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How Progressive is the U.S. Tax System?

Thomas Coleman†and David A. Weisbach‡

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Abstract

We examine changes in tax progressivity over time. Because there are many possible definitions of progressivity and because methods of defining and allocating income vary, we look for results that are robust across studies and definitions of progressivity. To do this, we compare the results from three different publicly available datasets, those from Piketty, Saez, and Zucman (2018), Auten and Splinter (2023) and Congressional Budget Office (2023). Notwithstanding some headline results to the contrary, all three datasets show that the tax system has become more progressive and more redistributive over the last several decades, with much of that change occurring in recent years. This increase in redistribution is driven primarily by an increase in transfers to households in the bottom half of the income distribution which is missed by a focus on the top 1%. A literature search for other studies confirms this result.

Keywords: progressivity, redistribution, inequality

JEL Codes: H20, H23

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1 Introduction

There is a widespread perception that the US tax system has become less progressive over the last 50 years while inequality has increased. Many believe not only that the tax system has failed to address rising inequality, but that it has contributed to the problem due to a reduction in top tax rates and massive evasion by the rich and by corporations. Examples of these views appear regularly in the media (Leonhardt, (2019); Rakoff, (2022)).

The academic debate on progressivity has largely been framed by Piketty and Saez (2003, 2007), and Piketty, Saez, and Zucman (2018) (PSZ). These authors find that the tax system has become less progressive over time because tax rates on the top 1% or top 0.1% have gone down and after-tax income shares for these groups have gone up. Saez and Zucman (2020) using a related but different specification, find that the tax system is now regressive because the average tax rates on top income groups exceed tax rates on lower income groups.

Although there are notable dissenters (e.g., Auten and Splinter (2023) (AS)), these views are widely accepted. For example, Greenstone et al. (2012) lists a dozen economics facts about tax reform, stating as Fact 4: “The tax system has become less progressive over time.” Heathcote, Storesletten, and Violante (2020, p. 2717) find that “the consensus view in the literature is that the US tax system has become less progressive over the last past 40 years” (although as we will discuss, that study finds no change in progressivity). Deese and Kamin (2023) (a recent chair and deputy chair of the National Economic Council) state that “the dominant feature of tax policy in the two decades from 2001 to 2021 was a series of large tax cuts that . . . made the distribution of post-tax income less equal.” Books on inequality, including books by Nobel Laureate economists, are based on the idea of a regressive, or at least a far less progressive, tax system.1 (Stiglitz, 2012;Freeland, 2012; Lindsey and Teles, 2017; Noah, 2012)

We argue that the view that the tax and transfer system has become less

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1Articles in periodicals may not reflect the views of the general public. There is limited credible evidence of the public’s views on progressivity, however. Stantcheva (2021), in a broad-based survey, examines a related question, which is whether the rich, middle, or poor pay their fair share of taxes. Only 20% of her sample think that high-income earners pay more than their fair share while 64% believe that the middle class pays more than its fair share.
progressive needs a critical review and reassessment. Our goal is to provide that review. We start, in Part 2, by arguing that any assessment of progressivity or redistribution needs to focus on the entire income spectrum, not only the top 1% that has been the focus in much of the recent literature. We also argue that no single summary measure of progressivity or redistribution captures the entire picture. We therefore use a variety of measures to examine progressivity and redistribution, all of which look at the entire distribution.

Part 3 addresses the data and estimation methods used to measure progressivity. It concludes that there are substantial uncertainties in any comprehensive estimate of income but that using narrower estimates, such as taxable income, can produce biased estimates. As a result, assessments of progressivity should use comprehensive measures of income but look for conclusions that are robust across different approaches to measurement.

Part 4 turns to the data and our results. Consistent with our view that we should look for results that are robust across metrics and methodologies, we looked at all recent studies of tax progressivity that (1) make detailed data and results available, (2) examine changes in the tax and transfer system over at least several decades, and (3) meet other criteria for quality such as making consistent incidence assumptions and looking at the entire tax and transfer system. We have found three studies that meet these criteria: (i) PSZ; (ii) AS; and (iii) the Congressional Budget Office’s annual series on tax system progressivity, Congressional Budget Office (2022) (CBO). To ensure that these studies are not outliers, we supplement our in-depth examination of these studies with a literature search for other estimates.

Our examination of these studies shows that over the last 40-60 years, the tax and transfer system has increasingly transferred resources to the lower end of the distribution and that most of that increase has occurred in the last several decades. These increases are large enough that after-tax-and-transfer income is markedly more equal than pre-tax and transfer income. Summary measures, such as the Reynolds-Smolensky (RS) index (Reynolds-Smolensky (1977)), show that redistribution has increased. We find this same result in all three datasets, and find no significant countervailing evidence from our literature search. The conclusions are robust to different metrics and different estimation techniques.
In short, the widespread view that the tax system has become less progressive appears to be factually incorrect.

It is important to note that we take no view here on whether the tax system should be more progressive than it currently is. There may be good arguments for increasing or for reducing tax rates on high earners, and the same is true for the corporate tax. It is crucial, however, to base tax reform proposals on an accurate assessment of the facts. Our goal is to help with that assessment.

2 Metrics

Much of the focus of recent studies of tax progressivity has been on the top 1%. This focus can obscure changes in the tax and transfer system that affect other income groups. In fact, a focus on the top 1% can be actively misleading about effects elsewhere in the distribution.

To illustrate, using an example from Kaplow (2006 p. 65, Figure 7), compare two tax regimes. Regime 1 offers a generous exemption, \( e_1 \), and taxes all income above the exemption at a flat rate. Regime 2 offers a smaller exemption, \( e_2 \), but has increasing marginal rates as income rises. For taxpayers with income lower than \( y_1 \), the flat rate tax of Regime 1 offers a lower average tax rate. For taxpayers with income between \( y_1 \) and \( y_2 \), Regime 2 offers a lower average rate. And for taxpayers with income above \( y_2 \), Regime 1 again offers a lower rate.

A focus on the top 1% would conclude that Regime 2 is more progressive than Regime 1. That focus, however, would ignore the benefits to low-income individuals of Regime 1. A decision to focus exclusively on the top 1% is a decision that we care more about that group than we do about the poor. As we will discuss in Part 4, many of the changes in tax and transfer policy over the last 50 years have occurred in the lower part of the distribution. A focus on the top 1% does not capture those changes and potentially presents a misleading picture. This is particularly vexing to the extent that either the utility function or the social welfare function is curved, because to this extent, the effects on income groups at the bottom are of central concern. To address this problem, studies should look at measures that consider the entire income spectrum.
There are a large number of possible measures, including the Kakwani index (Kakwani 1977), the RS index, and the elasticity of the net of tax rate to pre-tax income (Benabou, 2000; and Heathcote, Storesletten, and Violante, 2017, 2020). There is a corresponding literature on the choice of metrics, such as Lambert (1993). All of these metrics make assumptions about what matters, and all of these metrics necessarily reduce complex and differential effects across the income spectrum to a single number. As Kaplow (2005) and Kakwani and Son (2020) emphasize, these choices make assumptions about social welfare. For example, the RS index assumes that Gini coefficients are an appropriate measure of inequality. Moreover, comparing changes to the RS index over time when the underlying inequality and the structure of the economy has changed requires assumptions about how to understand redistribution in different settings.\(^2\)

We view the various measures of progressivity or redistribution as summary measures of a complex set of facts, the same way the mean and standard deviation are summary measures of a distribution. From this perspective, different measures are complementary, providing alternative views of the distribution. We get a better understanding of the underlying facts by looking at a variety of measures.

Following this logic, we use three different metrics to understand changes to the tax and transfer system over time. Our primary measure is the tax-and-transfer rate:

\[
\frac{Income\ Before\ Taxes\ &\ Transfers - Income\ After\ Taxes\ &\ Transfers}{Income\ Before\ Taxes\ &\ Transfers}\,.
\]

This is the analogue of the average tax rate but is more comprehensive in treating taxes and transfers symmetrically. We look at changes to the tax and transfer rate across income groups and across time.

