**Examining the Great Leveling: New Evidence on Midcentury American Income and Wages**


## Abstract

The mid-20th century American decline in income inequality has been called "the greatest leveling of all time" (Lindert and Williamson 2016)—and this despite a similarly unmatched rate of economic growth. Piketty and Saez (2003) sparked this insight with pioneering research on a century of top income shares. However, limitations in the available data had meant that we still do not fully understand the dynamics of change among the lower 90% of the income distribution. The purpose of this study is to shed new light on midcentury trends in income and wage inequality. Using a new data interpolation technique with archival tax records and complementary survey data on early-century incomes, as well as a series of imputations for problematic missing data, we add new detail and precision to the long-run series on American income and wage distributions. Our decomposition shows not only the history of income gains and losses among the poorest and among middle-class earners, but also a breakdown by individuals and not only by households. As a result, we find that pre-war economic growth and reductions in inequality reached the middle-class sooner than the poorest households—and that wartime advances for the poorest were short-lived, while they proved durable for the middle class. However, postwar wage compression lasted 30 years, to the particular benefit of the working poor.



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Master's Thesis (M2 PPD), Paris School of Economics

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June 2018

JEL N92, O51, H2, J3



## Introduction

Using a new statistical interpolation technique for existing historical data and a series of imputations for problematic missing data, this investigation will re-examine long-run trends in income distribution within the "bottom 90" percent of income earners in the 20th century United States.

The foundation for this work, Piketty and Saez (2003) painstakingly tracked US wealth and income inequality over the 20th century, a series that has since been expanded to include the early 21st century (Saez 2016). Most recently Piketty, Saez and Zucman (2018) harmonized long-run macroeconomic data with the same tax data and more recent survey estimates in order to provide an estimate of the full national income distribution, one that includes all sources of income in the national accounts. Taken together, these analyses both predicted and explain the increasing concentration of income at the top of the distribution, as income and wealth inequality in the US have risen to a level not seen since the early 20th century.

To place this study in context, first we show the existing long-run series on American income inequality at the tax unit level. Overlaid in blue is a preview of our results.

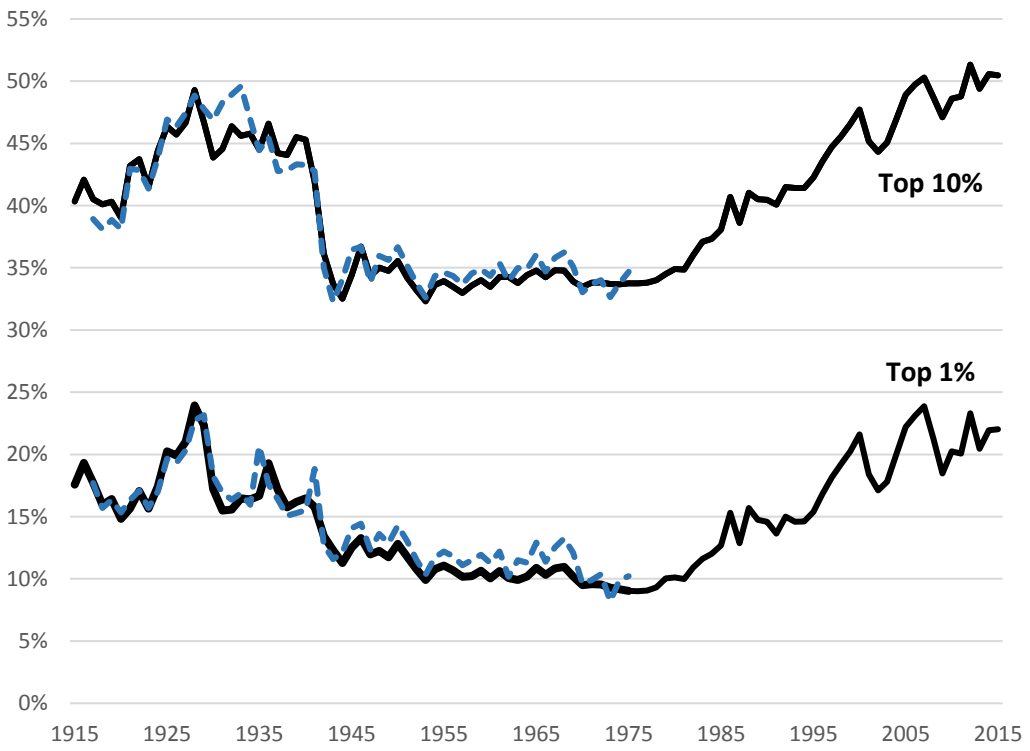


**Figure 1:** Top 10% and top 1% fiscal income share, tax units, 1915-2015. Adapted from Piketty-Saez (2003) benchmark series. Blue dash line overlay is a preview of our results.

