

WORKING PAPER · NO. 2024-147

How Much Does U.S. Fiscal System Redistribute?

Tom Coleman and David Weisbach

NOVEMBER 2024

How Much Does U.S. Fiscal System Redistribute?

Tom Coleman[†] and David Weisbach[‡]

November 18, 2024

Abstract

There is a widespread view that the tax and transfer system has become less progressive and less redistributive. To assess this view, we compare data from three studies: Congressional Budget Office (2024), Piketty, Saez, Zucman (2018), and Auten and Splinter (2024). Although they use different definitions of income, units, and taxes and transfers, all three show that the tax and transfer system has become more redistributive, not less. We also review all studies of the issue since 2012, which confirms these findings. In short, there is robust evidence across definitions and methodologies, that the tax system has become more redistributive.

Keywords: progressivity, redistribution, inequality

JEL Codes: H20, H23:

[†] The Harris School, The University of Chicago.

[‡] The University of Chicago Law School, d-weisbach@uchicago.edu. We thank Gerry Auten and David Splinter for discussions, and Louis Kaplow, participants at the University of Chicago Law School Work in Progress workshop, participants at the Harvard Law School Law and Economics Workshop and two anonymous referees for comments on an earlier draft.

1. INTRODUCTION

There is a widespread perception that the U.S. fiscal system, made up of taxes and transfers, has become less progressive and less redistributive over the last 50 years while inequality has increased. Many believe not only that the system has failed to address rising inequality, but that it has exacerbated the problem through lower top tax rates and evasion by the rich and by corporations. This view is frequently taken in public debates (e.g., Leonhardt, 2019; Rakoff, 2022, Sullivan 2024) and is a common theme in books on inequality. (Stiglitz, 2012; Freeland, 2012; Noah, 2012; Lindsey and Teles, 2017).

Many of these views are based on work by Piketty Saez and Zucman. These authors argue that the tax system (Piketty and Saez 2007) or tax and transfer system (Piketty, Saez, Zucman 2018) (PSZ) has become less progressive in recent decades because tax rates on the top 1% or top 0.1% have gone down as after-tax (or after tax and transfer) income shares for these groups have gone up. Saez and Zucman (2019) using 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, creating what they call “the collapse of progressivity.” Although there are notable dissenters (e.g., Auten and Splinter (2024) (AS) and Splinter (2019, 2020)), the view that progressivity and redistribution have decreased is 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 past 40 years.” Zwick (2019, p. 7) states that “there is fairly strong agreement that the tax-and-transfer system has become somewhat less progressive over the past few decades.”

We offer here a critical review and reassessment of this literature. We show that although particular estimates of progressivity and redistribution suffer from unresolved and perhaps unresolvable uncertainties, the consensus in the literature, robust across different specifications and measures, is that the tax and transfer system redistributes more now than it did in the recent 40 to 60 years. Although there are disputes about the top 1 percent, once the lens is

broadened to the entire population, there is substantial agreement across all available studies.

In Part 2, we address problems with measuring tax and transfer progressivity and redistribution. A key problem is the choice between using a narrow or broad base for measuring income. A narrow base, such as fiscal income reported on tax returns, requires fewer imputations, but can be misleading because the base changes differently over time for different income groups. A broad base can solve these problems but requires imputing income to units when, often, the correct imputation is unknown, allowing substantial researcher choice.

Related problems include the definition of units (e.g., adults, households, tax units, or individuals) and the set of policies to evaluate (e.g., just taxes, or taxes and transfers). As with income measures, units change differently for different income groups over time, and redistributive policies make use of different fiscal instruments over time, making any one measure possibly inaccurate. Furthermore, no single measure of progressivity or redistribution captures the full effects of complex policies. Measures such as the Kakwani (1977) measure of progressivity, the Reynolds Smolensky (1977) measure of redistribution, the 90:10 ratio, elasticity measures, or top 1% shares reduce complex distributions to a single number and may miss important effects.

Rather than attempting to adjudicate individual issues, we address these problems by looking for results that are robust across research methods, data, and choices of particular measures. While robust findings are not immune to error, they offer greater confidence in their validity. To pursue this approach, in Part 3 we compare data from three different research groups: (i) PSZ, (ii) AS; and (iii) the Congressional Budget Office's annual series on tax system progressivity (CBO). We chose these studies because they make most of their data available over a relatively long period, allowing us to make comparisons across

studies.¹ In addition, these studies are recent, use current methodologies, and PSZ has been central to framing the public debate on inequality. Our examination of data from all three groups, including PSZ, shows that the tax and transfer system redistributes more, not less, than it did in the recent past.

To ensure that these studies are not outliers, in Part 4 we perform a literature search for all recent studies that measure tax or tax and transfer system progressivity or redistribution (and meet other basic criteria). We have not found other studies that make data available as do PSZ, AS, and the CBO, which means we can only compare top line results from the remaining literature. With the exception of a small number of outliers, most of which can be readily explained, the literature confirms the results we find in PSZ, AS, and CBO. That is, a careful examination of the available data, robust across studies and research methods, shows that the tax and transfer system redistributes more than it did in the recent past.

It is important to note that we take no view here on whether the tax and transfer system *should* redistribute more than it currently does. There may be good reasons on both sides—for example, for increasing or for reducing tax rates on high earners or increasing or reducing transfers to low earners. It is crucial, however, to base reform proposals on an accurate assessment of the facts. Our goal is to help with that assessment.

2. METRICS AND MEASUREMENT

In this part, we discuss the central problems with estimating the progressivity and extent of redistribution of the tax and transfer system and discuss our approach.

¹ We do not have access to the full underlying data because all three groups use confidential tax return data. This limits the comparisons that we can make across studies.

A. Base and Purpose of Measurement

The starting point for estimating the effects of the tax or tax and transfer system is choosing the appropriate base for measurement. As Kaplow (2005) emphasizes, the choice of what to measure and how to measure it depends on the purpose of the exercise. AS, PSZ, and CBO use annual income. Annual income, however, is a snapshot that may not capture how income affects well-being over a lifetime. To better measure this, Auerbach, Kotlikoff, and Koehler (2023) use a lifetime income measure and find a higher degree of tax progressivity than annual income measures. Other studies, (e.g., Meyer and Sullivan 2011, 2013, 2017, 2023; Aguiar and Bils 2015), measure inequality in consumption, on the theory that consumption is more directly tied to welfare than is income. Because there is no concept of “pre-tax consumption,” however, these studies do not allow examination of progressivity or redistribution. Bricker et al (2020) measure how taxes vary by wealth, finding in their primary measure that the tax system is progressive in wealth and has become more so over time. Because the vast majority of studies use annual income measures, we follow that approach here, notwithstanding its well-known shortcomings.

B. Definition of Income

The central tension in defining income is between using a narrow but more certain measure or a broader but uncertain measure. Piketty and Saez (2003, 2007) used a narrow measure of income based on amounts reported on tax returns (fiscal income). They found a substantial reduction in progressivity (measured by changes in income shares of top income groups) over the period from 1960 to 2004.

Fiscal income, however, does not provide reliable information about the distribution of *economic* income which is the core item of interest for understanding welfare effects. Table 1 demonstrates the problem.

The first row is based on data from PSZ (based on the methodology of Piketty & Saez (2007) but with income per adult rather than per tax return). It shows the growth in real fiscal income per adult from 1979 to 2014 (using anonymized data, so not controlling for reranking – those in the top 1% in one year

may not be the same as in the following year). Per capita growth in fiscal income was 43.7% overall, but it was negative 26.0% for the bottom of the distribution. If we conflated fiscal income with *economic* income, this would be making the implausible claim that real income fell by over one-quarter for half the US population. In fact, fiscal income measures income reported for tax purposes, so it only indicates that the income required to be reported for taxation fell.

The second row, using data from the same paper, shows the growth in total national income per adult, which was 55.9% overall and 0.5% for the bottom half. The third row shows the growth in national income growth per person using the AS estimates. AS peg the overall growth rate per person at 75.6% and 29.7% for the bottom 50%. Comparing the first row to either of the second two rows shows how dramatically fiscal income understates a full measure of income.

Table 1: Growth in Real Average Per-Capita Income Measures, 1979-2014

	Overall	0-50 th	50-90 th	Top 10%
PSZ Fiscal Income	43.7%	-26.0%	25.1%	113.6%
PSZ Pre-Tax Income	55.9%	0.5%	42.0%	107.2%
AS Pre-Tax Income	75.6%	29.7%	67.5%	116.4%

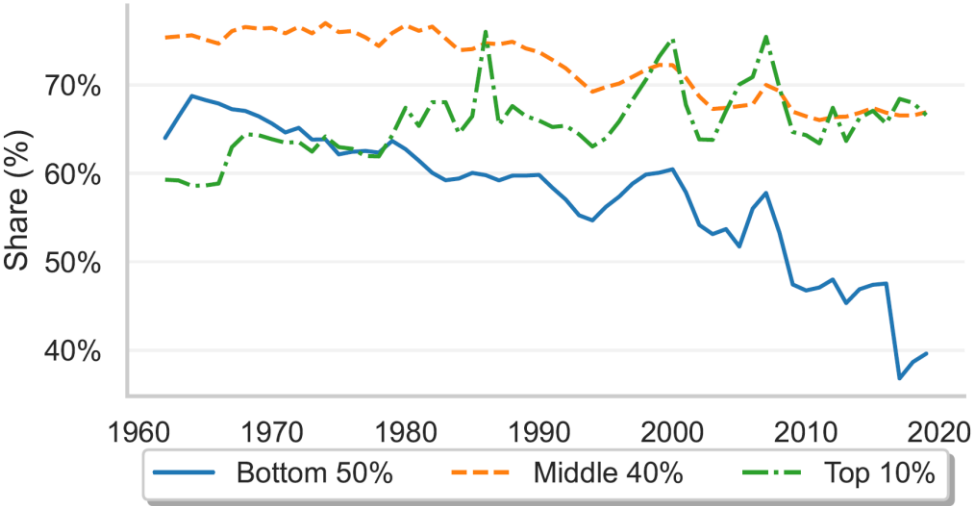
“Fiscal Income” is tax return income per adult. “PSZ Pre-Tax Income” is pre-tax income (matching national income) per adult. From PSZ 2022 sheets TD5, TD7, TD8, TD9, TB3. “AS Pre-Tax Income” is National Income per person, from AS 2024 sheet C1-Incomes, deflated by the number of individuals (filing & non-filing). PSZ use the national income price deflator (NIPA table 1.7.4) while AS use the Personal Consumption Expenditure (PCE) price deflator (NIPA table 2.3.4).

The problem, however, is not just that the overall level of growth of fiscal income understates the growth in national income. Fiscal income as a fraction of national income has changed differently for different income groups, which means that looking at fiscal income can be outright misleading. Figure 1 illustrates.² It shows fiscal income as a fraction of a comprehensive measure of pre-

² Scripts for generating all our figures are available at <https://github.com/tscolem/TaxRedistributionPaper> Full size figures are provided in the Online Appendix.

tax income over time for the bottom 50%, the middle 40%, and the top 10%, using data and methodologies from PSZ (which we describe below). Fiscal income for the bottom 50% shrinks over the 60-year period while it grows at the top. Looking at fiscal 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. Fiscal income (on its own) provides little useful insight into the distribution of economic income, either at a point in time or changes over time.

Figure 1: Fiscal Income as a Fraction of Pre-Tax Hybrid Income
PSZ data, 1960-2019



“Fiscal Income” is tax return income per adult. “PSZ Pre-Tax Income” is pre-tax income (matching national income) per adult. From PSZ 2024 sheets TD7, TD8, TD9, TB3.