This measure does not account for changes in underlying income. For example, a reduction in the tax-and-transfer rate to a particular income group may be

\(^2\)The problem was recognized as early as Musgrave and Thin (1948) but there is no way to correct for this problem without making strong assumptions. For example, a measure of progressivity or redistribution can normalize the pre-tax distribution of income across time or across countries using a variety of procedures, as was done by Dardanoni and Lambert (2002), but this procedure requires assumptions about how a polity would respond were the underlying distribution of income or consumption different. These assumptions—which can drive the results—cannot be supported empirically. Instead, they are simply imposed by modelers.
offset by increases in that group’s pre-tax income. To account for this effect, we also show changes in pre-tax and after-tax income over time for different income groups (the distance between the two is the tax and transfer rate). Finally, as a summary measure, we show changes to the RS index.

In all cases, we seek broad-based measurements. Because the boundary between what is nominally in the tax system and nominally a transfer is arbitrary, we look at metrics that examine the tax and transfer system, not just the tax system. We also prefer measures that use reasonably complete measures of income. While lifetime income or other measures that account for lifecycle effects and mobility might be preferable, because of data limitations, we look at annual income measures and cross-sectional data. In our literature review, we report on studies that use alternative bases.

3 Data and Measurement

Even once we have chosen a set of progressivity measure, the data problems are significant. The core agenda for researchers into inequality over the last 20 years has been developing better data sources and methods. We consider four issues: (i) coverage; (ii) allocation of national income to individuals; (iii) the measurement unit; (iv) reranking.

3.1 Coverage

Many of the recent discussions of inequality and tax progressivity were spurred by Piketty and Saez (2003, 2007). Those papers used income tax returns to attempt to trace top income shares over time. Because they used income tax returns, the information in those studies was limited to taxable (or fiscal) income. What was not appreciated at the time and still appears not to be widely recognized outside of specialists working in the areas, is just how little information on the distribution of economic income across people or time is provided by taxable income.

The data presented in Table 1 demonstrates the problem. The first row is based on data from PSZ (following the methodology of Piketty & Saez (2007)). It shows the growth in fiscal or taxable income per adult from 1979 to 2014. As
Table 1: Growth in Real Average Per-Capita Income Measures, 1979-2014

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>0-50th</th>
<th>50-90th</th>
<th>Top 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSZ Fiscal Income</td>
<td>30.0%</td>
<td>-37.6%</td>
<td>5.7%</td>
<td>90.9%</td>
</tr>
<tr>
<td>PSZ Pre-Tax Hybrid Income</td>
<td>55.9%</td>
<td>0.5%</td>
<td>42.0%</td>
<td>107.3%</td>
</tr>
<tr>
<td>AS Pre-Tax National Income</td>
<td>75.6%</td>
<td>27.1%</td>
<td>69.3%</td>
<td>117.8%</td>
</tr>
</tbody>
</table>


can be seen, using these data, overall growth per capita was 30.0% while it was negative 37.6% for the bottom of the distribution. The second row, using data from the same paper, shows the growth in total national income per adult (i.e., both taxable income and income that is not subject to tax – we label this “hybrid income” for reasons discussed below), which was 55.9% while the bottom group had essentially zero growth. The third row shows the estimate from AS, who estimate the growth rate of total national income per person. They peg overall growth rate per person at 75.6% and 27.1% for the bottom. Comparing the first row (fiscal income) to either of the second two rows shows how dramatically fiscal income understates a full measure of income. It also shows that fiscal income does not represent the economic income enjoyed by those in the US – claiming that the average per-capita income for half the US population fell by over one-third is strongly at variance with reality.

The problem is not just about the overall level of growth. Taxable income as a fraction of total income has changed differently for different income groups, which means that looking at taxable income can be misleading. Figure 1 illustrates. It shows taxable income as a fraction of total income for three different income groups: the bottom 50%, the middle 40%, and the top 10% (data taken from PSZ). As can be seen, the tax base for the bottom 50% (as a fraction of total income for that group) shrinks dramatically over the 60-year period while the tax base at the top grows. Looking at taxable income, therefore, would make it look like there is relatively much less income at the bottom and more income at the top, overstating the growth in inequality.
The solution to this problem is to use a complete measure of national income, capturing both taxable income and all sources of other income. One approach, which first appeared in Pechman and Okner (1974, 15) is to start with tax returns and then impute missing components of income. In the last decade, Pechman and Okner’s approach has been refined and used by Fixler and Johnson (2014), Smith et al. (2019), Fixler, Gindelsky, and Johnson (2020a) as well as PSZ and AS. This approach solves some of the problems with using taxable income as a measure, but introduces separate problems, which we turn to immediately below.

### 3.2 Imputing National Income to Units

While we have reasonable estimates of national income, there are significant problems with allocating it to individuals or households. Studies that appear to use similar approaches may produce widely different estimates. We consider seven components of national income, however, that are not well-measured. Key examples include household services (home childcare, cooking, cleaning, and so forth) and imputed income from non-traded wealth, such as collectibles.
problems.

*Underreported income.* Income that taxpayers hide to avoid taxation (whether it is hidden in legal tax shelters or hidden in illegal tax evasion) is, by its nature, difficult to observe. Estimates of the annual tax gap put it around $450 billion/year. After enforcement, the gap goes down to about $380 billion/year, which is large enough to have significant effects on results.

The allocation of unreported income generates the single biggest difference between the results in PSZ and AS for the top 1%, as illustrated in AS Table 4. AS allocate unreported income based on data from the series of intensive audits regularly conducted by the IRS. These studies indicate that evasion is spread across income groups, with for example, middle income taxpayers evading by running cash businesses. This method allocates 15% of underreported income to the top 1%. PSZ, by contrast, allocate underreported income by shares of positive taxable income. The effect is to allocate 50% of underreported income to the top 1%. Relative to AS, their approach, therefore, shifts income from the middle and bottom of the income distribution to the top, thus making inequality look worse and the tax system less redistributive.

There remains significant uncertainty in this allocation because hidden income is, by its very nature, hard to observe. The approach of PSZ is problematic because they do not allocate *any* unreported income to households that report losses, a group almost certainly including households with unreported income. On the other hand, Guyton et al. (2021) find that the IRS intensive audits may miss income hidden offshore which is concentrated in the top 1%.

*Timing of tax preferred retirement income.* Returns in tax-preferred retirement accounts are a large fraction of capital income. There are no straightforward choices for how to count these returns. The two basic options are to count retirement income when it is earned (i.e., the initial year savings are deposited into a retirement account and on an accrual basis thereafter) or when it is distributed in retirement, or some combination. A Haig-Simons approach would include retirement income when it is earned but an implication would be that retired individuals have little or no income. The approach would make many people who are living comfortably look poor. Including retirement income only when distributed, however, risks understating earnings during working years. The
difference is substantial: AS, for example, estimate that relative to distributing income when received in retirement, including retirement income when earned would increase the top 1% share in 2014 by 1.5 percentage points.

*Taxes.* Any estimate of the effects of taxes (and transfers) has to make assumptions about their incidence. The usual assumption for payroll taxes is that they are entirely borne by workers, notwithstanding that half of the taxes are remitted by employers. The incidence of the corporate tax is more disputed. Most distributional estimates allocate between one quarter and one half to labor and the rest to all non-housing capital. The incidence of transfers is much less studied but transfers, like taxes, could well be shifted to individuals other than the direct recipients.

Saez and Zucman (2019, 2020) depart from these practices but do so inconsistently. They argue that the appropriate incidence assumption for distributional analysis is to allocate taxes based on remittance obligations. This means that they allocate all corporate taxes to corporate shareholders, allocating none to labor and none to owners of other capital. On the other hand, they allocate payroll taxes to labor notwithstanding that half of payroll taxes are remitted by employers. Similarly, they allocate sales taxes to consumers, notwithstanding remittance by retailers. Moreover, it appears that each of Saez and Zucman’s incidence assumptions makes inequality look worse and makes the tax system look less progressive. Based on these problems and other criticisms made by Kopcuk (2019), we omit the estimates from Saez and Zucman from our literature survey in Part 3B.