Further, after the Piketty-Saez-Zucman (2018) study, we also now observe the top 10% and top 1% shares not only on a tax unit basis, but also since 1962 on the basis of equal-split adults. This concept eliminates any bias in the series that might owe to demographic characteristics, by which high-income earning households (and tax units) might file as a married couple more frequently than low-income households (which would bias the measure or inequality upward, if we compare rich couples with poor individuals). Also since 1962, we now know the evolution of middle-class and lowest income shares, including the share of total fiscal income that accrued to the bottom 50% of earners, and that to the 50$^{th}$ to 90$^{th}$ percentiles (what we call the middle 40%). Bottom 50% and middle 40% shares are shown below in dark green, while top 10% and top 1% shares are shown in red. The dash line overlay is a preview of our new results.

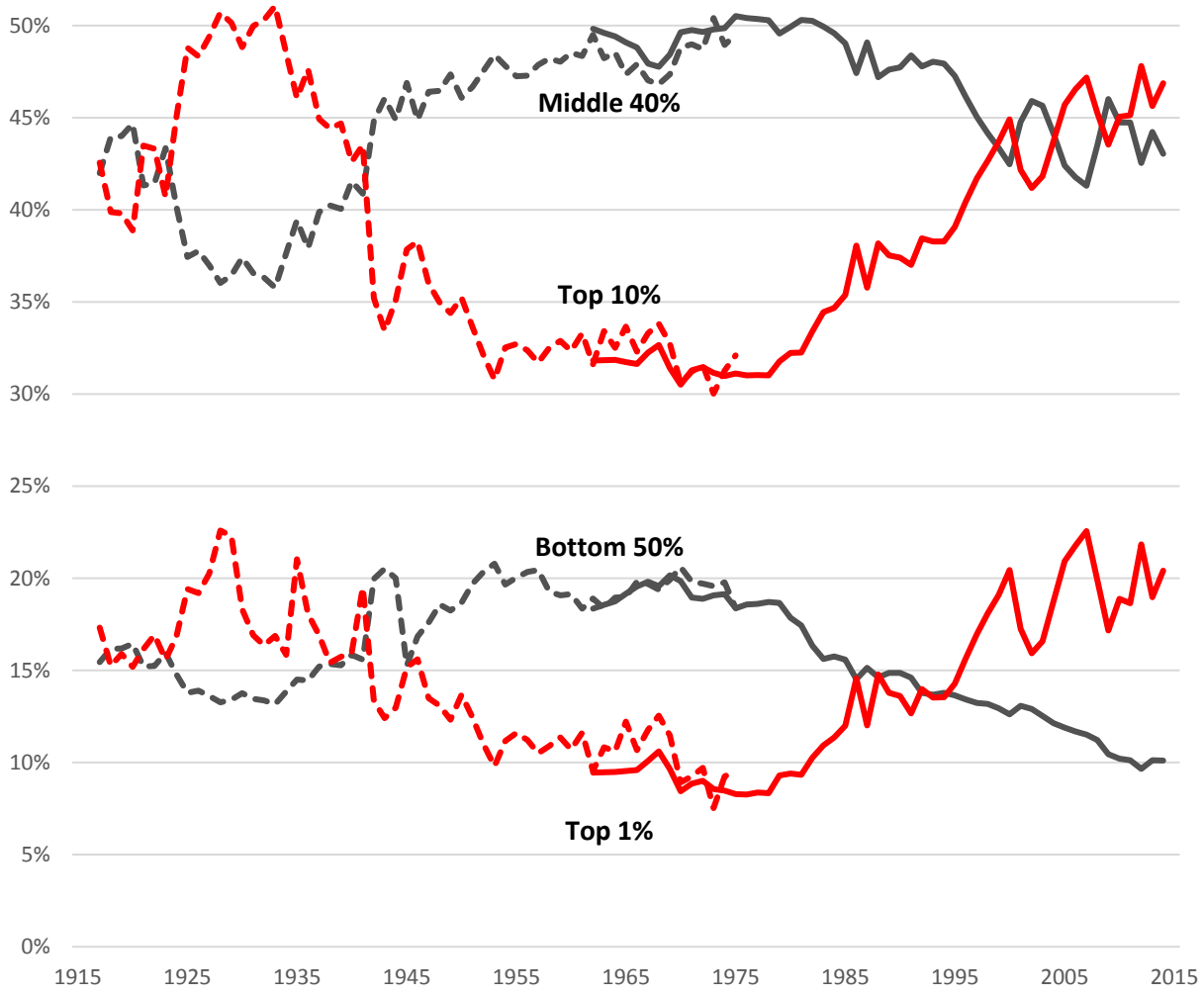


**Figure 2:** Top 10% and top 1%, middle 40% and bottom 50% fiscal income share, equal-split adults, 1917-2013. Adapted from Piketty-Saez-Zucman (2018) benchmark series. Dashed lines preview results.

While Piketty, Saez and Zucman (2018) have estimated the full percentile distribution of US income shares since 1962, this had not yet been done for the years prior to 1962. Nor had this been done for the income from wages and salaries, which is the most significant source of total fiscal income, and especially for middle-class households.

The purpose of this study, then, is threefold: (1) to contribute data interpolation and analysis on the distribution of American income prior to 1962; (2) to place new inferences in the context of what is already known about the evolution of American income inequality in the 20th century; and (3) to make sense of these observed patterns.

Unobserved patterns of income distribution have been the largest constraint prior to this study. For the early 20th century American economy, Piketty, Saez and Zucman (2018) summarize the missing data issue as follows:

> For the pre-1962 period, no micro-files are available so we rely instead on the Piketty and Saez (2003, updated to 2015) series of top income shares, which were constructed from annual tabulations of income and its composition by size of income (US Treasury Department, Internal Revenue Service, annual since 1916).

Regarding these top 10% shares, the earlier paper explains: "Before 1944, because of large exemptions levels, only a small fraction of individuals had to file tax returns and therefore, by necessity, we must restrict our analysis to the top decile of the income distribution" (Piketty Saez 2003).

The lack of pre-1962 data has inhibited analysis of early 20th century changes across the whole of the income distribution, since we do not presume that the missing data was randomly distributed among all income earners. However, as total income (national accounts) data was not missing for these years, and since top decile income data was not missing, it was possible to estimate the "top 10" vs. "bottom 90" percent split in the income distribution.