A solution to this problem is to use a comprehensive measure of income. One approach, which (to our knowledge) first appeared in Pechman and Okner (1974, 15) is to start with fiscal income 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 and to some extent CBO.

While this approach solves some of the problems with using fiscal income as a measure, there is no straightforward method of allocating many compo-

nents of national income to individuals. In some cases, such as income attributable to tax evasion, there is a correct answer (particular individuals, and not others, engaged in tax evasion) but it is difficult or impossible to determine what that answer is. In other cases, such as many components of government spending (e.g., national defense), there may be no conceptually coherent answer. The allocation is to a great extent arbitrary. As a result, research groups have substantial latitude when allocating national income to individuals. Moreover, the choices made by research groups can have large effects. To get a sense of the problems with using a comprehensive measure of income, we describe some of the core issues.

Underreported income. Income that taxpayers hide to avoid taxation is, by its nature, difficult to observe. Estimates of the tax gap are around \$500 billion/year. After enforcement, the gap goes down to about \$425 billion/year. The allocation of unreported income generates the single biggest difference between the results in PSZ and AS for the top 1 percent (see AS Table 4).

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 counting these returns. The two basic options are to count retirement income when it is contributed (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. Allocating retirement income to individuals when contributed would mean that retired individuals have little or no income, making many people who are living comfortably look poor (although this concern is based on consumption not income). Including retirement income only when distributed, however, risks understating earnings during working years.

Taxes. Any estimate of the effects of taxes (and transfers) must make assumptions about their incidence. While there is substantial agreement on the incidence of some taxes, such as payroll taxes, the incidence of other taxes, such as the corporate tax, remains disputed. The incidence of transfers is much less studied, but transfers, like taxes, could well be shifted to individuals other

than the direct recipients. Choices regarding incidence may be central to reported results.³

Capital gains and returns to holding wealth. A large fraction of the returns to holding wealth is not reported on tax returns and much of it cannot easily be observed. The allocation of this income may significantly affect inequality. One allocation method, used by CBO, is to include only realized income. 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. Moreover, it bunches the timing of income that is actually earned over many periods. Another approach, used by AS, is to allocate corporate retained earnings to shareholders. PSZ, following Saez and Zucman (2016), use a capitalization approach. They estimate wealth shares based on observable capital income, compute macroeconomic yields for various asset classes, and then allocate capital income based on individual wealth components and the yields.

These choices may have substantial effects. Armour, Burkhauser, and Larimore (2014) compute income growth from 1979 to 2007 for each quintile using, alternatively, no capital gains, realized capital gains, and accrued earnings. Income growth goes from modestly skewed toward the top quintile when estimated without capital gains or realized capital gains to dominated by the bottom quintile when estimated using accrued earnings, essentially reversing the outcomes.

³ Saez and Zucman (2019, 2020) illustrate the problem with researcher choice of incidence. They argue for allocating taxes based on remittance obligations, which is contrary to standard economic theory. This means that they allocate all corporate taxes to corporate shareholders, allocating none to labor or to owners of other capital. Nevertheless, they allocate payroll taxes to labor notwithstanding that half of payroll taxes are remitted by employers, and allocate sales taxes to consumers, notwithstanding remittance by retailers. Based on these problems and criticisms made by Kopczuk (2019) and Joint Committee on Taxation (2024, p. 8, note 22), we omit the estimates from Saez and Zucman (2019, 2020) .

Government spending. In fiscal year 2023, total federal spending was \$6.1 trillion (out of a GDP of about \$27 trillion). Any allocation of national income to individuals must account for federal spending. Cash or cash-like transfers to individuals are usually allocated to recipients (without attempting to determine their incidence).⁴ There is no clear way to allocate the rest of government spending, such as spending on national defense, education, and highways, which is about \$3 trillion/year, or more than 10% of GDP. AS allocate these amounts half per capita and half by after-tax income. PSZ allocate in proportion to after tax and transfer income. Allocating by after-tax and transfer income assumes that government spending is distributionally neutral. For example, if the government increased spending in disadvantaged communities and cut cash transfers to those communities by a similar amount, this allocation would view the combination as regressive. The effects may be large: Riedlel and Stichnoth (2024) calculate that allocating government spending on a lump sum basis decreases the PSZ top 10% share of national income by 5 percentage points and increases the bottom 50% by roughly the same amount.

Deficits and debt. Net interest on federal debt in 2022 was \$476 billion, about 2% of GDP. We do not know which income groups bear this cost. PSZ allocate this by transfer payments, on the theory that transfers will eventually be reduced rather than taxes increased. AS use a combination of current taxes and a per capita allocation. Both are guesses.

Summary. The combination of these and other problems means that there is considerable uncertainty in the allocation of national income to units. Further research might narrow this uncertainty but is unlikely to eliminate researcher latitude to make different allocations. Using a narrower measure of income reduces the uncertainty and researcher choice but comes at the cost of using a less comprehensive and possibly misleading measure.

⁴ PSZ argue that the incidence of transfers of health care may be to health care providers rather than patients, but they do not attempt to estimate the incidence.

C. Units

In addition to choosing a measure of income, researchers must decide which units to use. Possibilities include individuals, adults, households, or tax filing units. The size and number of each of these units changes differently over time. More importantly, unit size and number have changed differently at different income levels. For example, marriage rates among tax filers went down from 67 to 37 percent between 1960 and 2019, but only fell from 90 percent to 85 percent for the top 1 percent, implying that marriage rates below the top fell far more than at the top. (AS, p. 2192) This mechanically increases the number of tax filing units at the low end, increasing inequality when measured by tax units.⁵ Burkhauser, Larrimore and Simon (2012) show that the choice of units can significantly affect income trends.

To illustrate the size of this issue, compare rows 2 and 3 in Table 1. PSZ peg overall per capita growth at 55.9 percent while AS estimate it at 75.6 percent, which appears to be a stark difference in a number that can be estimated with substantial accuracy. The major reason for the difference is that PSZ report income per adult and AS report 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).⁶ The underlying data are the same, but the different measurement unit produces large differences in reported *per-capita* incomes.

⁵ This 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.

⁶ The total difference in ratio terms is 1.126 (1.756/1.559). A formal decomposition shows that roughly 80% (9.9/12.6) is due to measurement unit (adults versus individuals) and 20% (2.4/12.6) due to the deflator. PSZ use the national income price deflator (NIPA table 1.7.4) while AS use the Personal Consumption Expenditure (PCE) price deflator (NIPA table 2.3.4).

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, which are larger than the overall differences.⁷ 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 the difference.⁸

D. Which policies to evaluate.

Studies differ on which policies they evaluate. Piketty and Saez (2007) look only at federal taxes. Saez and Zucman (2019) look at federal, state, and local taxes. CBO looks at federal taxes and transfers. PSZ, and AS all look at federal, state, and sales taxes plus transfers, though as we discuss in Part E, they define transfers differently.

Saez and Zucman (2019, p. 18) argue that taxes and transfer are distinct, and that it is appropriate to study the progressivity of taxes alone. Their argument is that the timing of taxes and transfers are often different and that most transfers are in-kind while taxes are paid in cash.

There are two problems with looking only at taxes. First, the distinction between taxes and transfers is arbitrary. Looking only at one component of fiscal policy can produce misleading results. To illustrate, suppose that current policy achieves a given after-fiscal policy result. The government can achieve the same result while raising taxes and increasing transfers to precisely offset those tax increases, leaving everyone in the same place. The gross taxes and transfers used for this thought experiment are arbitrary which means that one

⁷ 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.

⁸ AS Table 4, which decomposes differences in their methodology and PSZ's does not list units as a central difference in the two studies. This table, however, only reports differences for the top 1%, while the central problem with the choice of units is at the bottom.

can arbitrarily choose the level of tax-only progressivity without changing inequality (or indeed, the welfare of any individual). A study that the tax system progressivity has, say, decreased, would not be informative.

Second, considering only taxes makes the comparison between pre-tax and after-tax distributions difficult and possibly impossible. Government spending in the United States (including both transfers and other forms of government spending) is in the range of one-third of GDP. Counting only taxes but not spending in the analysis means comparing a pre-tax amount that is more than 50% larger than the after-tax amount. It is not clear that such a comparison is meaningful, particularly so if the reason for doing the comparison is to understand how government policy affects welfare. For these reasons, we look only at evaluations of both taxes and transfers.

E. Defining taxes and transfers

Even if we include all taxes and transfers, it is not clear what counts as a tax or a transfer which means that studies vary on what they include in pre-tax-and-transfer income and after-tax-and-transfer income. For example, CBO starts with a measure they call “market income.” Market income includes contributions to private pension plans but not distributions from those plans. Their “pre-tax income” adds social insurance benefits, such as Social Security, Medicare, and Unemployment Insurance.

PSZ also include Social Security receipts in pre-tax and transfer income, but unlike CBO, they subtract Social Security taxes and they do not include Medicare or Unemployment Insurance in pre-tax and transfer income. In addition, unlike CBO, they subtract contributions to private pension plans and include distributions in their measure of pre-tax income (that is, they use a distribution approach).

AS follow the NIPA definition of national income. They use a distribution approach for private retirement savings. Social Security receipts are not part of pre-tax income (unlike CBO and PSZ), nor are Medicare and Unemployment Insurance (unlike CBO but like PSZ). They do not subtract Social Security taxes from pre-tax income (like CBO but unlike PSZ).

Social Security and private pension plans are, to some extent, substitutes for one another which means that one might want to treat them the same way. On the other hand, Social Security is formally run by the state while private pension plans are not. Private pension plans, however, are state subsidized which means that they are neither entirely private nor entirely voluntary. Indeed, one can imagine a continuum of policies from entirely mandatory (like Social Security), highly subsidized, lightly subsidized, or completely private. Any choice of what to treat as private and what to treat as part of the tax and transfer system would, to some extent, be arbitrary.⁹

In some cases, the choice of how to treat these items can be determined by the purpose of the study. For example, if one wants to study the effects of a particular policy on inequality, one would naturally look at the effects before and after that policy. In other cases, the treatment of many of these items is a matter of researcher choice. The inquiry here—what is the effect of the tax and transfer system on inequality—does not point to a single answer, which may be why different research groups addressing this question have answered it differently.

F. Metrics

There is a substantial literature on the choice of metrics for measuring progressivity or the extent of redistribution, including Lambert (1993) and Slavov and Viard (2016). All the various metrics reduce complex effects across the income spectrum to a single number, which means that they make implicit choices about what matters. They are summary measures of a complex set of facts, the same way the mean and standard deviation are summary measures of a distribution. Even in relatively simple cases where the Lorenz curve at one

⁹ The problem is analogous to the “state action” problem in the legal literature. Some legal rules, such as the First Amendment and parts of the Fourteenth Amendment apply only to actions by the state, not private actors. Defining what counts as state action, however, has turned out to be difficult. In some cases, what looks like purely private conduct, such as the enforcement of a contract, is treated as state action (e.g., *Shelley v. Kraemer* 334 U.S. 1 (1948)), but other times is not (e.g., *DeShaney v. Winnebago County*, 489 US. 189 (1989)).