*Capital gains and returns to holding wealth.* Returns to holding wealth cannot easily be observed but may be a significant fraction of income. One method, used by some studies such as the CBO, is to include only realized income (mostly capital gains). This measure, however, does not capture gains in tax-preferred accounts, and gains that are excluded due to stepped up basis at death, likely understating the capital income of wealthy individuals. Other alternatives are to use accrued capital gains or to distribute corporate retained earnings while excluding capital gains (AS and PSZ).

These choices have substantial affects. For example, Larrimore et al. (2021) use accrued capital gains for their primary estimates of inequality. They report
that in the year 2008 (the Great Recession), accrued losses were more than $11 trillion but taxpayers reported $0.5 trillion in taxable realized gains. Over their 28-year measurement period, they estimate that there were over $28 trillion in real, accrued capital gains (with nominal accrued capital gains almost double that, at $52 trillion) while there were only $14 trillion of nominal taxable realized gains.

*Government spending.* Spending by the federal government is a large fraction of GDP. In fiscal year 2023, total federal spending was $6.1 trillion (out of a GDP of about $27 trillion). Cash or cash-like transfers to individuals are relatively easy to allocate but a large fraction of government spending, such as national defense, education, streets and highways, is not. Subtracting the $956 billion spent on Medicare, the $954 billion for Social Security, $523 billion for (federal) Medicaid, and $545 billion interest expense (discussed below), leaves more than $3 trillion of government spending, more than 10% of GDP, that needs to be allocated.

The literature tends to allocate government spending either on a per-capita basis or in proportion to after-tax income, or some mixture. For example, AS allocate government spending half per capita and half by after-tax income while PSZ allocate it based on after-tax income. There is no straightforward method for determining which method is best or whether a third alternative would be preferable. Given the size of the amounts at stake, the choice is nontrivial. For example, AS (table 4) report that allocating spending based entirely on after-tax income would increase the top 1% share of income in 2014 by 1.3 percentage points.

*Deficits and debt.* Net interest on federal debt in 2022 was $476 billion. Some studies (PSZ) allocate this by transfer payments, presumably on the theory that transfers will eventually be reduced, while others (AS) allocate it to current taxes. Both are simply guesses.

*Transfer income.* Transfer income is concentrated at the low end. It has been increasing over time, which means that properly accounting for it will affect the time series of tax and transfer progressivity and redistribution. Because it is mostly not taxable, it must be estimated using survey data. Habib (2018) finds that there is significant underreporting of transfer income in surveys. Without correcting for underreporting, the tax and transfer system will look less progressive and will look like it redistributes less. For example, Habib (2018) reports that
adjusting for unreported transfer income noticeably reduces the CBO’s estimates of the after-tax-and-transfer Gini.

Summary. The combination of all of these problems means that there is considerable uncertainty in the allocation of national income to individuals. Studies that use the same top-line number for national income may produce different estimates of inequality and tax progressivity, even holding all else constant (such as measurement units, discussed below). Many of the choices have no clear right or wrong answers, which means that the uncertainties are unlikely to be resolved and, moreover, researchers have a significant degree of freedom when making choices. One possibility is for studies to report ranges of estimates reflecting the underlying uncertainty.

3.3 Units

Even if we could accurately allocate national income to units, we have to decide how to define units. Possibilities, used variously in the literature, include individuals, adults, households, or tax filing units. If different types of units remained fixed over time, the choice might wash out in comparisons of changes over time. Unfortunately, this is not the case – units change differently over time. For example, marriage rates declined for all income groups over the last 60 years but fell much more for lower income groups than for the top 1%. This mechanically increases the number of tax filing units at the low end and, unless adjustments are made, would artificially increase measured inequality when measured by tax units.4

To illustrate the size of this issue, compare rows 2 and 3 in Table 1. Row 2, column 2 (“PSZ Pre-Tax Hybrid Income,” “Overall”) is per capita growth reported by PSZ while row 3 is the AS estimate. PSZ peg per capita growth at 55.9% while AS estimate it at 75.6%, which is a stark difference in a number that should be easy to estimate with substantial accuracy.5

4This was a key problem with Piketty and Saez (2003). It used tax filing units and did not adjust for the relative change in those units across different income groups. (Larrimore 2014) found that declining marriage rates between 1979 and 2007 account for 23% of the increase in the Gini coefficient when measured using households.

5We know each year’s GDP and population with substantial precision. In fact using BEA
The major reason for the difference is different units: PSZ report income per adult and AS income per person. The number of adults has grown more quickly than number of people (family size fell from 1979 to 2014). This means that even though they have the same gross number for national income, PSZ’s per-capita measure (per adult) grows more slowly than AS’s measure (per person). The underlying data are the same, but the different measurement unit produces large differences in reported per-capita incomes.

The difference in units also likely explains a large part of the difference in PSZ’s and AS’s estimate of growth for the bottom 50th percentile. The differences reported there are larger than the overall differences. While some of this difference may be due to differences in how income is imputed, a large fraction is likely due to changes in units over time. In particular, family size has fallen more for the lower part of the income distribution than the upper, and this higher growth in adults relative to population in the lower half could account for much of the difference.

3.4 Reranking

If the tax system causes a reranking of households, measures of progressivity or redistribution will be altered. For example, the tax system might cause a household that was in the bottom quintile pre-tax to move up to the second quintile after-tax (and correspondingly cause a household in the second quintile...

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*To be precise, most of the difference is due to measurement unit with some due to the deflator. A formal decomposition shows that of the total difference in ratio terms of 1.126 (1.756/1.559), 1.099 is due to measurement unit and 1.024 due to deflator.

*The tax income data (row 1 of Table 1) as originally reported by PS and replicated by PSZ, uses taxable units as the measurement unit. PSZ in their on-line data report the tax income by adult, with growth of 43.7% versus 55.9% for NI growth. The figure comparable to AS, reporting growth per person rather than per tax unit, would be 61.8% (versus NI 75.6%).

*For example, the ratio of AS’s result to PSZ’s result for the bottom 50% is 1.271/1.005 = 1.265 while the same ratio for overall growth is 1.126.

*There is a sizable literature on reranking and horizontal equity. Most of that literature seeks decompositions of the Kakwani or Reynolds-Smolensky indices into vertical and horizontal components (Atkinson, 1980; Plotnick, 1981; Aronson and Lambert 1994; Lerman and Yitzhaki, 1995; Omruba, Picos-Sanchez and Rodado 2014, di Caro, 2020). We do not address horizontal equity here as our concern is the effect of taxes on overall inequality.
To move down).

To illustrate the problem presented by reranking, consider a simple hypothetical where households in the bottom quintile have pre-tax earnings of 100 and households in the second quintile have pre-tax earnings of 110. Suppose that the transfer system provides benefits to households in the bottom quintile that push their after-tax-and-transfer earnings to 115 (leaving households in the second quintile at 110). Because of the reranking, the after-tax-and-transfer rankings would show that the bottom quintile has earnings of 110 while the second quintile has after-tax earnings of 115. If we do not account for the reranking, it would incorrectly appear as if some of the benefits of the transfer system (1/3 of the $15 transfer) went to the second quintile. The system would appear less progressive than it is. The transfer system in this hypothetical is targeted entirely at the bottom and does not make the second quintile better off. To ensure an accurate measurement of progressivity and redistribution, we need to use a consistent ranking of households, such as comparing the pre-tax income to after-tax income, using pre-tax rankings for both pre-tax and after-tax income.