A striking methodological advance allows us to estimate a generalized Pareto curve and "nonparametrically recover the entire distribution based on tabulated income or wealth data as is generally available from tax authorities" (Blanchet, Fournier and Piketty 2017). Applied to United States data 1962-2014, the method is shown to closely follow the true distribution using only threshold tabulations. Since this type of tabulation remains the extent of our tax data for the period 1913-1962, in the absence of micro-data tax records, such precision to "smooth" the income density distribution is a welcome source of new estimation.

However, several imputations are necessary for the generalized Pareto interpolation technique to treat our data without bias. First, it is necessary to treat tax units as equal-split adults. Even if the relative

distribution of two-income households had not changed over time (it did), tax incentives also could have changed in a way that was heterogeneous across the income distribution. The increasing level of households filing tax returns jointly or separately (whether due to changing incentives, or an increasing number women in the labor force, or both) could give a misleading impression of middle-class growth if we do not account for the trend by calculating these propensities with greater precision.

A particular challenge in the construction of this dataset will be our treatment of "missing" tax units who did not file tax returns. There are several approaches we can take to deal with missing data, and we explore two of them. One approach is to assign missing income and missing people to the leftmost side of income distribution, under the (realistic) inference that it is poorer households who do not file tax returns (Saez 2016). Another approach would be to assume that these non-filers were randomly or equally distributed throughout the lower deciles, an approach that is applied with success to French historical income data in Garbinti, Goupille-Lebret and Piketty (2017). We show results from both methods, and ultimately select the former as more appropriate in the context of this data.

An even greater challenge for imputation of missing tax data is in the pre-World War II period, when the majority of American households did not file tax returns—namely, those below the top 10% of the income distribution. To deal with this missing middle-class tax data, we will integrate a historical survey on American family income from 1929-44, harmonized with the tax data. To the extent that they are representative and include reliable information our "missing" tax units, data from this Goldsmith-OBE series helps us assign the non-missing tax units to their appropriate and realistic rankings in the imputed income distribution—prior to generalized Pareto interpolation the fills in the rest of the cumulative distribution function.