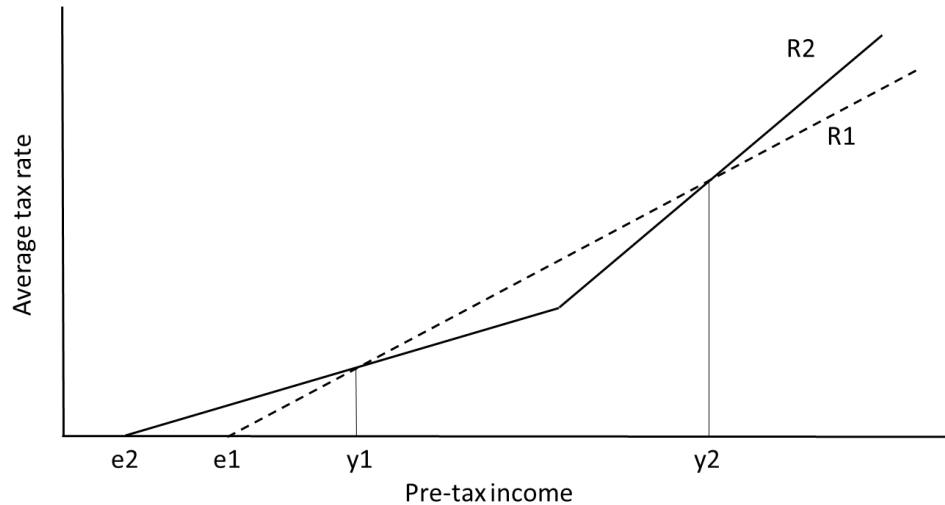
point in time strictly dominates the curve at another point in time, a measure of the extent of the change in progressivity or redistribution requires a judgment of how to weigh changes at different parts of the income spectrum. Moreover, any index of progressivity or redistribution used to compare changes over time has to account for underlying changes in the economy. For example, an increase in transfers may be the result of an aging population or an increase in underlying inequality rather than a change in policy. This problem was recognized as early as Musgrave and Thin (1948), but there is no straightforward solution. (For a discussion, see Vellutini and Benitez (2021).)

To try to capture the full range of effects and to avoid imposing implicit choices, we will use a number of different metrics. We limit ourselves in two ways, however. First, we avoid metrics that focus on a narrow subset of the population, particularly metrics that focus on progressivity at the top of the income distribution. For example, Piketty and Saez (2007) are explicit in their focus on the top and even exclude the bottom 20% of the income distribution from their study. This focus can obscure changes in the tax and transfer system that affect other income groups.

To illustrate, using an example from Kaplow (2006 p. 65, Figure 7, reproduced below as Figure 2), 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 a two-rate structure with 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. For taxpayers with income above y_2 , Regime 1 again offers a lower rate.

A focus on the top 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. As we will discuss, 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 does not capture those changes and potentially presents a misleading picture. This is particularly vexing because the income groups at the bottom are of central concern. To address this problem, studies should look at measures that consider the entire income spectrum.

Figure 2, Comparison of Tax Rate Schedules from Kaplow 2006



Second, we limit ourselves to metrics that focus on redistribution rather than progressivity. Progressivity is a measure of differences in average tax rates across income groups. A system can be highly progressive while having modest effects on inequality, if tax rates are low. Redistribution measures how much households pay or receive, which is directly related to welfare. Therefore, we look only at measures of redistribution, not of progressivity.

G. Our approach:

Further research may provide answers to some of these issues, or at least reduce uncertainty and researcher choice. Except as specified above (we look at taxes and transfers across the entire income spectrum and use measures of redistribution not progressivity), we do not try to adjudicate individual issues. Instead, we view them as sources of fundamental uncertainty and seek results that are robust across different approaches. Results that are common across research groups and methods are more likely to be correct and generate a higher degree of confidence.

To this end, we performed a literature search for all studies of the effects of the tax and transfer system on inequality since 2012 (ten years from when

we started the project). We imposed some minimum criteria on our search results. We are interested in changes over time, so we looked only at studies that estimate the effects of the tax and transfer system over at least several decades. For reasons discussed above, we only considered studies that examine both taxes and transfers. We eliminated Saez and Zucman (2019 and 2020) because they use inconsistent incidence assumptions. Finally, we are concerned with inequality across the entire income spectrum, so we only looked at studies that report results across the income spectrum and not, for example, just the top 1 percent.

We divide our review of the results into two groups. The first group, AS, PSZ, and the CBO, make most of their underlying data available, allowing us to make detailed comparisons of their results. We provide those comparisons in Part 3.¹⁰ The second group consists of all other studies that met our search criteria. We review those studies in Part 4.

Because we have access to considerable data for CBO, AS, and PSZ, we can choose which metrics of redistribution to use when comparing the results of those studies. As noted, we view these metrics as summary measures rather than complete descriptions of the underlying data. To get a full sense of the data, we use three different metrics, all of which focus on redistribution throughout the income spectrum.

Our primary measure is the tax-and-transfer rate at each income level:

¹⁰ Data published by the BEA (U.S. Bureau of Economic Analysis, “Distribution of Personal Income,” <https://www.bea.gov/data/special-topics/distribution-of-personal-income>) provides before- versus after-tax rates. Fixler, Gindelsky, and Johnson (2020) describe their allocation method. The BEA data are not directly comparable to the AS, PSZ, or CBO data because they use personal income, which includes transfers in pre-tax income. They also only compute their series from 2007 and do not appear to provide consistent rankings across years. Therefore, we do not present data from their studies. Gindelsky (2022) decomposes the BEA allocation of transfers to show their effects by income class, age, and race. This analysis is largely consistent with AS, PSZ, and CBO data, showing the dominance of transfers at the bottom of the income distribution.

$$\frac{\text{Income Before Taxes \& Transfers} - \text{Income After Taxes \& Transfers}}{\text{Income Before Taxes \& Transfers}}$$

This is the analogue of the average tax rate but is more comprehensive in treating taxes and transfers symmetrically. Note that our sign convention is from the government’s perspective: taxes are inflows and transfers are outflows. 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.

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 offset by increases in that group’s pre-tax income. To account for this effect, we show changes in pre-tax and after-tax income over time for different income groups. Finally, as a summary measure, we show changes to the Reynolds Smolensky index over time.

3. CBO, AS, AND PSZ

In this section, we compare the results from CBO, AS and PSZ. Part 3A provides a description of the methodologies used by these studies. Part 3B presents the results from those studies.

A. Summary of methodologies

We provide here a brief review of the core choices made by each group. Table 2 provides a more complete summary.

CBO uses the narrowest measure of income of the three groups. CBO’s “market income” is the sum of wages and other forms of labor income (including cash wages, employers’ contributions for health insurance premiums, and payroll taxes paid by employers), business income from pass-throughs, realized capital income (including capital gains), and other income sources. CBO’s “income before taxes and transfers” is market income plus social insurance bene-

fits (Social Security, Medicare, unemployment insurance and workers' compensation). We use market income in our analysis below because it better matches AS's definitions.

CBO's market income is notably narrower than AS or PSZ's definition of income, which both match the Bureau of Economic Analysis's National Income from the national income and product accounts. CBO pegs 2018 per capita income as \$47,637 while AS and PSZ put it as \$54,717 and \$54,055 (the difference reflecting differences in population estimates).

AS and PSZ both match total income to national income but have a number of notable differences in their allocation methods, such as their allocation of unreported income, their estimates of capital income, and their assumption about who bears the burden of deficits. A key difference between AS and PSZ is their treatment of social insurance benefits. AS follow the NIPA national income definitions and define pre-tax income to include contributions to social insurance funds but not distributions. PSZ numerically match national income but define pre-tax income to deduct contributions to social insurance funds and to include distributions.

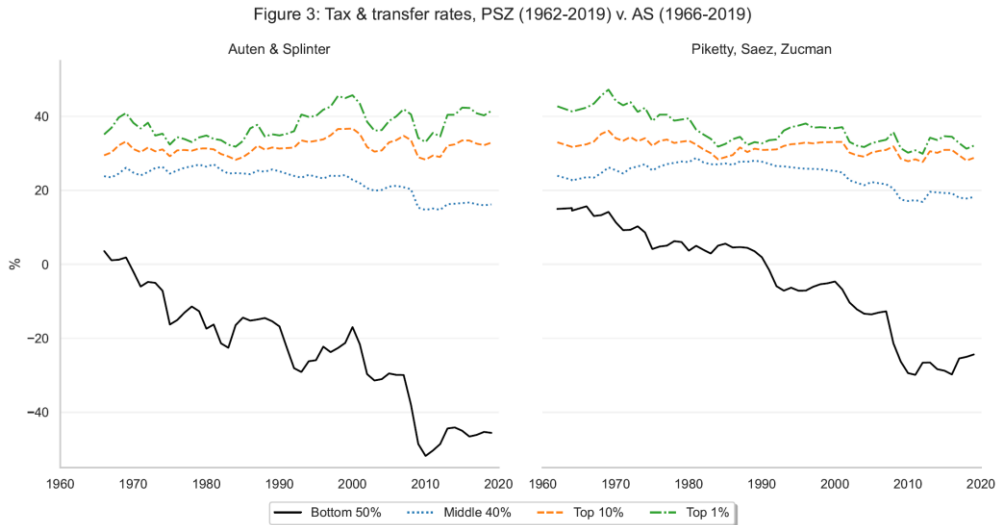
PSZ also define a term they call "factor income" which includes social insurance on a contributions basis, matching the approach taken in AS and NIPA definitions. PSZ do not, however, publish their factor income results using consistent rankings with after-tax income. Therefore, we use PSZ's pre-tax income series instead. The online appendix shows our results using PSZ factor income instead of pre-tax income. The qualitative results remain the same.

The three groups also differ in their definitions of units. CBO reports their data on a household basis constructed by matching Census data to tax units, creating synthetic households. They do not adjust for household size when reporting their income measures but use size adjustments for ranking households and assigning them to income groups. PSZ report their data based on adults (over 20 years of age), splitting income equally between adults within tax units. AS report based on all individuals but use size-adjusted tax units for ranking. Because these units change differently over time, some (undetermined fraction) of the differences in the results of the studies is due to their choice of

units. Moreover, the size of the units at any given point in time (e.g., CBO synthetic households versus PSZ tax units) will be different.

B. Comparisons

We start by comparing the tax and transfer rates produced by all three groups. PSZ only provide consistent rankings for the bottom 50 percent, the 50-90 percent (which they call the middle 40 percent), the top 10 percent, the top 1 percent and smaller groupings at the top. To compare the results to PSZ, we use the AS data for the same groups. Figure 3 shows the tax and transfer rates for each of these groups from 1966 (the first year of consistent data in AS) until 2019.



PSZ tax rates from PSZ (2024 online) sheet TG1, transfer rates author calculations from dollar transfers (sheet TG4d) and pre-tax income (sheet TB3). AS rates are author calculations based on detailed data in AS(2024 online) sheet 'Outputz'. Income, taxes, and transfers are based on groups ranked by pre-tax income to provide a consistent comparison within income groupings. All measures are *before* government consumption and deficits.

Looking at the top three lines in each panel (50th to 10th percentile, the top 10%, and the top 1%) we can see differences between PSZ and AS. These differences are important and substantive, reflecting differences in methodology and data, but they are not our primary focus. Instead, both datasets 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-and-transfer rate for the bottom half of the population was -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 (measuring by adults versus individuals among them), one 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. 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.