This concern is not just hypothetical. Table 2 gives the average income for each quintile in 2019 ranked either by pre-tax income or by post-tax income using CBO data. Ranked by pre-tax income, households in the bottom quintile had average pre-tax income of $23,800. If we rank them by after-tax income, households in the (re-ranked) bottom quintile had average pre-tax income of $28,600. The only way this can happen is if some households with higher income pre-tax and transfer (i.e., in the second quintile) are pushed into the bottom quintile after-tax-and-transfer. The same holds if we look at the second quintile. Its average when ranked by pre-tax income is less than when ranked by after-tax income. This has to reverse itself. If some households are pushed into lower quintiles, others are pushed into higher quintiles. This reversal happens for the top three quintiles. In each of these quintiles, average pre-tax household income is higher when ranked pre-tax than when ranked after-tax, which means that some poorer households get pushed up into these quintiles when ranked after-tax.

In our estimates of tax and transfer rates below, we hold rankings constant, using the pre-tax and transfer rankings. Because of data limitations, for our
Table 2: Average pre-tax & transfer income/quintile for 2019, CBO data

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Ranked by pre-tax income</th>
<th>Ranked by post-tax income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23,800</td>
<td>28,600</td>
</tr>
<tr>
<td>2</td>
<td>52,400</td>
<td>53,300</td>
</tr>
<tr>
<td>3</td>
<td>81,800</td>
<td>81,200</td>
</tr>
<tr>
<td>4</td>
<td>123,000</td>
<td>122,800</td>
</tr>
<tr>
<td>5</td>
<td>332,100</td>
<td>331,900</td>
</tr>
</tbody>
</table>


calculations of the RS index\textsuperscript{10} and our comparisons of pre-tax income to after-tax income, we use after-tax rankings when computing after-tax incomes.

4 The estimates

In this section, we present measures of the progressivity of, and redistribution by, the tax and transfer system. We limit our analysis to studies that use a comprehensive measure of income, examine the entire tax and transfer system, provide estimates for at least several decades, make their data and detailed results available, and meet basic reliability tests from the discussion above. Only three studies meet these criteria, PSZ, AS and CBO. Part 4A describes the methodologies used by these studies which vary significantly. Part 4B presents the results from those studies. To ensure that these studies are not outliers, we performed a literature search. Part 3C we present the results that search.

\textsuperscript{10}Because the RS index is concerned with overall changes in the distribution of income, we also believe it is correct to use post-tax rankings of income when calculating the post-tax Gini. Reynolds and Smolensky (1977) follow this approach. Other definitions of the RS index such as Lambert (1993, p. 182) use pre-tax rankings. Regardless, the PSZ data needed to calculate the RS index only ranks post-tax income by the post-tax distribution. As a result, this is the only method of calculating the index that we can use in our cross-study comparisons.
4.1 Summary of the methodologies

Table 3, which extends Fixler et al Table 4 (2020b, “Measuring Inequality”), provides an item-by-item breakdown of the income definitions used by each of the three groups plus the definitions used by the Bureau of Economic Analysis (personal income and disposable personal income), the Census (money income), and Elwell, Corinth, and Burkhauser (2012) (discussed in part 3B below).

CBO uses a nationally representative sample of income tax returns from the Statistics of Income supplemented with data from CPS surveys. They define pre-tax income (which they call “income before transfers and taxes”) to include employment and business income and investment income (what they label market income), plus some cash transfers (Social Security, Medicare, Unemployment Insurance, and Workers’ Compensation), employer-provided benefits, and retirement income disbursements (what they label “social insurance benefits”). The definition of income is based on income tax reporting which means, for example, that it does not capture underreported income, inside buildup in retirement accounts, imputed rents on owner-occupied housing or unrealized capital gains. It does, however, include realized capital gains, which are not part of either the AS or PSZ definition of income. CBO ranks income groups (households) by square-root size-adjusted income: household income divided by the square root of the number of people in the household. CBO’s income after transfers and before tax includes only means-tested transfers such as Medicaid, SNAP, SSI and housing assistance.\footnote{Previously, CBO included all transfers in their measure of before-tax income. They included transfers in before-tax income because they viewed their mandate as narrowly focused on taxes. In 2017, CBO began separating means-tested transfers from other transfers. The reason for this change was that the tax and transfer systems have become increasingly intertwined, which meant, they argued, that studying taxes alone no longer made sense. They do not include social insurance benefits, such as Social Security and Medicare because of what they view as the difficulty of analyzing the distributional impact of those policies within an annual framework.}

Because their mandate is to study federal taxes, they only subtract federal taxes from income after transfers to calculate after-tax income.

Both AS and PSZ seek to allocate all national income to individuals, using related but distinct methodologies. AS start with tax return data and make adjustments to account for the shortcomings in that data to produce a measure of pre-tax national income. This process includes both correcting how income
Table 3: Summary of income definitions for various studies

<table>
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<tr>
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<tr>
<td>Employment income</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Business income (including self-employment)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Corporate profits (retained earnings and taxes)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>Investment income</td>
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</tr>
<tr>
<td>Imputed interest on investments</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>?</td>
</tr>
<tr>
<td>Retirement income</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Imputed capital gains</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Transfers</td>
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<td>Government cash transfers</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Social security disbursements</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Income transfers: Federal</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Income transfers: State &amp; Local</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Property taxes, sales taxes, corporate taxes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<th>Measurement Unit</th>
<th>Household</th>
<th>Household</th>
<th>Household</th>
<th>Individual</th>
<th>Adult</th>
<th>Tax Units &amp; Individual</th>
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<tbody>
<tr>
<td>Equivalence scale (income-sharing)</td>
<td>Square-root</td>
<td>None</td>
<td>Square-root</td>
<td>Square-root</td>
<td>Equal-split</td>
<td>None &amp; Square-root</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Primary / original</th>
<th>CPS ASEC</th>
<th>CPS ASEC</th>
<th>Tax Files (PUF &amp; SO)</th>
<th>Tax Files (PUF &amp; SO)</th>
<th>Tax Files (PUF &amp; SO)</th>
<th>CPS ASEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targeting income definition</td>
<td>IHPI DPI</td>
<td>...</td>
<td>...</td>
<td>NPIA NI</td>
<td>Hybrid NPIA NDI</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

Supplementary data source: CPS ASEC, CPS ASEC, CPS ASEC, Census for pre-1979

*No/Yes* indicates multiple published measures, without with and with the indicated item. Red simply denotes items added or corrected from the Fixler table.

1. This is the pretax and transfer measure. AS and PSZ also produce post-tax and transfer national income, which includes in-kind government transfers.
2. Since employer and employer contributions are both added and subtracted they are effectively absent.
3. PSZ exclude social security contributions.
4. CBO pretax/transfer measure includes Medicare and social insurance programs, and creates a post tax/transfer measure that includes means-tested cash and in-kind transfers.
5. PSZ exclude all cash transfers. PSZ include social insurance programs similar to CPS ASEC
6. I think Fixler et al are simply wrong – both AS and PSZ target NI and so we do not include Social Security. I have decomposed the difference in overall AS vs PSZ growth into p
7. PSZ include cash transfers such as EITC in taxes, so include in post-tax. Need to double-check for PSZ.
8. Need to check on PSZ, since the are targeting NI (and I think so correctly) I think AS and PSZ should do the same thing for pre-tax NI
9. AS exclude social security disbursements.
10. AS and ECB also publish pre-tax post-transfer. AS and ECB also publish pre-tax post-transfer

Based on Table 4 from Fixler et al (2020b), modified and extended by the authors.
is measured on tax returns (including attempting to make that measurement consistent across time even though the tax rules have changed) and imputing to individuals the large fraction of national income not reported on tax returns. They then add transfers to produce a measure of after-transfer but before-tax income, and subtract taxes to measure after-tax income (before government spending), and finally allocate other government spending and deficits to produce a full measure of after-tax national income. Under this approach, the total or overall pre-tax national income should be equal to after-tax national income. Transfers, taxes, and other government spending reallocate the amounts across the distribution but do not change the totals; the question is how taxes and spending reallocate.