These imputation methods, discussed further below, can be calibrated using post-1962 data: If the survey data distributions match our IRS Statement of Income (SOI) tabulations in the years immediately after 1962, according to micro-data tax records, we can infer that a similar match exists in the years immediately prior to 1962. That inference may be less robust as we move farther into history from this time period, but we pay special attention to changes in pre-World War II survey statistics and federal income tax legislation (cf. Witte 1985) and filing requirements.

## Data and Methodology

*Sources*

We begin with the same sources as Piketty-Saez (2003) and Piketty-Saez-Zucman (2018). The annual Statement of Income reports of the United States Internal Revenue Service have documented brackets of earned income for the entire taxpaying population since 1916 (and in an earlier version from the Commissioner of Internal Revenue, 1913-15). While micro files (public use sample datasets) are available for the period after 1962, they are not available before, so we revert to meso-level data in tabular form, in which the SOI calculated the number of tax returns and gross income according to stepwise income brackets. These tables were presented each year in similar but not identical formats, with various levels of disaggregation and reformatting, e.g., by specific source of income, by type of tax return, or even by state. Threshold levels of tabulated income, categories for inclusion and exemption, and definitions of concepts all fluctuated over time, as did the legislation for tax filing and taxable status. Nonetheless, we build on the former studies to harmonize a more complete record of fiscal and wage income in the 20th century.

We take advantage of what few sources of information are available on the historical income distribution:

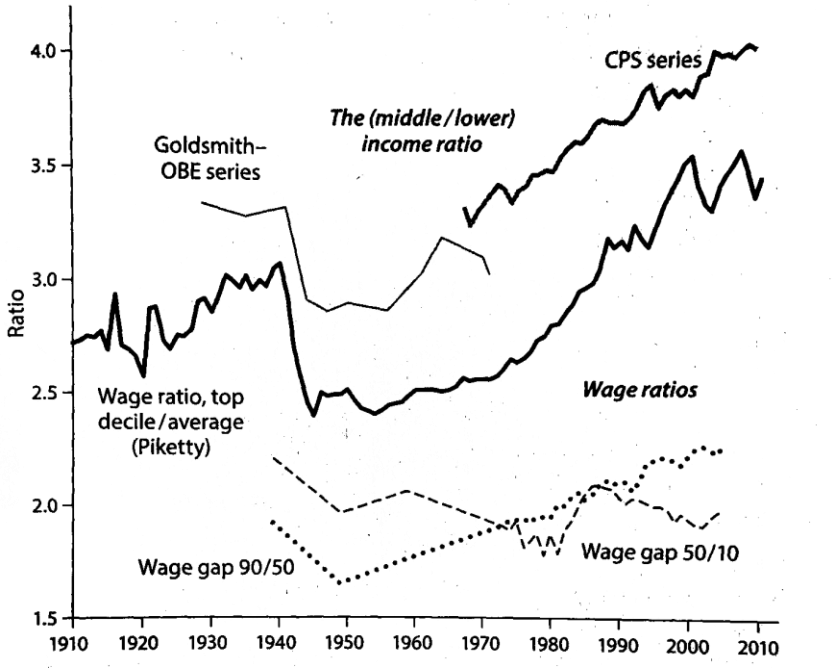


**Figure 3:** A catalog of historical income data in the United States, 1910-2010, with findings on inequality ratios (Lindert and Williamson 2016).

It is clear that there is little information available before World War II (the Census at the time did not ask questions about income). Autor and Goldin, among others (cf. Autor et al 2013; Acemoglu and Autor 2012; Goldin and Katz 2008) have contributed to the literature with studies of US wage trends, but the

datasets are either strictly post-1962 (Autor et al 2013) or, at best, have limited explanatory power pre-1940 (Goldin and Katz 2008). Goldin and Katz (2008) made use of occupational wage ratios to draw inferences about the evolution of the "skill premium" of white-collar vs. blue-collar jobs, but even if this data is informative, unfortunately it is neither comprehensive nor does it extend much before World War II. In the present study, we rely primarily on IRS data before complementing it with Goldsmith-OBE survey data for the years before 1945. We will return to discuss that method at the end of this section.