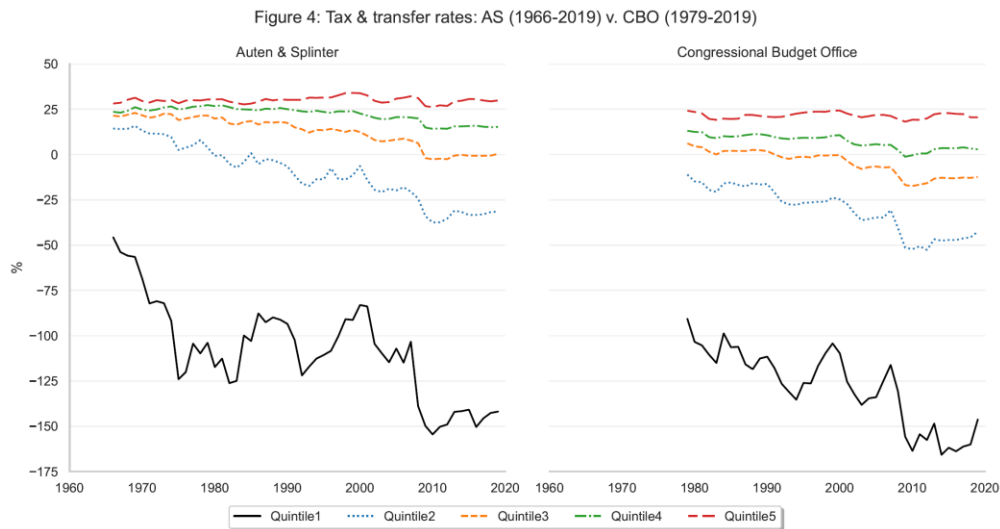
Turning to the CBO data, Figure 4 compares AS (left hand panel) to CBO (right hand panel). Both these research groups break their data into quintiles while controlling for reranking, which allows us to isolate groups at the bottom, something we cannot do with the PSZ data.

These two studies use different methodologies. Their results are, nevertheless, remarkably similar. AS shows roughly the same results as described above: there is a widening of tax rates for higher income groups but changes for these groups are swamped by the increase in transfers to the bottom. The CBO results are similar.

Table 2: Summary of methodologies

	CBO	AS	PSZ
Pre-tax income:	Market income	Pre-tax income	Pre-tax income
Basic concept	Labor income + health and pension fringes + employer's share of payroll taxes + business income (pass-throughs) + capital gains + share of corporate taxes. Narrower than National Income.	Corrected fiscal income – cap gains – Social Security and unemployment + health and pension fringes, employer's share of payroll taxes, C-corp retained earnings, retirement accounts, unreported income, imputed rent. Equals National Income	Fiscal income + tax-exempt labor income (health and pension fringes plus employer's share of payroll taxes) + tax-exempt capital income. Matches National Income.
Unreported income	Not included	Based on NRP audits	In proportion to positive reported business income or wage income
Retirement income	Both contributions and distributions	Distribution basis (subtracts contributions, includes benefits)	Distribution basis (subtracts contributions, includes benefits)
Social Insurance Benefits	Contribution basis: OASDI taxes and employer share of OASDI taxes included, distributions not included	Contribution basis: OASDI taxes and employer share of OASDI taxes included, distributions not included	Distribution basis: SS +DI +UI included, taxes removed
Retained earnings and other capital income	Capital gains	C corp retained earnings + taxes	Capitalization (effectively in proportion to estimated equity wealth)
Corp tax incidence	75% of corp tax to owners of capital, 25% to labor	75% of corp tax to corporate capital and interesting bearing assets, 25% to labor	100% to nonresidential capital
Other		Imputed rents	
After-tax & transfer income (before government spending & deficits)			
Taxes	Federal (including payroll taxes)	Federal (including payroll) + state/local + sales + property	Federal (including payroll) + state/local + sales + property
Transfers	Social Insurance (including SS and Medicare) plus other (Medicaid, SNAP, ...)	Social Insurance (including SS and Medicare) plus other (Medicaid, SNAP, ...)	Excludes Social Insurance (SS+DI+UI), Includes Medicare, Medicaid, SNAP, ...
Government spending & Deficits	Not included	Not included	Not included
Ranking			
	Pre-tax income = market income plus Social Insurance Benefits	Pre-tax income	Pre-tax income
Units			
Equivalence scale	Household, civilian, non-institutional Square root for households	Individual, all Square root for tax units	Adults, all Equal split, tax units

Comparing Figures 3 and 4, 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 decrease in the tax-and-transfer rate for the bottom half of the population is due to changes for the bottom quintile. The second quintile has some increase in transfers, but nothing like the increase to the bottom quintile. 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.)



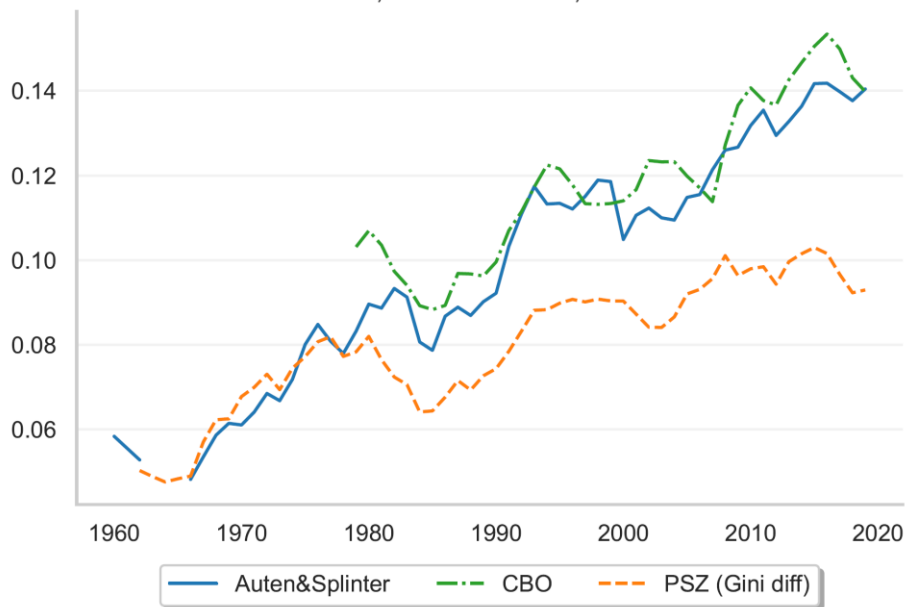
AS rates are author calculations based on detailed data in AS(2024 online) sheet ‘Output2’. CBO rates are author calculations for market income versus after-tax income, from CBO “Additional data for researchers” (2019) sheet for *table 03 average household income* for households ranked by *before tax and transfer income*. Income, taxes, and transfers are based on groups ranked by pre-tax income to provide a consistent comparison within income groupings. All measures are *before* government consumption and deficits.

All three studies yield similar qualitative results. While methodological differences affect the size of their estimates, the central narrative remains consistent: the dominant change in the tax and transfer system over the past fifty years has been an increase in transfers to the bottom.

To confirm this, we calculated the Reynolds-Smolensky index for AS and CBO (Figure 5). PSZ do not provide detailed consistently ranked data for the

bottom 50 percent of the population, and so we are unable to calculate a Reynolds-Smolensky index from their data. Instead, we compare the pre-tax to the after-tax Gini coefficients.¹¹ AS and CBO largely overlap notwithstanding their differing approaches, and both show large increases in redistribution. PSZ and AS show differences in levels, but since they are different measures, the different levels are difficult to interpret. All three show an increase in redistribution over the last several decades. The only dispute is how much.

Figure 5: Auten & Splinter and CBO Reynolds-Smolensky Index
AS 1960-2019, CBO 1979-2019, PSZ 1962-2019

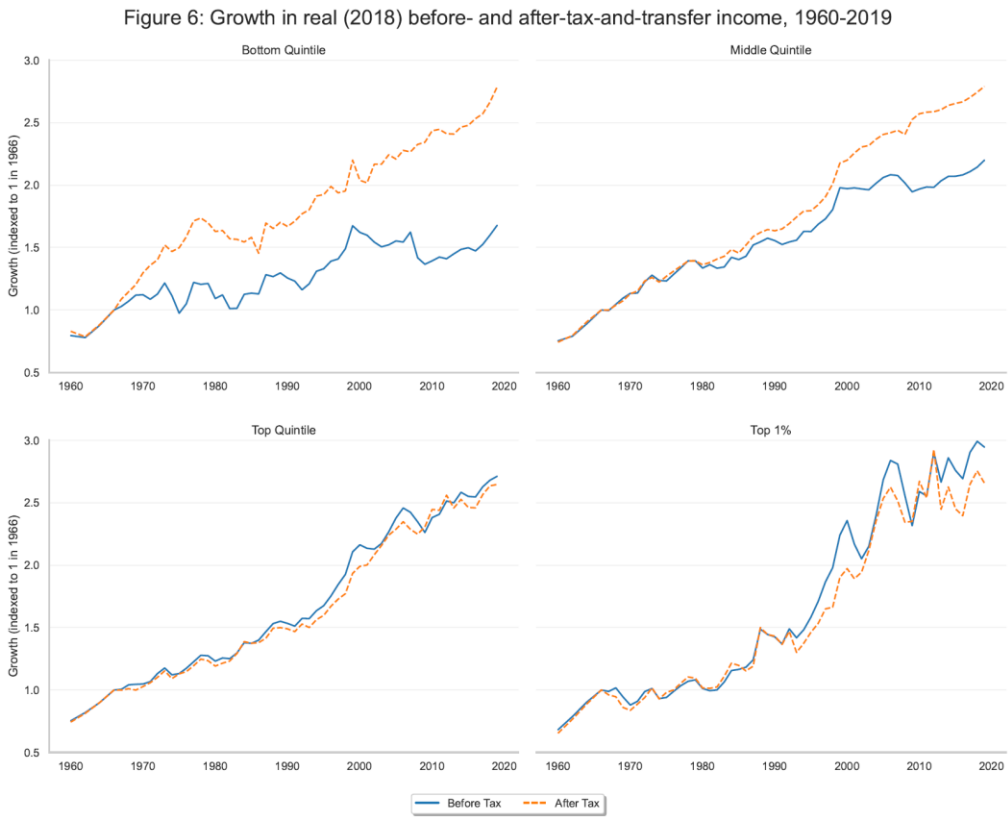


AS author calculations from AS(2024 online) sheet “Output”. RS index calculated as “Gini not size adjusted” (col AK) less “After tax&transfer, before deficits & gov’t cons” (col AI). CBO author calculations based on workbook *58353-supplemental-data.xlsx*, sheet “Household Income Shares”. Ginis calculated for quintiles 1, 2, 3, 4, and percentiles 81-90, 91-95, 96-99, 99-100. RS index calculated as Gini for market data less Gini for after-tax-and-transfer, with all data ranked by pre-tax income. PSZ author calculations based

¹¹ To check for consistency, we also compare a Gini-to-Gini estimate for AS and PSZ, which can be found in the online appendix.

on percentiles of pre-tax and after-tax income (sheets TB4 and TC4). Ginis calculated from detailed percentiles, and “Gini difference” as “Gini before-tax” less “Gini after-tax”. Auten & Splinter measures are *before* government consumption and deficits.

Figures 3 and 4 showed the tax and transfer rates, which address questions about the extent of redistribution. Figure 6 presents similar information but in terms of income levels and growth. It shows changes in pre-tax income and after-tax income for four different income groups, normalized to the 1966 income for that group, using AS data. The vertical distance between these two tells us the extent of redistribution while the slope of the lines show how pre-tax and after-tax income has changed for each of the groups.



Author calculations from AS(2024 online) sheet “Output2”. Data on pre-tax income and tax-and-transfer additions to pre-tax income ranked consistently by pre-tax income. Converted to 2019 dollars and per-

capita using the “PCE Index” and “N. Individuals (filing & non-fil.)” in sheet Co-Ref Stats. All measures are *before* government consumption and deficits.

Focusing on pre-tax income (the solid blue lines), we see the standard story about inequality: since around 1980, the pre-tax 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 a factor of 3, with all that growth occurring since 1982. Individuals in the bottom quintile saw growth from 1966 until 1999, when their income was 1.67-times their 1966 income (again, with all that growth occurring since 1982). Since that time, their pre-tax income has stagnated: in 2019 it was 1.68-times their 1966 income, the same as it was in 1999.¹² The middle quintile fell 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 percent, reaching 2.20-times 1966 income in 2019.