PSZ follow a similar approach but there are a number of differences in the methodologies of the two research groups. For example, PSZ use tax units to measure income, split that income equally among adults, and then rank and calculate statistics by adults. AS measure income by households, split income among individuals according to a square-root sharing rule, and rank and calculate statistics for individuals.12 The two groups allocate reported income differently, use different incidence assumptions for corporate taxes and federal deficits, use different methods for estimating untaxed returns to capital, and use different methods for allocating retirement income. Table 4 in AS provides an item-by-item calculation of how each of these differences affect the income of the top 1% (but not for other groups).

AS target and match national income reported in the National Income and

12Splitting income according to a square-root sharing rule introduces some subtle complications, in that the size-adjusted income which is allocated to individuals will no longer add up to the actual total income. But average incomes must be calculated using actual income. This issue has led to some confusion and debate among rival research groups (and we suspect this is the reason PSZ split income equally between adults and only count adults). AS state "size-adjusted incomes are only used to rank tax units and determine income groups in the income distribution. Income shares are calculated using total tax-unit incomes, such that they sum to national income." What this means is that whether a household is in, say, the bottom 20% of the distribution depends on the size-adjusted (square-root distributed) income of the individuals in the household, all of whom have the same size-adjusted income. Further, the "bottom 20%" is defined to hold 20% of the population (individuals) so this will generally not be 20% of the households. The aggregate income of that "bottom 20%" is now defined to be the sum of household income of those households that fall in the "bottom 20%". The average per person income will be that aggregate income divided by the number of individuals (20% of the total population). For a formalization of this explanation, see Coleman (2023).
Table 4: NIPA National Income v. Personal Income (BEA Tables 1.12 and 2.1)

<table>
<thead>
<tr>
<th></th>
<th>National Income</th>
<th>Personal Income</th>
<th>PSZ Hybrid Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate profits</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Miscellaneous items (net interest, taxes on production, business current transfer payments, ...)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Personal income receipts on assets</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Personal current transfer receipts (mainly government, Social Security, Medicare, UI, ...)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Less contributions for gov’t social insurance</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Product Accounts (Table 1.12 of the BEA NIPA). PSZ (pp. 560-561) claim to do as well, but they actually construct a hybrid measure that appears to be something between national income and personal income, which we label “PSZ Hybrid Income” or simply “Hybrid Income”.

This difference between AS and PSZ is not well appreciated, so we undertake a short digression to clarify the approaches. National income (NI) is the sum of all labor and capital income—the flow return to human and nonhuman capital—that accrues to US resident individuals. This is more appropriate than GDP because national income removes capital depreciation (which does not directly produce consumption or accumulation of wealth) and adds income received from abroad. As a broad measure of all income in the economy, it serves as a useful benchmark.

Personal income (PI) is another complete measure of income, the income that persons\(^\text{(13)}\) receive in return for provision of labor and capital, plus current transfer receipts (e.g. Social Security, Medicare) less contributions for government social insurance. The broad differences in items included in NI and PI are shown in Table 4.

Some of the differences between NI and PI involve fundamentally different income concepts: corporate profits are included in NI but not PI. Others are “distributional”: PI includes personal current transfer receipts (largely government

\(^{13}\)“Persons” are households, nonprofit institutions that serve households, private noninsured welfare funds, and private trust funds.
social benefits such as Social Security) but nets out contributions for government
social insurance. If government benefits were funded out of current revenue then
this would have little effect on the amount of income but would have a large effect
on who received the income—older retirees receive Social Security while younger
workers contribute. In terms of amount, national income and personal income are
not far apart for most years—for 2014 as reported in the on-line data appendixes
for AS and PSZ the difference was 1.7%: NI was $15,228.0 billion compared to PI
of $14,976.6 billion.14

PSZ’s goal in defining income (what they call “pre-tax national income” but
which would more accurately be called “hybrid income”) is to account for “all income
flows going to labor and capital, after taking into account the operation of private
and public pensions” (PSZ p 565). In doing so they want to conceptually match
national income and so include items such as “Primary income of corporations” (in
their definition of “Personal factor income”) which seems to be akin to the NIPA
corporate profits. However, they also want to include social insurance income and
deduct the contributions, which is akin to personal income.15 In the table above
we have noted that PSZ include items that are conceptually akin to various items
in both national and personal income. PSZ include some items that align with NI:
some of the miscellaneous items (“Taxes on production”) they take directly from
NI and they include “Primary income of corporations” which seems, conceptually
although not numerically, to be in line with “Corporate profits.” Other items align
with PI: they include “Social insurance income,” deduct “Social contributions,” and
include “Property income received” (which is a modification of PI “Personal income
receipts on assets” to net out imputed interest on defined benefit pension plans
and to include nonprofits). They constrain their hybrid income to numerically
match the published NIPA NI each year so that they are correct in a technical
sense in saying “we follow . . . national income” but conceptually their measure is

14The pandemic years of 2021 and 2022 were an exception with large “Other government
social benefits” producing a larger difference.
15PSZ include government and private pensions but not Medicare and Medicaid. Because
social insurance income and contributions do not match (private contributions generally exceed
distributions while for Social Security contributions are generally less), PSZ add back the surplus
or deficit. PSZ fn 15 p 565. Details on PSZ’s construction of their national income / hybrid income
measure are available in the sheets in their workbook “PSZ2022AppendixTablesI(Aggreg).xlsx”

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a hybrid, not following either NI or PI.\textsuperscript{16}

4.2 Comparisons of PSZ, AS, and CBO

We start by comparing the tax and transfer rates produced by all three research groups. The tax and transfer rate is the difference between pre-tax and transfer income and after-tax-and-transfer income, normalized by the pre-tax-and-transfer income.\textsuperscript{17} A positive number means that the household pays net taxes (the taxes it pays exceed the transfers it receives) and a negative number means that the household receives net transfers. That is, our sign convention is from the government’s perspective: taxes are inflows and transfers are outflows. (For compactness, we often omit the “and transfer” below, effectively treating transfers as negative taxes.)

The tax rate calculated this way is an average rate for a given income group. This means that by comparing tax rates across income groups, we can get a measure of progressivity. For example, if the difference between the tax rates of a high-income group and a low-income group has increased, the tax system has become more progressive. In the figures we use below, this is the vertical distance between the tax rates for different groups: in general, if the vertical distance is larger, the tax system is more progressive.\textsuperscript{18}

We start by comparing PSZ to AS. While PSZ provide estimates of income by percentile, these estimates do not control for reranking and so do not allow for a like-for-like comparison of before versus after tax income. Instead, we use their

\textsuperscript{16}BEA has also calculated distributional national accounts similar to the estimates by AS and PSZ, though BEA’s estimates only start in 2000, so we do not present their results here. Fixer et al (2020). The BEA targets personal income (pre-tax) and disposable personal income (after-tax). This is a valuable source of data that complements and supplements the distributional measures we discuss here. The BEA estimates the distribution by decile and also includes the bottom 5%, top 5%, and top 1%.

\textsuperscript{17}For both PSZ and AS “after-tax-and-transfer” is before government consumption and deficits, so does not match total national income. CBO includes only federal taxes and no government consumption.

\textsuperscript{18}Not surprisingly, if the changes are not monotonic, we may not be able to make easy inferences. For example, the difference in tax rates for some groups may get smaller and for other groups larger. In this case, there may be no straightforward way to estimate progressivity, as was discussed in Part 1. Fortunately, most of the changes we see in the data are monotonic or close to monotonic.
rankings that aggregate the population into four groups: the bottom 50%, the middle 40%, the top 10% and the top 1%, which allow us to control for reranking. We use the AS data for the same groups. Figure 2 shows the tax rates for each of these groups from 1966 (the first year of consistent data in AS) until 2019.

Figure 2: Tax & transfer rates, PSZ v. AS

Looking at the top three lines in each panel (the middle 40%, the top 10%, and the top 1%) we can see some differences. PSZ show a sharp narrowing of tax rates from the 1960’s to the 1985 with a modest spread after that time. The tax rate on the top 1% peaks at 47.2% in 1969 and goes down to 31.8% in 1984. It sees only modest changes after that with the 2019 tax rate on the top 1% equal to 32.1%, almost the same as it was in 1984. The middle 40% sees a peak tax rate in 1981 of 30%, declining to 21% in 2019. Overall, the tax system for these three groups looks less progressive now than it was in the 1960’s, driven by a decline taxes on the top 1%.

Looking at the same top three groups, AS show markedly different story. In their data, the tax system for these three groups has become more progressive. In particular, there is no substantial narrowing of the gap in rates between the top 1% and the middle 40% prior to 1986 and the gap has grown recently in the
In 1966, the top 1% had an average tax rate of 35.1% while the middle 40% had an average rate of 23.8%. By 2019, the top 1% had an average tax rate of 40.9% compared to 16.2% for the middle 40. Just looking at these upper income groups, the results of the two research groups seem to be at odds. The discussions of the results in AS and in the media, such as Matthews (2018) have focused on this difference.

This focus on the top, however, misses the central change in the tax and transfer system over the last 60 years. Once we look at the bottom half of the population, the two datasets tell a similar story. Both show that the key change over the last 60 years has been a dramatic increase in transfers to the bottom half of the population. This increase swamps the changes in tax rates for the top half of the population.

While the two studies show similar trends, AS show larger transfers to the bottom half of the population and a larger increase in those transfers. In 2019, PSZ estimate that the tax rate for the bottom half of the population is -24.4% while AS peg the rate at almost twice that value, -45.6%. While there may be a number of factors driving this difference, one key factor is how the two research groups treat Social Security: as discussed PSZ exclude Social Security from their definition of transfers (including it in their definition of pre-tax hybrid income) while AS treat Social Security as a transfer (as it is not included in national income). Regardless of this difference, however, both groups show that the increase in transfers to the bottom half of the population is the central story of the tax and transfer system over the last half century.

Turning to the CBO data, Figure 3 compares AS (left hand panel) to CBO (right hand panel). Both these research groups break their data into quintiles while controlling for reranking, which allows us to isolate groups at the bottom, something we cannot do with the PSZ data.

As discussed above, these two studies use different methodologies. Nevertheless, the results are remarkably similar. Broken down into quintiles, AS shows roughly the same results as described above: there is a widening of tax rates for higher

\[19\] We suspect that the marked narrowing apparent in the PSZ estimates for the top rates for 1966-1985, versus the lack of such narrowing in the AS estimates, is related to the 1986 TRA and the efforts by AS to make the pre- versus post-1986 tax series consistent.
income groups but changes for these groups are swamped by the increase in transfers to the bottom. The CBO results are similar.

Figure 3: Tax & transfer rates: AS v. CBO

"Auten and Splinter" is based on workbook “AutenSplinter-IncomeIneq.xlsx” updated in 2022, available from http://davidsplinter.com/. Their sheet “C7a-Redis” calculates (for quintiles) a “redistribution rate” which is our “tax & transfer rate” with sign reversed. We use the data in their sheet “Output2” (which also allows us to correct an error in the 2022 sheet “C7a-Redis” of using “ESI+Payroll taxes” instead of “Payroll taxes”). “Congressional Budget Office” is pre-tax income (market income plus social insurance benefits, before means-tested transfers and federal taxes) from url https://www.cbo.gov/publication/58353, “Supplemental Data” workbook “58353-supplemental-data.xlsx” sheet “3. Avg HH Income”. The Tax & Transfer Rate is calculated as (“market income” less “income after (federal) taxes and transfers”) divided by “market income”. Income (quintile) groups for both income measures are ranked by “income before transfers” which is “market income” plus “social insurance”. Note that income, taxes, and transfers are all based on groups ranked by pre-tax income, to provide a consistent comparison within income groupings.

Comparing Figures 2 and 3, we see that aggregating the bottom half of the population into a single group hides differences within this group. Both AS and CBO show that almost all the increase in transfers to the bottom half of the population go to the bottom quintile. The second quintile has some increase in transfers, but nothing like the increase to the bottom quintile.20 CBO (Exhibit 9) attributes this increase in transfers to Medicaid and CHIP, due to an increase in the number of households qualifying for these benefits and the cost of those benefits. (Food Stamps (SNAP) and SSI were relatively level during this period.)

All three studies produce the same qualitative results. Methodological choices produce some differences in the size of their estimates and the size of the trends, but the central story in all these studies is the same: the dominant change in the tax and transfer system over the past half-century has been an increase in transfers to the bottom. Looking at the difference between tax rates at the top 20CBO, however, excludes Medicare from its definition of a transfer, which means that it is also possible that some of the increase in transfers shown in the AS data is due to changes in Medicare.

Electronic copy available at: https://ssrn.com/abstract=4647122
and those at the bottom, all three studies show that the tax and transfer system has become more progressive and more redistributive.\footnote{Data published by the BEA (U.S. Bureau of Economic Analysis, “Distribution of Personal Income,” \url{https://www.bea.gov/data/special-topics/distribution-of-personal-income}) provides before- versus after-tax rates but these are not directly comparable to the AS tax and transfer rates. For 2019 the BEA rate for the bottom quintile was -10.0%. This includes taxes but not transfers since the BEA pre-tax income measure is personal income which includes most transfers. The AS estimate of taxes plus transfers -141.9%, but transfers are most of this – taxes for the bottom quintile are close to zero.}

To confirm this, we calculated the RS index for each study (Figure 4). We used the definitions of pre-tax and transfer income and after-tax-and-transfer income from each study, which means that the before and after comparisons are different across the three cases.\footnote{Here, the PSZ and AS “after-tax” income includes government consumption and deficits, so it matches total national income.}

The lefthand side shows the absolute values of the index. Redistribution goes up in all three. PSZ and CBO show a lower RS index value than AS, but for different reasons. PSZ have high Ginis for both before- and after-tax income. CBO shows relatively low before-tax Gini, because the CBO “before-tax” income includes social insurance benefits (transfers) including Social Security, Medicare, and others. The righthand side shows percentage increases, normalized to 1979 values, (the first year we have CBO data). Until about 2010, all three studies show similar percent changes, PSZ flatten out after that while AS and CBO continuing to increase. This appears to be a result of the after-tax Gini coefficients, which increase for PSZ after 2010 but do not for AS and CBO.

This fact—that the tax and transfer system is more redistributive now than it was in the past—appears to have been lost in the public discourse. This is likely a result of the focus on the top 1% or on even more elite groups. The differences between PSZ and the AS and CBO results show that there remains disputes about top income groups (and much of the discussion in AS is devoted to those differences). Once we broaden the focus to the entire population, however, we see that important changes have occurred at the bottom. Moreover, these changes have made the system more progressive and led to more redistribution.

Because all three research groups produce similar core results, to keep the discussion compact, we focus our remaining discussion on the results from AS.
We choose AS because their definitions and scope are more comprehensive than CBO’s, and because we believe they make better methodological choices than PSZ.

Figures 2 and 3 showed the tax and transfer rates, which address questions about redistribution and progressivity. As discussed in Part 1, however, we may care more about people’s wellbeing than about progressivity or redistribution per se. What matters is how people are faring and the level of income.

Figure 5 presents data that addresses this question. It shows changes in pre-tax income and after-tax income for four different income groups, normalized to the 1966 income for that group. We can think of pre-tax income as, roughly, market earnings. Understanding trends in market earnings is important for examining how labor and capital markets are functioning. For example, Goldin and Katz (2010), Murphy and Topel, (2016), and Guvenen et al., (2022) find stagnant market earnings for low-wage men. Understanding the reasons low-wage men have not performed well in the last several decades is important. Such studies focus on
pre-tax earnings because they attempt to understand labor-market dynamics.