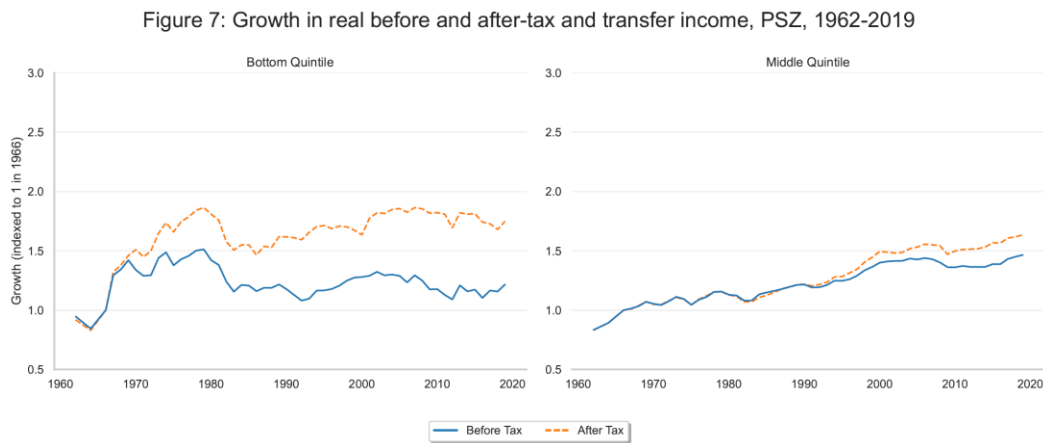
Looking at after-tax income shows a markedly different story. All four groups had almost the same growth in after-tax income during the period we examine, equal to just under 2.50 times 1966 income.¹³ That is, the tax system appears to be offsetting the changes in the growth of market income, doing more 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 percent capturing most of the market gains in recent years, after-tax income growth has been more evenly spread.

¹² Note however, that looking at just the post-financial crisis period, their pre-tax income has grown, going from 1.37-times 1966 income to 1.68-times.

¹³ This appears to be a coincidence rather than a chosen policy result. Using different start years produces different quantitative results. If we use 1980 as a starting point, the bottom quintile grows by less than 1.50-times while the top grows in the range of 2.25-2.50-times. This may also be a coincidence, however, because after-tax incomes of the top 1% stagnated until 1982. Subsequent growth is off this low base.

This outcome is consistent with Figure 3. Figure 3 showed a sharp increase in transfers to the bottom quintile. We can see this in Figure 6 as well: the gap between the pre-tax and after-tax income of the bottom quintile grows over this period. It is also larger for the bottom quintile than for the middle (which also receives net transfers). A version of Figure 6 using CBO data (not shown) is similar.¹⁴

PSZ do not break down pre-tax and after-tax income by quintile using consistent rankings which limits our ability to compare their results. Figure 7 shows their results for growth in real income for the bottom and middle quintile with *non-consistent* rankings of units.



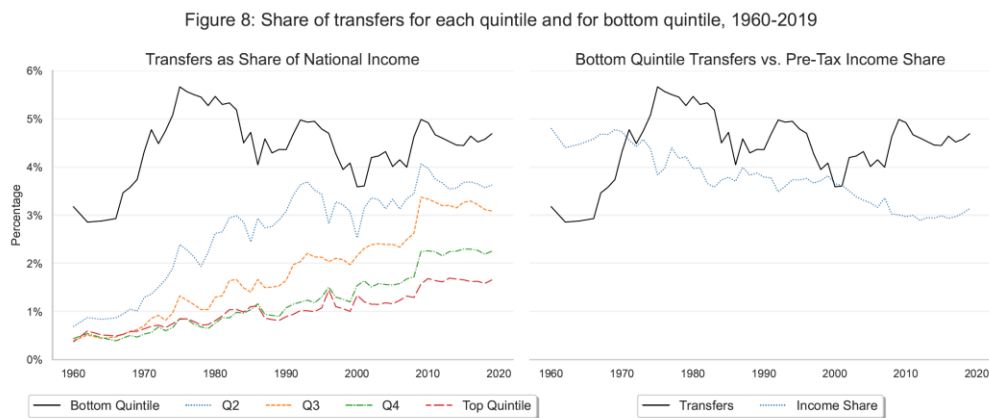
Author calculations from PSZ (2024 online) sheets TA4 and TB4, detailed percentiles of income not ranked on a consistent basis.

From 1979, until 2009, PSZ estimate that pre-tax income for the bottom quintile declines by 22.3 percent. After-tax and transfer income, however, modestly increases in this period. While the differences in pre-tax income at the

¹⁴ The figure on page 18 of CBO (2024) shows after-tax and transfer growth rates for the highest, middle, three and lowest quintiles since 1979. The results are similar to the AS results in Figure 6.

bottom between AS and PSZ are important and worth additional investigation,¹⁵ both show significant and growing redistribution toward the bottom: the ratio of after-tax and transfer income to before-tax and transfer income in 2019 in the AS data is 1.6 while it is 1.4 in the PSZ data.

The figures so far demonstrate that the most important change to the fiscal system is the increase in transfer to bottom income groups. To understand this better, Figure 8 isolates transfers, using AS data and definitions (which means that transfers administered as part of the tax system, such as the EITC and the child tax credit are not included). The left-hand panel shows transfers as a share of national income. The righthand panel drills further down, showing just the transfers to the bottom quintile along with its income share.



¹⁵ We suspect that the differences between the PSZ and AS results for pre-tax income are driven by three factors. First, the PSZ results are for non-consistent rankings, which means that different adults are in each quintile in each of the years shown. Second, because PSZ use adults as their measurement unit while AS use people, and the number of adults at the bottom and middle has grown faster than the number of people, we should expect more muted effects. Finally, the allocation choices made by the two research groups will also affect these results. For example, AS allocate a larger share of underreported income to lower income groups than do PSZ. To the extent underreported income has grown over time, this means that AS will show stronger growth at the bottom than PSZ do.

Author calculations from AS(2024 online) sheet “Output2”. Data on pre-tax income and transfer to pre-tax income ranked consistently by pre-tax income. Transfer rates also found in sheet “C7a-Redis” (opposite sign). All measures are *before* government consumption and deficits.

Here we see a somewhat more nuanced story. Although total transfers have gone up over time (from 5.2% of national income in 1966 to 15.3% of national income in 2019), transfers to the bottom quintile peaked in 1975 at 5.7% of national income and declined since then to 4.7% of national income. The increase in transfers as a share of national income 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 transfers, though smaller increases than for the middle groups. 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 8 shows that this is not true. The government has instead increasingly shifted resources toward the middle.¹⁶

The reason that prior figures show that transfer *rates* have gone up at the bottom while Figure 8 shows transfer *amounts* 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 8, which shows the income share for the bottom quintile declining from 4.6% in 1966 to 3.2% in 2019.¹⁷

¹⁶ 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 the increase in transfers since 1975 has been to the middle three groups.

¹⁷ 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.

4. OTHER WORK AND OTHER MEASURES

To verify the results above, we conducted a literature review on the progressivity and redistribution of the U.S. tax and transfer system. We tried to find all recent published papers that estimate changes in the progressivity or redistribution rates of the U.S. tax and transfer system over time. We limited our search to (i) papers published since 2012 (10 years from when we started this project), (ii) that show changes in progressivity or redistribution over time, and (iii) examine the entire distribution, not just top income groups. The full list of papers along with a brief summary of each paper is in the Online Appendix.

Our review of these studies finds that almost all of the results are consistent with the results from CBO, AS, and PSZ. Where they differ, there are clear explanations which allows us to reconcile the results. We highlight some prominent results.

Elwell, Corinth, and Burkhauser (2020) use ASEC-CPS data to construct estimates of household income from 1959 to 2016, supplementing the CPS data with estimates of the value of health benefits. Table 3 summarizes their findings (from Table 1, Panel A, columns 4 and 7). Before taxes, the top 5% of households' income almost doubled. The lowest quintile grew only 18% over for the 57-year period. After accounting for taxes and transfers, however, the poorest quintile experiences the largest growth, with the other quintiles all growing at about the same rate.

Table 3: Percent income growth by quintile, 1959-2016 from Elwell et al (2020)

	Media n	Bottom	Second	Third	Fourth	Top	5%
Pre-tax Market	91.3	18.0	63.3	91.9	116.2	160.4	193.4
Post- tax/transfer	153.7	262.0	157.6	154.5	162.2	175.7	186.8

Ellwell et al compute pre-tax and transfer and after-tax and transfer Gini coefficients (though not using consistent rankings). In 1959, the pre-tax and transfer Gini was 0.411 and the after-tax-and-transfer Gini was 0.350, a 0.061

difference. By 2016, the pre-tax Gini rose to 0.502, while the after-tax-and-transfer Gini dropped to 0.341, a 0.161 difference.

Many studies estimate the elasticity of after-tax income to pre-tax income, fitting a power curve of the form $T(y) = y - \lambda y^{(1-t)}$. The value of $1-t$ is a measure of the curvature of the tax and transfer schedule, which is similar to, but not exactly the same as, a progressivity measure or a redistribution measure. (Splinter 2020, online appendix, p. 8, provides a discussion.) For example, Heathcote, Storesletten, and Violante (2020) use CBO data, excluding health transfers and not counting elderly households, and find that $1-t$ did not change between 1979-1983 and 2012-2016, with a constant value of 0.186. Comparing their results to Splinter (2020), however, they note that had they included elderly households and in-kind and Social Security benefits among transfers, they would have found an increase in their curvature parameter.¹⁸ Most, but not all, other estimates using this approach such as Coen-Pirani (2021), and König (2023), find similar results and can similarly be reconciled with the findings here.

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 transfer rate to the bottom, and the size of those increases swamp any changes at the top. This is robust across different methodologies

¹⁸ Moreover, if the value of t is taken to be a progressivity measure and, therefore, used to estimate changes to taxes rather than taxes plus (some) transfers, they find a 19% increase in the value of t from 1979-1983 to 2012-2016 (Table 1).

and datasets. Second and consistent with this finding, the tax and transfer system has become more redistributive over the last half century, with much of that increase occurring in the last several decades.

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, our 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.

DISCLOSURES:

The authors have no financial arrangements that might give rise to conflicts of interest with respect to the research reported in this paper.

REFERENCES

Aguiar, Mark, and Mark Bilal. 2015. "Has Consumption Inequality Mirrored Income Inequality?" *American Economic Review* 105 (9): 2725–56.

Almeida, Vanda. 2020. "Income Inequality and Redistribution in the Aftermath of the 2007–2008 Crisis: The U.S. Case." *National Tax Journal* 73 (1): 77–114.

Armour, Philip, Richard V. Burkhauser, and Jeff Larrimore. 2014. "Levels and Trends in U.S. Income and Its Distribution: A Crosswalk from Market Income towards a Comprehensive Haig-Simons Income Approach." *Southern Economic Journal* 8 (12): 271–93.

Auerbach, Alan J., Laurence J. Kotlikoff, and Darryl Koehler. 2023. "US Inequality and Fiscal Progressivity: An Intragenerational Accounting." *Journal of Political Economy* 131 (5): 1249–93.

Auten, Gerald, and David Splinter. 2024. "Income Inequality in the United States: Using Tax Data to Measure Long-Term Trends." *Journal of Political Economy* 132 (7): 2179–2227.

Auten, Gerald E., and David Splinter. 2024. "Online Appendix to 'Income Inequality in the United States: Using Tax Data to Measure Long-Term Trends.'" <http://davidsplinter.com/AutenSplinter-IncomeIneq.xlsx>.

Bakis, Ozan, Baris Kaymak, and Markus Poschke. 2015. "Transitional Dynamics and the Optimal Progressivity of Income Redistribution." *Review of Economic Dynamics* 18 (3): 679–93.

Bargain, Olivier, Mathias Dolls, Herwig Immervoll, Dirk Neumann, Andreas Peichl, Nico Pestel, and Sebastian Sieglöcher. 2015. "Tax Policy and Income Inequality in the United States, 1979–2007." *Economic Inquiry* 53 (2): 1061–85.

Blanchet, Thomas, Lucas Chancel, and Amory Gethin. 2022. "Why Is Europe More Equal than the United States?" *American Economic Journal: Applied Economics* 14 (4): 480–518.

Borella, Margherita, Mariacristina De Nardi, Michael Pak, Nicolo Russo, and Fang Yang. 2023. "The Importance of Modeling Income Taxes over Time: U.S. Reforms and Outcomes." *Journal of the European Economic Association*, September, jvado53.

Bricker, Jesse, Kevin B. Moore, Sarah J. Reber, and Alice Henriques Volz. 2020. "Effective Tax Rates by Income and Wealth Class." *National Tax Journal* 73 (4): 987–1004.

Burkhauser, Richard V., Jeff Larrimore, and Kosali I. Simon. 2012. "A 'Second Opinion' on the Economic Health of the American Middle Class." *National Tax Journal* 65 (1): 7–32..

Coen-Pirani, Daniele. 2021. "Geographic Mobility and Redistribution." *International Economic Review* 62 (3): 921–52.

Congressional Budget Office. 2022. “The Distribution of Household Income, 2019.”

Congressional Budget Office. 2024. “The Distribution of Household Income, 2021.”

DeBacker, Jason, Bradley Heim, Vasia Panousi, Shanthi Ramnath, and Ivan Vidangos. 2013. “Rising Inequality: Transitory or Persistent? New Evidence from a Panel of U.S. Tax Returns.” *Brookings Papers on Economic Activity* 44 (1 (Spring)): 67–142.

Elwell, James, Kevin Corinth, and Richard V. Burkhauser. 2020. “Income Growth and Its Distribution from Eisenhower to Obama: The Growing Importance of In-Kind Transfers (1959–2016).” In *United States Income, Wealth, Consumption, and Inequality*. New York: Oxford University Press..

Ferriere, Axelle, Philipp Grubener, Gaston Navarro, and Oliko Vardishvili. 2023. “On the Optimal Design of Transfers and Income Tax Progressivity.” *Journal of Political Economy Macroeconomics* 1 (2): 276–333.

Fixler, Dennis, Marina Gindelsky, and David Johnson. 2020. “Distributing Personal Income: Trends over Time.” c14454. National Bureau of Economic Research.

Fixler, Dennis, and David S. Johnson. 2014. “Accounting for the Distribution of Income in the U.S. National Accounts.” In *Measuring Economic Sustainability and Progress*, edited by Dale W. Jorgenson, J. Steven Landefeld, and Paul Schreyer, 213–44. University of Chicago Press.

Freeland, Chrystia. 2012. *Plutocrats: The Rise of the New Global Super-Rich and the Fall of Everyone Else*. Penguin.

Gindelsky, Marina. 2022. “Do Transfers Lower Inequality between Households? Demographic Evidence from Distributional National Accounts.” *Economic Inquiry* 60 (3): 1233–57.

Greenstone, Michael, Dmitri Koustas, Karen Li, Adam Looney, and Leslie B. Samuels. 2012. “A Dozen Economic Facts About Tax Reform.” Policy Memo. Hamilton Project.

Guner, Nezih, Remzi Kaygusuz, and Gustavo Ventura. 2014. “Income Taxation of U.S. Households: Facts and Parametric Estimates.” *Review of Economic Dynamics* 17 (4): 559–81.

Guvenen, Fatih, Greg Kaplan, Jae Song, and Justin Weidner. 2022. “Lifetime Earnings in the United States over Six Decades.” *American Economic Journal: Applied Economics* 14 (4): 446–79.

Heathcote, Jonathan, Fabrizio Perri, Giovanni L. Violante, and Lichen Zhang. 2023. “More Unequal We Stand? Inequality Dynamics in the United States, 1967–2021.” *Review of Economic Dynamics*, August..

Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L. Violante. 2017. “Optimal Tax Progressivity: An Analytical Framework.” *The Quarterly Journal of Economics* 132 (4): 1693–1754.

Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L Violante. 2020. “How Should Tax Progressivity Respond to Rising Income Inequality?” *Journal of the European Economic Association* 18 (6): 2715–54.

Iselin, John, and Daniel Reck. 2024. “Comment on ‘Inequality in the United States: Using Tax Data to Measure Long-Term Trends,’ by Auten and Splinter”, available at <https://static1.squarespace.com/static/59ae6e08914e6b4040aa9716/t/66ba39241770b376e2c7c204/1723480357321/CommentAutenSplinter.pdf>

Jalles, João Tovar, and Georgios Karras. 2024. “Tax Progressivity and Output in the US.” *Economics Letters* 235 (February):111545.

Joint Committee on Taxation. 2024. Present Law and Background on the Income Taxation of High Income and High Wealth Taxpayers, JCX-47-24.

Kakwani, Nanak C. 1977. "Measurement of Tax Progressivity: An International Comparison." *The Economic Journal* 87 (345): 71–80.

Kaplow, Louis. 2005. "Why measure inequality?" *Journal of Economic Inequality* 3: 65–

———. 2006. "Taxation and Redistribution: Some Clarifications." *Tax Law Review* 60 (2): 57–82.

Kopczuk, Wojciech. 2019. "Comments and Discussion." *Brookings Papers on Economic Activity*, 512–33.

Lambert, Peter. 2001. *The Distribution and Redistribution of Income: Third Edition*. Manchester University Press.

Larrimore, Jeff, Richard V. Burkhauser, Gerald Auten, and Philip Armour. 2021. "Recent Trends in US Income Distributions in Tax Record Data Using More Comprehensive Measures of Income Including Real Accrued Capital Gains." *Journal of Political Economy* 129 (5): 1319–60.

Leonhardt, David. 2019. "Opinion | The Rich Really Do Pay Lower Taxes Than You." *The New York Times*, October 6, 2019, sec. Opinion.

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

Matthews, H. Damon. 2015. "Quantifying Historical Carbon and Climate Debts among Nations." *Nature Climate Change* advance online publication (September).

Meyer, Bruce D., and James X. Sullivan. 2011. "Viewpoint: Further Results on Measuring the Well-Being of the Poor Using Income and Consumption." *Canadian Journal of Economics/Revue Canadienne d'économique* 44 (1): 52–87.

———. 2013. “Consumption and Income Inequality and the Great Recession.” *American Economic Review* 103 (3): 178–83.

———. 2017. “Consumption and Income Inequality in the U.S. Since the 1960s.” w23655. National Bureau of Economic Research.

———. 2023. “Consumption and Income Inequality in the United States since the 1960s.” *Journal of Political Economy* 131 (2): 247–84.

Noah, Timothy. 2012. *The Great Divergence: America’s Growing Inequality Crisis and What We Can Do about It*. Bloomsbury Publishing USA.

Pechman, Joseph A., and Benjamin A. Okner. 1974. “Who Bears the Tax Burden? Studies of Government Finance Series.”

Piketty, Thomas, and Emmanuel Saez. 2003. “Income Inequality in the United States, 1913–1998*.” *The Quarterly Journal of Economics* 118 (1): 1–41.

———. 2007. “How Progressive Is the U.S. Federal Tax System? A Historical and International Perspective.” *Journal of Economic Perspectives* 21 (1): 3–24.

Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman. 2018. “Distributional National Accounts: Methods and Estimates for the United States.” *The Quarterly Journal of Economics* 133 (2): 553–609.

Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman. 2024. “Distributional National Accounts.” May 2018. <http://gabriel-zucman.eu/usdina/>.

Rakoff, Jed S. 2022. “The Rich Get Richer.” *The New York Review*, June 23, 2022.

Reynolds, Morgan, and Eugene Smolensky. 1977. *Public Expenditures, Taxes, and the Distribution of Income: The United States, 1950, 1961, 1970*. Academic Press.

Riedel, Lukas, and Holger Stichnoth. 2024. "Government Consumption in the DINA Framework: Allocation Methods and Consequences for Post-Tax Income Inequality." *International Tax and Public Finance* 31 (3): 736–79.

Saez, Emmanuel, and Gabriel Zucman. 2019. *The Triumph of Injustice*. New York, NY: W. W. Norton & Company.

———. 2020. "The Rise of Income and Wealth Inequality in America: Evidence from Distributional Macroeconomic Accounts." *Journal of Economic Perspectives* 34 (4): 3–26.

Slavov, Sita, and Alan D. Viard. 2016. "Taxes, Transfers, Progressivity and Redistribution: Part 2." *Tax Notes*, September, 1879–89.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick. 2019. "Capitalists in the Twenty-First Century." *The Quarterly Journal of Economics* 134 (4): 1675–1745.

Smith, Matthew, Owen Zidar, and Eric Zwick. 2023. "Top Wealth in America: New Estimates Under Heterogeneous Returns*." *The Quarterly Journal of Economics* 138 (1): 515–73.

Splinter, David. 2019. "Who Pays No Tax? The Declining Fraction Paying Income Taxes and Increasing Tax Progressivity." *Contemporary Economic Policy* 37 (3): 413–26.

———. 2020. "U.s. Tax Progressivity and Redistribution." *National Tax Journal* 73 (4): 1005–24.

Stiglitz, Joseph E. 2012. *The Price of Inequality: How Today's Divided Society Endangers Our Future*. W. W. Norton & Company.

Sullivan, Martin. 2024. "Wyden Correctly Criticizes JCT's Misleading 34 Percent Rate." *Taxes Notes Federal* (September 23, 2024): 2412-2415.

Vellutini, Charles, and Juan Carlos Benitez. 2021. “Measuring the Redistributive Capacity of Tax Policies.” IMF Working Paper. No. 2021/252.

Wu, Chunzan. 2021. “More Unequal Income but Less Progressive Taxation.” *Journal of Monetary Economics* 117 (January):949–68.

Zwick Eric, 2019. “Testimony for Joint Economic Committee Hearing on ‘Measuring Economic Inequality in the United States’”

A. Literature review

1. *Papers estimating a power function*

Many papers estimate the tax system using a reduced functional form, usually a power function of the form, $T(y) = y - \lambda y^{(1-t)}$. Most of these papers use the progressivity parameter as an input into a structural model that is studying something else. Some papers, however, estimate a reduced form function to study progressivity. We start with three papers that use the power function formulation where one of the main goals of the paper is to estimate progressivity over time. The remainder of this section lists papers that estimate progressivity using a power function formulation but use that as an input into something else or papers that do not estimate progressivity over a sufficiently long period to be comparable to our main results.

- Heathcote et al (2020)

Use CBO data and definitions but exclude Medicaid and Medicare. Look only at federal taxes (not state and local). Use a power function (as in Heathcote et al 2017). Their pre-tax and transfer measure is CBO's (less Medicare, Medicaid, and CHIP), as opposed to our use of CBO's "market income." This means that Social Security is in pre-tax income. They exclude elderly households. Compare two periods: 1979-1983 and 2012-2016. Find a stable value for $t = 0.186$ for both periods. Unclear precisely why they find stable progressivity and, using CBO data, we find an increase in the RS index. It is likely due to their exclusion of health transfers and possibly the elderly.

They also do some alternative specifications. In one, they put SS in post-tax income. Here, t falls a little bit.