After-tax income tells us how much different groups have available for consumption or savings. It includes all sources of income, including transfers and government consumption (e.g., roads, parks, etc.). This is directly relevant to well-being and, therefore, is of central concern. The vertical distance between these two tells us the extent of redistribution

Figure 5: Growth in real (2019) before- and after-tax-and-transfer income


Focusing on pre-tax income (the blue lines), we see the standard story about inequality: since around 1980, the pre-tax or market income of the top 1% grew much faster than the income of other groups. By 2019, income of the top 1% had grown from their 1966 income by almost 300%, with all of that growth occurring since 1982. Compare that to the bottom quintile. Individuals in that quintile saw growth from 1966 until 1999, when their income was 167.5% of their 1966 income (again, with all of that growth occurring since 1982). Since that time, their income has stagnated: in 2019 it was 167.8% of their 1966 income, the same
as it was in 1999. The middle quintile fell in the middle between these two: households in this group saw a steady increase in their income over the entire period (rather than stagnating until 1982) but the overall growth in their incomes was much smaller than for the top 1%, reaching 220% of 1966 income in 2019.

Looking at after-tax income shows a markedly different story. All four groups had almost the same growth in after-tax income during the period we examine, equal to just under 250% of 1966 income. That is, the tax system appears to be offsetting the changes in the growth of market income, doing more over time as the differences in market income grow. Most importantly, the bottom quintile has seen significant growth in their after-tax income over time. Whatever the story is about the top 1% capturing most of the market gains in recent years, after-tax income growth has been fairly evenly spread.

This outcome is consistent with the data shown in Figure 3. Figure 3 showed a sharp increase in transfers to the bottom quintile. We can see this in Figure 5 as well: the gap between the pre-tax and after-tax income of the bottom quintile grows over this time period. It is also far larger for the bottom quintile than for the middle (which also receives net transfers).

To dig into this story more, it is useful to focus on nominal transfers (keeping in mind that the distinction between taxes and transfers is ambiguous). The data so far shows that increased transfers to the bottom are the central story of how the tax and transfer system has changed.

Figure 6 (left hand panel) shows transfers as a share of national income rather than as a share of each group’s pre-tax income, using AS data. This lets us understand the total amount transferred to each group (normalized by national income for each year). The righthand panel drills further down, showing just the transfers to the bottom quintile along with its income share.

Here we see a somewhat more nuanced story. Total transfers have gone up

\[\text{Note however, that looking at just the post-financial crisis period, their pre-tax income has grown, going from 136.6\% of 1966 income to 167.8\%.}\]

\[\text{This appears to be just a coincidence rather than a chosen policy result. Using different start years produces different quantitative results. For example, if we use 1980 (the start of the Reagan period) as a starting point, the bottom quintile grow by less than 150\% while the top grows in the range of 225-250\%. This may also be a coincidence, however, because after-tax incomes of the top 1\% stagnated until 1982. Subsequent growth is off of this low base.}\]
over time, from 5.2% of national income in 1966 to 15.3% of national income in 2019, by any measure a substantial increase. Transfers to the bottom quintile, however, peaked in 1975 (at 5.7% of national income) and have declined since then to 4.7% of national income.

The increase in transfers over time has instead largely accrued to the middle quintiles (which is similar to what Looney, Larrimore and Splinter (2020) found). The second and third quintiles saw large increases in transfers. The fourth and fifth quintiles also saw increases in transfer, though smaller increases than for the middle groups. That is, if the story one might have gotten from the first set of figures is that government policy has increasingly shifted resources toward the bottom, Figure 6 shows that this is not true. The government has instead increasingly shifted resources toward the middle.\textsuperscript{25}

The reason that prior figures show that transfers have gone up at the bottom while Figure 6 shows that they have gone down is that income at the bottom has grown more slowly than national income. This can be seen in the right-hand panel of Figure 6, which shows the income share for the bottom quintile. It declines

\footnote{\textsuperscript{25}In fact, since 1975, the top quintile saw an increase in transfers from 0.8% of national income to 1.7%, an increase of 0.9 percentage points. The bottom saw a decline during that same period of 1 percentage point. That means that roughly all of the increase in total transfers since 1975 has been to the middle three groups.}
from 4.6% in 1966 to 3.2% in 2019.26

We conclude by producing a version of a figure in AS (Figure 5, panel A). It shows pre-tax and after-tax shares of income for various groups. Although we are not sure that shares of income matter, at least not very much, many discussions of inequality and progressivity focus on shares (such as the top 1% share). Figure 7 shows the results.

Figure 7: Pre-tax and after-tax shares of income per quintile

The story in Figure 7 is consistent with the prior data. The lefthand panel shows pre-tax income shares. The top quintile captures a larger share of national income over time (and this would be even more dramatic if we looked at smaller slices at the top). Because income shares add to one, this means that other quintiles have to receive smaller shares. Most of the decline is at the bottom, with the bottom and second quintiles seeing declines.

After taxes and transfers, the story is completely different. Income shares are almost entirely constant over this time period, which is consistent with Figure 6 (which showed the same growth rates for each quintile). The tax and transfer system is equalizing the shares of the national pie.

26 A simple example shows that there is no inconsistency in the two sets of figures. Suppose that national income goes from $100 to $200 over a given period, and that share of pre-tax income of the bottom quintile goes down from 20% to 12%. Income grows for the bottom, from $20 to $24, but at a slower rate than national income. Suppose that transfers to the bottom quintile as a share of national income decline, say from 10% of national income to 8%. This means that transfers in dollar amounts go from $10 to $16. In the initial period, after-transfer income for the bottom quintile is $30, with 33% coming from transfers. In the late period, after-tax income is $40, with 40% coming from transfers.
Figure 7 also shows the extent of redistribution. This can be seen by comparing the height of the lines for each quintile. The top quintile has a much lower share after taxes and transfers than before, while the bottom two quintiles have a larger share.

4.3 Other work and other measures

To check that the results presented above are not anomalous, we performed a literature search for other papers examining the progressivity or level of redistribution of the U.S. tax system. We present selective results from this search here, with a full list and description of each paper given in the Appendix. Part 1 shows the results of studies that use annual income as their base. This allows a direct comparison to PSZ, AS, and CBO. We then present studies that, alternatively, use lifetime income, consumption, and wealth, as their base. This allows us to see whether using annual income produces anomalous results.

4.3.1 Search criteria

Our goal was to find all recent papers that estimate changes in the progressivity or redistribution rates of the U.S. tax and transfer system over time. To do this, we used Google Scholar and searched for relevant terms. To ensure complete coverage, we then looked forward and backwards from the papers turned up in the initial search, looking at papers that cited the papers found in our initial search and the papers cited in those papers. We limited our search to (i) papers published in the last 10 years (that is, since 2013), (ii) that show changes in progressivity or redistribution over time, (iii) examine the entire distribution, not just top income groups, and (iv) met the various criteria discussed in Parts 1 and 2. (Note that there were so few papers using a base other than annual income that we included two studies that did not show changes over time.) We also only look at papers examining the United States. The full list of papers along with a brief summary of each paper is in the Appendix. We highlight some prominent results.

27 Note that there are a number of important papers that estimate changes to income, (Guvenen et al. 2022), consumption, (Meyer and Sullivan 2023), or wealth inequality (Smith, Zidar, and Zwick 2021), over the last several decades but that do compute tax rates based on those measures.
Table 5: Percent income growth by quintile, Elwell et al (2019)

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tax Market income</td>
<td>91.3</td>
<td>18.0</td>
<td>63.3</td>
<td>91.9</td>
<td>116.2</td>
<td>160.4</td>
<td>193.4</td>
</tr>
<tr>
<td>Post-tax/transfer income</td>
<td>153.7</td>
<td>262.0</td>
<td>157.6</td>
<td>154.5</td>
<td>162.2</td>
<td>175.7</td>
<td>186.8</td>
</tr>
</tbody>
</table>

4.3.2 Annual income measures:

We found 11 papers that met our search criteria that used an annual income base. A key example is Elwell, Corinth, and Burkhauser (2020) who use public-use ASEC-CPS data to construct estimates of household income from 1959 to 2016. One of their goals is to understand how the provision of in-kind transfers, mostly health care, alter the distributions of income. To do this they supplement the CPS data with estimates of the value of health benefits.

Table 5 summarizes their results (from Table 1, Panel A, columns 4 and 7, in their paper). On a pre-tax basis the highest income households had the highest growth, with income of the top 5% of households almost doubling between 1959 and 2016. The lowest quintile grew only 18% over the 57-year period (equivalent to a 0.3% annual rate of growth). Once we account for taxes and transfers, however, that result is reversed. The poorest quintile now has the largest growth, with the other quintiles growing by roughly the same amount.

They also compute pre-tax and after-tax Gini coefficients, allowing us to compute a RS index (Table 2 in their paper). The pre-tax Gini of household-size adjusted market income in 1959 was 0.411 and the after-tax-and-transfer Gini was .350, or a 0.061 difference. In 2016, the pre-tax Gini had gone up to 0.502 but the after-tax-and-transfer Gini had gone down, to .341, a difference of .161. The RS index, as a result, increased by 164%.

An alternative approach estimates the elasticity of after-tax income to pre-tax income. The most common method of doing this is to fit a power curve of the form $T(y) = y - \lambda y^{(1-t)}$ to income and tax data. The value of $1-t$ gives a measure of progressivity. For example, Heathcote, Storesletten, and Violante (2020) estimate this power function using CBO data. They exclude Medicaid and CHIP from

Because they do not provide a measure of tax progressivity or redistribution, we do not include those papers in our literature summary.

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their definition of transfers, and because they are primarily interested in how taxes affect work incentives, they exclude elderly households from their sample. They find that that value of $1-t$ did not change between 1979-1983 and 2012-2016.

As discussed above, however, the same CBO data show a large increase in transfers to the bottom during this period mostly from increases in Medicaid and CHIP. This means that had these authors included Medicaid and CHIP, they would almost surely have found an increase in progressivity. Most, but not all, other estimates using this approach such as Coen-Pirani (2021, and König (2023), find similar results. One exception is Wu (2021), who finds a reduction in progressivity. He excludes Medicaid and CHIP, however, which likely affects his results.

4.3.3 Other bases:

Because of the limitations of annual income, analysts have looked at other measures of individual or household well-being. One approach is to look at the overall income of each generation or age cohort. Auerbach, Kotlikoff, and Koehler (2023) is the most recent example of that approach. They find that looking at annual net taxes understates the degree of progressivity of the tax system, the average level of taxes paid by the rich, and the level of transfers received by the poor. For example, they estimate for the 40-49 year old cohort, the lowest quintile receives lifetime transfers of 44.4% (or using our sign convention, they pay net taxes of -44.4%) but looking only at the current year would peg that number at 25.6%. The reverse is true for higher income quintiles in that cohort. Overall, they find a higher degree of progressivity using lifetime income compared to studies using annual measures.

The authors do not provide similar estimates for earlier years, which would allow us to see how progressivity has changed over time. That is, while the tax and transfer system is more progressive when measuring lifetime income than when using annual income, we do not know whether progressivity has increased or decreased when measured on a life-time basis.

An alternative approach is to look at inequality in consumption. While there are many papers that examine changes to consumption inequality such as Meyer...
and Sullivan (2011, 2013, 2017, 2023) and Aguiar and Bils (2015), we are not aware of studies that use consumption as a base to measure tax progressivity. There is no readily available concept of pre-tax consumption, which means that consumption measures are not well-suited to estimating progressivity.

Finally, many people are interested in wealth inequality. It is thought to shed light on whether the distribution of resources is fair. Although a number of papers analyze changes to wealth inequality (Saez and Zucman, 2016; Smith, Zidar, and Zwick, 2021), we are aware of only two papers that analyze whether taxes are progressive in wealth. The most recent is Bricker et al. (2020), who measure how income taxes (and other annual taxes such as property taxes) vary by wealth using data from the SCF. In their measure that excludes unrealized capital gains, they find that the tax system is progressive in wealth and has become more so over time. In their measure that includes unrealized capital gains, they find that the system is less progressive but they do not report changes over time.

5 Conclusion

Examining studies of the progressivity and extent of redistribution in the tax and transfer system we find two striking facts. First, the major studies find consistent results on the changes to the tax and transfer system over the last half century. While there are some differences in their estimates of the effects at the top of the distribution, there is broad agreement that there have been large increases in net transfers to the bottom, and the size of those increases swamp any changes at the top. This is robust across different methodologies and datasets. Second and consistent with this finding, the tax and transfer system has become more progressive and more redistributive over the last half century, with much of that increase occurring in the last several decades. The public view that progressivity has declined is incorrect.

As we have discussed, the definitions of progressivity and redistribution are contested and accounting for various sources of income is complex, uncertain, and at times completely indeterminate. Nevertheless, these two findings appear to be robust to most methodological choices. Different datasets, different accounting
methods, and different approaches to measuring progressivity all point in the same direction.
6 References


Bozio, Antoine et al. forthcoming. “Predistribution vs. Redistribution: Evi-


Lindsey, Brink, and Steven M. Teles. 2017. The Captured Economy: How the
Powerful Enrich Themselves, Slow Down Growth, and Increase Inequality. Oxford University Press.


Appendix: Literature review

7.1 A. Papers discussed in the text:

- Auten and Splinter (2023)
- Piketty, Saez and Zucman (2018)
- Piketty and Saez (2003, 2007)
- Congressional Budget Office (2022)
- Saez and Zucman (2019)
- Saez and Zucman, (2020).
- Elwell, Corinth, and Burkhauser (2020)
- Heathcote, Storesletten, and Violante (2017, 2020)
- Bricker et al. (2020)

7.2 B. Papers using annual income measures:

Papers estimating taxes as a power function:


- Ferrier and Navarro (2020): uses as log-linear function to estimate average marginal tax rates assuming a fixed sample of taxpayers and TAXSIM. Finds a sharp drop in progressivity after 1986 and a stable level since then. The paper excludes transfers and looks only at the statutory rates.
• Wu (2021): Estimates a power function of actual tax liabilities (computed using TAXSIM) using CPS data and finds that the tax system in 2014-2016 was less progressive than in 1978-1908. Includes some transfers but excludes healthcare transfers and Social Security.

• Borella et al. (2023): estimate the tax system using a power function, PSID data and TAXSIM. Find a large drop in the progressivity parameter from the mid-1970's until 1987 and then a modest increase since then. They do this for a representative household and then separately for married and single households. Married households see a greater post-1987 increase in progressivity than do singles. Note that they include transfers in pre-tax income (see Appendix A2).

Other approaches

• Mathews (2014) Kakwani or Suits type measures (but modified) from 1929 to 2009. Since 1940's progressivity indices have been mostly level. Excludes transfers and uses taxable income as the measure

• Splinter (2020): examines CBO data, finding an increase in both progressivity (Kakwani index) and redistribution (Reynolds Smolensky index).

• Guner, Kaygusuz, and Ventura (2014): Use tax data. Don’t seem to show changes over time.

• Blanchet, Chancel, and Gethin (2022) This paper compares inequality, including the tax and transfer systems of the US and European countries. They appear to just use the PSZ data for the United States. A key finding is that the tax and transfer system in the United States transfers more to the bottom 50% than the same system in any European country.

• Almeida (2020): focuses on the Great Recession. It does, however, find that the cushioning effects of the tax and transfer system at the low end became weaker after 2010.
• Bargain et al. (2015): use TAXSIM to ask “what if” questions: what if the
distribution of pre-tax income were the same but a different year’s tax rules
applied (or vice versa). Limited to tax data, so very much like Piketty/Saez.
Assume remittance = incidence and omit corporate and estate/gift taxes.

7.3 C. Papers using other measures:

7.3.1 Lifetime income.

Nothing meets our search criteria other than Auerbach et al. 2023, discussed in
the text.

7.3.2 Consumption

Nothing meets our search criteria.

7.3.3 Wealth

• Moore, Pack, and Sabelhaus (2016): earlier but similar work to Bicker et
al 2020. They show effective tax rates (tax liability to income) but ranked
by wealth. They do not provide a clear progressivity measure but have
suggestive figures showing a decline in progressivity under that measure.