- Borella et al (2023)

Key point of the paper is to estimate tax changes over time. Includes long discussions of various tax reforms. They estimate a power function back to the

1960's. PSID data and TAXSIM. Just look at monetary income, so exclude health and other in-kind transfers. They 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).

- Guner, Kaygusuz, and Ventura (2014)

This paper uses tax data to study the structure of the tax system for a cross section of households. They estimate four functional forms for effective tax rates. They use IRS public use file for 2000. Income is fiscal income (realized capital gains, not counting contributions to employer health plans, no transfers), with pensions on a distributions basis. Taxes are only federal income taxes. (They seem to exclude payroll taxes and don't distribute corporate taxes). Their value for t in the HSV specification is 0.36. They only evaluate the year 2000 and do not show changes over time.

- Bakis Kaymak and Poschke (2015)

Optimal tax paper about transitional dynamics. They calibrate their model to the US economy and in doing so, estimate the progressivity of the tax system using a power function. They use the March CPS for 1979 to 2009 and compute federal and state income taxes, and payroll taxes per household using TAXSIM. Pre-tax income = gross earnings plus payroll tax. After-tax income (which they call disposable income) is reported earnings less federal and state income taxes. They get a value of 0.17. Note that they seem to exclude transfer payments.

- Heathcote et al (2017)

Use PSID for 200, 2002, 2004 and 2006 and TAXSIM to estimate a power function. Pre-government household gross income = labor earnings, self-employment income, private transfers, interest, dividends and rents. (No capital

gains?) $TI = \text{this minus MID, medical expenses, state taxes, and charitable donations plus employer share of FICA. Post government} = \text{progovernment} - \text{taxes} + \text{transfers. Taxes} = \text{federal and state income} + \text{payroll. Transfers} = \text{public cash transfers} + \text{Social Security. No Medicare. They don't say anything about Medicaid or CHIP. They get a value of } t = 0.181.$

- Coen-Pirani (2020)

This paper considers how progressive taxes reduce incentives to relocate to more productive locations (because they take away some of the gains from increased productivity). To estimate the model, Coen-Pirani needs a measure of tax progressivity. She uses the power-law estimation, and CBO data and definitions, comparing market income to after-tax income for 2000 to 2007 (p. 932). Gets a value of 0.192 for $1-t$ (compared to Heathcote et al 2017 value of 0.18, using PSID data and Bakis et al's value of 0.17 using the March CPS). She finds no evidence of a trend in the CBO data.

- Wu (2021)

This paper investigates how changes in the economy and social structure affect progressivity. Wu estimates a tax function as a power function, using CPS data and TAXSIM. Pre-tax income is wage income and self-employment income before the deduction of the employer share of the FICA tax. Taxes are federal and state income taxes (but possibly not payroll taxes). Transfers are UI, worker's comp., SSI, and public assistance (AFDC). The definition of transfers seems to exclude Social Security, Medicare, and Medicaid. With these definitions, Wu finds that the tax system in 2014-2016 was less progressive than in 1978-1980.

- Ferriere, Grubener, Navarro, and Vardishvili (2023)

Paper on the optimal size of transfers in an optimal tax framework. In doing so, they estimate a log-linear tax function with a non-zero intercept. They use CPS data for 2013. They include federal and state taxes, payroll taxes, tax credits (the EITC and the CTC), and SNAP. They do not appear to include

health transfers. They replicate Heathcote et al 2017 estimate without an intercept but with an intercept, get a much lower value of 0.06. They do not estimate changes over time. They also estimate a more flexible function (p. 294) and get a similar value. As with their main specification, they do this for just one year.

- Jalles and Karras (2024)

This paper investigates how progressivity in the tax system, as estimated by a power law, affects inequality. They appear to use the Borella et al (2023) et al data and definitions discussed above (data is from PSID). Figure 1 in this paper looks like Figure 1(b) in Borella.

2. Papers taking other approaches

This section lists papers that estimate the progressivity or redistributive effect of the tax or tax and transfer system over time but that do not use the power function formulation.

- Burkhauser, Larrimore, and Simon (2012)

The goal of this paper is to explore how unit definitions and income definitions affect estimates of income growth over time. They use March CPS over 30 years. Use TAXSIM to impute federal and state tax credits and liabilities, including payroll taxes. CPS uses households, so divide into tax units. Impute the ex-ante value of employer contributions to health insurance and the value of public health insurance (Medicaid and Medicare). Use this to calculate distributional statistics for various permutations of income definitions, sharing units, and size adjustments. In addition to median income, they also look at quintiles. They show percent growth for each of three decades and for the entire period from 1979 to 2007 (Table 4). They do not directly calculate changes in tax/transfer progressivity or redistribution.

- DeBacker et al (2013)

This paper studies whether the causes of rising inequality are due to persistent factors or transitory factors. Use confidence IRS data to examine both

male labor earnings and total household income before and after taxes from 1987 to 2007. Pre-tax household income = total income in the 1040 (including capital gains), so this is akin to Piketty Saez fiscal income. After-tax income is pre-tax minus tax plus refundable credits. In Part VII (Figure 9) They use variance as a measure of inequality and find that the effect of the tax system on reducing inequality is relatively stable over their period.

- Mathews (2014)

Mathews computes four different progressivity measures (Kakwani, Suits, Stroop and his own) from 1929 until recently. He uses tax return data from SOI for the first set of computations. Then to account for non-filers, he allocates all residual income (I assume measured by GNP) proportionally across the entire population. He finds that progressivity was much higher in the early years of the income tax, bottoms out in the late 1960's and has increased since then. The results are summarized in Fig 4. Note that the paper seems to use tax units, tax definitions, excludes transfers, and so forth so it is similar to Piketty Saez (2007).

- Bargain et al. (2015)

This paper 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). Their goal is to distinguish automatic changes in redistribution due to changes in underlying inequality and policy changes. It is limited to tax data and definitions, so very much like Piketty/Saez. It assumes remittance is the same as incidence and omits corporate and estate/gift taxes. Figure 2, left hand panel shows changes to tax rates by quintile from 1979 to 2007 and looks like our Figure 4.

- Saez and Zucman (2019)

This paper follows PSZ except that it only considers taxes (but considers state and local taxes as well as federal) and it changes the assumptions about the incidence of taxes (as discussed in the body of the paper). Note that they

treat refundable credits as transfers, not negative taxes. That means they exclude the EITC from their analysis. With this approach, they find a decline in progressivity as measured by comparing average tax rates among income classes. They also consider how transfers would affect this, which appears to be PSZ with different tax incidence assumptions.

- Splinter (2019)

The focus of this paper is on the population that does not pay federal income taxes. Part F, however, relates that to progressivity measures including the Kakwani index. The paper uses tax data and definitions, including tax units. Only federal income taxes are included (not payroll or self-employment taxes). Only working age adults are included. Figure 6 shows a large increase in the Kakwani index from 1986 to 2015. Figure 7 shows average effective tax rates by quintile for 1985 and 2015, with a steeper curve in 2015.

- Splinter (2020)

This paper examines CBO data in detail, finding an increase in both progressivity (Kakwani index) and redistribution (Reynolds Smolensky index) as well as other measures of either progressivity or redistribution. The results are similar to the CBO results presented here.

- Almeida (2020)

This paper measures redistribution for 2006-2012 using CPS (ASEC) data for that period. It uses five different income measures (market, + cash transfers, minus taxes, + credits, + in kind transfers (but not health transfers)). It doesn't seem to specify what units are used but since it uses Census data, it probably uses households. It finds increasing redistribution during financial crisis but less so in the later years as the emergency programs run out. See Figure 6, right hand panel.

- Elwell, Corinth, and Burkhauser (2020)

Extends Burkhauser et al (2012) back to 1959 and forward to 2016. A key contribution is to estimate government transfers to periods before 1979, when the Census began to estimate these values. As with Burkhauser et al 2012, they use ASEC CPS data to estimate household income. As with Burkhauser et al 2012, they consider a number of different definitions, including household size-adjusted market income of persons, and household size-adjusted post-tax and poste-transfer plus in-kind transfer income of persons (including Medicare and Medicaid). The key results are in the body of the paper.

- Bricker et al. (2020)

Estimate average tax rates across both income and wealth distributions from 1994 to 2015 using data from the SCF. Income is fiscal income, employer-paid health insurance premiums, Medicare, Medicaid, SNAP and other government benefits, plus corporate retained earnings. The methodology is taken from Bricker et al 2016. Taxes are federal, state (using TAXSIM), property taxes, and business property and corporate taxes (75% to stock, 25% to wages). They do not include payroll taxes and consumption taxes. Average tax rates appear to be just tax, not tax and transfer (transfers are part of income). Figure 3, panel B shows ATRs by income class (bottom 50, next 40, 90-99, 99-99.9 and 0.1), for 1995, 19978, 2004, 2007, 2010, 2013 and 2016. The lines largely overlap. They do not have any formal progressivity estimates.

- Blanchet, Chancel, and Gethin (2022)

This paper compares inequality, including the tax and transfer systems of the US and European countries. They appear to use the PSZ data for the United States so the results should be similar to PSZ. 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.

- Heathcote et al (2023)

This paper extends Heathcote et al (2010). They use CPS and rank households year by year by “equivalized total market income” which is all income excluding transfers and before taxes. (They therefore use inconsistent ranking.)

They drop households where no member of the household is of working age, so no elderly households. They do not include Medicare, Medicaid, or CHIP in their definition of transfers (see Appendix A, p. 262). Taxes are both state and federal and payroll, estimated using TAXSIM. The appendix describes the data behind figures 16 and 17 but not for 18 and 19.

Figure 16 shows that transfers have increased at the bottom. Figure 18 panels B and C compare household earnings to household disposable income (which is after-tax and transfer income). It shows an increase in transfers to the bottom. This figure is a version of our Figures 6 and 7 but with the data aggregated differently. It looks roughly consistent with the AS data.

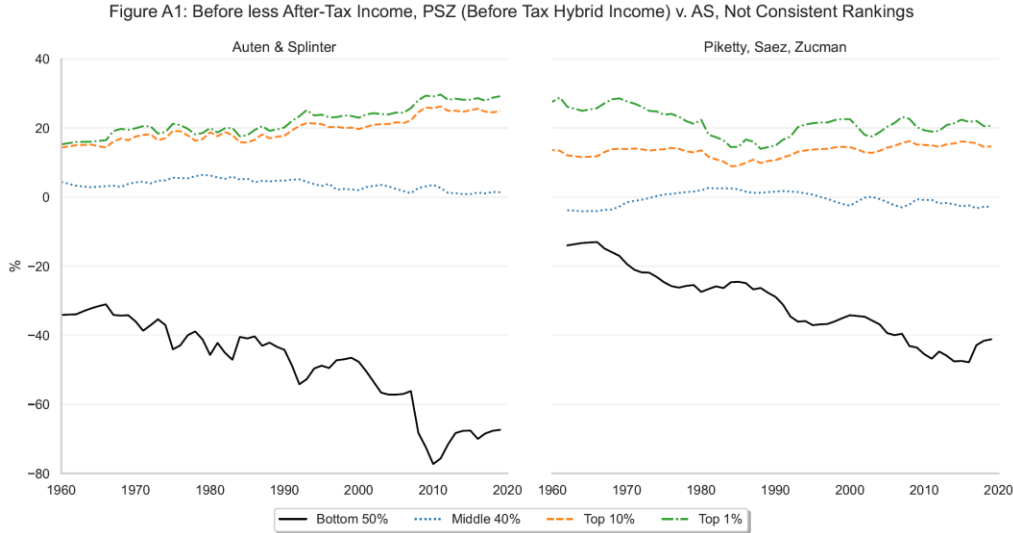
Figure 19 shows government redistribution, measured as a ratio of the variance of market income minus variance in disposable income divided by variance of market income. It shows a large increase in redistribution during the 1970's, a decline during the 1980's and a slower increase since that decline.

B. Analysis using PSZ Factor Income

The main text uses the PSZ pre-tax income series because PSZ provide consistent pre-tax and transfer and after-tax and transfer data for that series, at least when treating the entire bottom 50 percent as a single group. PSZ pre-tax income, however, includes Social Security, disability and unemployment benefits, and distributions from private pensions and excludes contributions to those funds. PSZ Factor Income flips this: it includes the contributions to Social Security, unemployment, and private pension and excludes distributions.

PSZ Factor Income is closer in concept to AS pre-tax income and CBO market income, which are the other series we use. PSZ, however, do not provide Factor Income using consistent rankings for pre-tax and transfer and after-tax and transfer income. Instead, their data takes a cross-sectional approach (e.g. showing the people in the bottom 50 percent in each period even if they are different people than the ones in the bottom 50 percent in a prior period). Therefore, in the main text, we use PSZ pre-tax income. As a robustness check, we show results using PSZ Factor Income here.

Figure A1 shows the same comparison as Figure 3 in the main test (tax and transfer rates for AS pre-tax income and PSZ pre-tax income) but using inconsistent rankings. This allows us to see the effects of the change from consistent to inconsistent rankings without changing the definitions of terms in data series that we use.



The effects are substantial: both AS (left hand side) and PSZ (right hand side) show much larger transfers to the bottom 50 percent when using inconsistent rankings (Figure A1) than when using consistent rankings (Figure 3 in the main text) across all time periods. Both also show an increase in transfers to the bottom 50 percent, supporting our central conclusion.

Figure A2 shows the tax and transfer rate for PSZ Factor Income instead of PSZ pre-tax income (leaving the left-hand panel the same—tax and transfer rates for AS using inconsistent rankings). We see much larger transfers to the bottom 50 percent in the PSZ data because Social Security is now counted as a transfer. In fact, the AS and PSZ bottom 50 percent series closely match in this comparison, both showing large and increasing transfers to the bottom 50 percent.

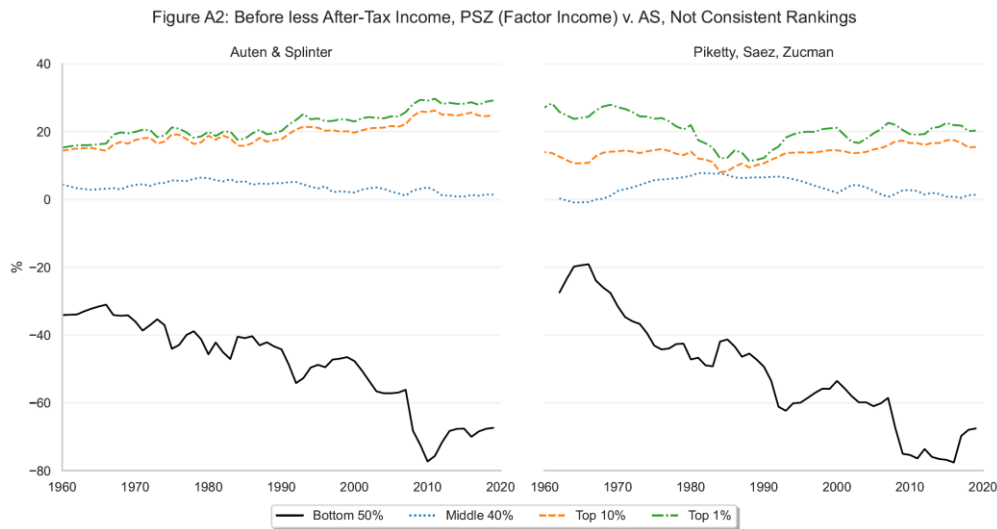
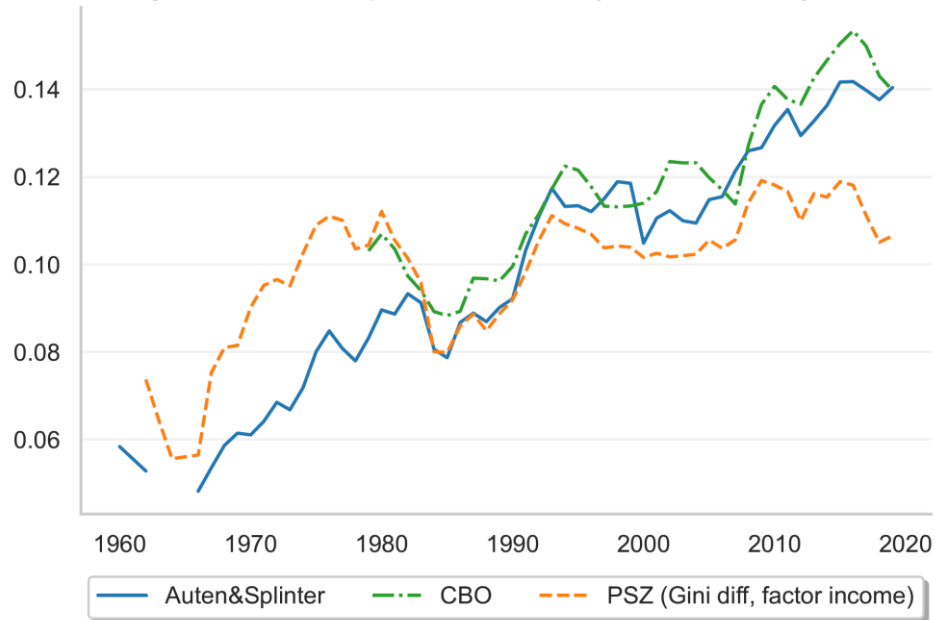


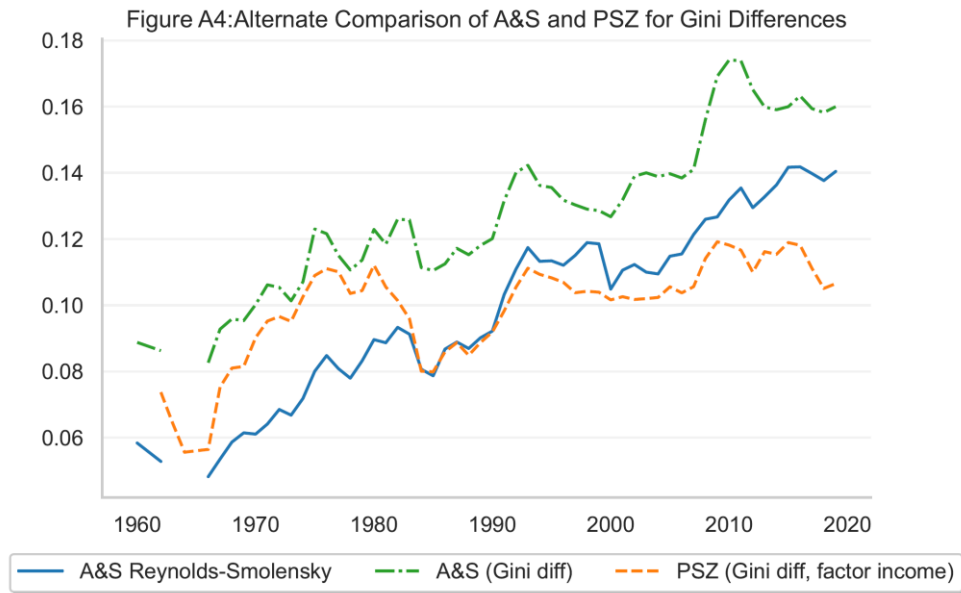
Figure 5 in the main text shows the Reynolds-Smolensky index for AS and CBO. Because PSZ do not provide any series with consistent rankings in sufficient detail to compute a Reynolds-Smolensky index, Figure 5 shows the pre-tax and transfer Gini coefficient compared to after-tax and transfer Gini efficient, normalized by the pre-tax Gini (which we will call the Gini difference) using PSZ pre-tax income.

Figure A3 is the same as Figure 5 in the text except using PSZ Factor Income instead of pre-tax income (still computing the Gini difference rather than the Reynolds-Smolensky index for the PSZ series). All three series are on top of each other in this comparison, although the PSZ series shows a larger increase during the 1970's than do AS and CBO and a smaller increase after that. The PSZ Gini different flattens out after about 2010 while the AS and CBO Reynolds-Smolensky indices continues to increase.

Figure A3: Auten & Splinter and CBO Reynolds–Smolensky Index



To understand how much difference using the Reynolds-Smolensky index makes compared to comparing Gini difference, Figure A4 shows the AS Reynolds-Smolensky index, the AS Gini difference, and the PSZ Gini difference (using PSZ Factor Income). Looking at the two AS lines, we see that the Gini difference is uniformly higher than the Reynolds-Smolensky index. The lines are roughly parallel except for a notable difference during the 2008-2009 financial crisis, with the Gini difference showing a sharp increase that is not seen in the Reynolds-Smolensky index, likely due to significant reranking during that crisis. Comparing the AS and PSZ lines for the Gini difference, we see that they are similar until about 1980. After 1980, however, PSZ is markedly flatter than AS with its current value roughly the same as its value in 1980. Interestingly, PSZ only shows a modest increase in the Gini difference during the financial crisis.



Finally, Figure 7 in the main text showed the growth in real income using PSZ data for the bottom quintile and middle quintile, comparing pre-tax income to after-tax income (again, with inconsistent rankings because they do not make consistent rankings available in sufficient detail). Figure A 5 shows the same comparison but comparing Factor Income to after-tax income. Because Factor Income does not include Social Security, we see two offsetting effects.

First, Factor Income for the bottom quintile declines substantially starting in the late 1970's. From 1979 until 2009, PSZ estimate that Factor Income declined by a remarkable 42 percent for the bottom quintile as compared to 23 percent for their pre-tax income measure. In fact, they find that the entire bottom half of the population (not shown) saw a decline in Factor Income of 6.8 percent from 1979 until 2009, and a total increase of only about 4.9 percent during the period from 1979 until 2019.

The reason for the difference between the AS estimates for the bottom quintile in pre-tax income and the PSZ estimates for Factor Income is worth further investigation: depending on which estimates we believe, either the bottom quintile had an increase in pre-tax income over the last 50 years (though

at a lower rate than other quintiles) or the income of the bottom quintile has plummeted. With respect to our focus, the extent of redistribution, however, AS and PSZ are largely in concordance, both finding substantial increases in redistribution. That is shifting from PSZ pre-tax income to PSZ Factor Income moves Social Security out of the before-tax estimate but leaves it in the after-tax estimate, so the increase in transfers arithmetically matches the reduction in the before-tax measure.

It is also worth noting that PSZ show negative factor income for much of the bottom 10 percent of the population since about 2000 and for the bottom percentile since at least 1980. (See Tab Ta4 in their online data appendix: [https://gabriel-zucman.eu/files/PSZ2022AppendixTablesII\(Distrib\).xlsx](https://gabriel-zucman.eu/files/PSZ2022AppendixTablesII(Distrib).xlsx)) We suspect that most of these losses are due to asset sales or losses in closely held businesses. We do not have enough information to determine whether the individuals showing these losses are in fact the vest poorest in society, but they must own assets or a business to generate these losses. If in fact these individuals showing losses in factor income are not poor, they may be skewing the results for the bottom quintile.

The middle quintile is less effected by the switch from pre-tax income to Factor Income with Factor Income only slightly below pre-tax income and the size of the transfer going up in a similar modest amount.