Returning to the IRS archive first of all, then, we produce a dataset with income and wage and filing statistics for the entire register of tax brackets in every year for which the records are available. Beyond the top ten percent of highest-income tax returns, we include every recorded bracket of tax returns, including zero net income, so that we can later analyze the proportion of total income accruing to the bottom 50% of households, and to the "middle" 40% (51$^{st}$ to 90$^{th}$ percentiles of the distribution).

*Generalized Pareto Curves*

The method we use to infer the entire distribution, including below the 90$^{th}$ percentile, is a generalized Pareto curve interpolation (Blanchet, Fournier and Piketty 2017). While the well-known original Pareto distribution function has been taken as roughly appropriate to interpolate the top percentiles of an income distribution (Pareto 1897; Kuznets 1953; Atkinson 2017), Blanchet and Fournier and Piketty developed the nonparametric generalized Pareto curve in order to recover an entire distribution according to varying inverted Pareto coefficients *b(p)* that are similar but not precisely identical over the course of the smooth distribution function.

Following Fournier (2015) and Atkinson, Piketty and Saez (2011), the Pareto distribution can be expressed as:

$$F(y) = 1 - \left(\frac{k}{y}\right)^{\propto}$$

where $k > 0$ is the scale parameter, income is $y > k$, and $\alpha > 1$ is the Pareto parameter determining the shape of the distribution. In the classical Paretian distribution, the ratio of the average income above $y$ to $y$ itself does not depend on the threshold level of $y$. This ratio *b(p)* is the inverted Pareto coefficient, given by:

$$b(p) = \frac{\alpha}{\alpha - 1}$$

While this Pareto coefficient *b(p)* can be considered as a constant parameter throughout the distribution, it can also be modeled more flexibly to match empirically observed data. This is one of the most interesting

contributions of the theory of generalized Pareto curves (Blanchet, Fournier and Piketty 2017), as the technique allows the parameter *b(p)* to change over the course of the distribution. In turn, this allows us to model an entire income distribution based on no more than a few pieces of information sampled from the population: several income levels (e.g., thresholds at cumulative population density $p$ = 10%, 50%, 90% and 99%), and the average income of earners within those brackets. The interpolation method creates a polynomial spline function from these pieces of information. Tests of the method show that an estimation error of less than 1% (on top incomes shares) can be achieved with income information on as little as three brackets, and that the error can be reduced to less than 0.05% with seven brackets (Blanchet, Fournier and Piketty 2017).

However, the information on these brackets needs to be well placed over the income distribution in order to yield the most precise results. Fortunately, our income data from American tax records after 1944 meets that criterion, and is granular enough to provide information across the entire distribution—for the years in which tax returns are representative of the population (or close to a full population sample). Unfortunately, before 1945, we do not observe a full population sample filing tax returns. We will turn to this question below. As we will discuss, when we do not have information below the 90$^{th}$ percentile, then it is difficult at best (speculative at worst) to infer the levels and shares of income for middle-class earners. Therefore, we must infer or impute as much information as possible about income levels throughout the population, before setting our generalized Pareto curve distribution function to smooth out the cumulative distribution function and rigorously model income shares accruing to the middle-class and poorest households.

In fine, when we model the cumulative distribution function,[1] we infer the entire taxpayer income distribution based on available information from tax brackets and complementary information that we have imputed and assigned accordingly.

*Missing Income and Missing People: Two Imputation Approaches*

One of the greatest challenges of this approach, then, is what to infer about missing information: the people and the income that go unreported in the annual SOI tabulations.

Harmonizing our procedure with the original Piketty-Saez (2003) analysis and more recent Piketty-Saez-Zucman (2018) datasets, we know the total number of tax units in the population thanks to US Census and historical data on the marital structure of the population. And from the same source we use the total income of the population (beyond only the tax filers) computed from national accounts data. Piketty and

[1] An excellent tool is available online at http://wid.world/gpinter

Saez (2003) found that tax return gross income (adjusted gross income, plus transfers, minus capital gains) remained between 77 and 83 percent of national accounts' personal income from 1944 through 1998, after adjustments for non-filers, and imputed this fraction at exactly 80 percent from 1913 to 1944. There were fewer non-filers after 1944, so the amount imputed to non-filers equals only 2-3% of the total income.[2] By contrast, non-filers before 1944 represented a much greater proportion of the population (up to 90 percent or more), so the challenge is how to allocate their imputed income across the income distribution.

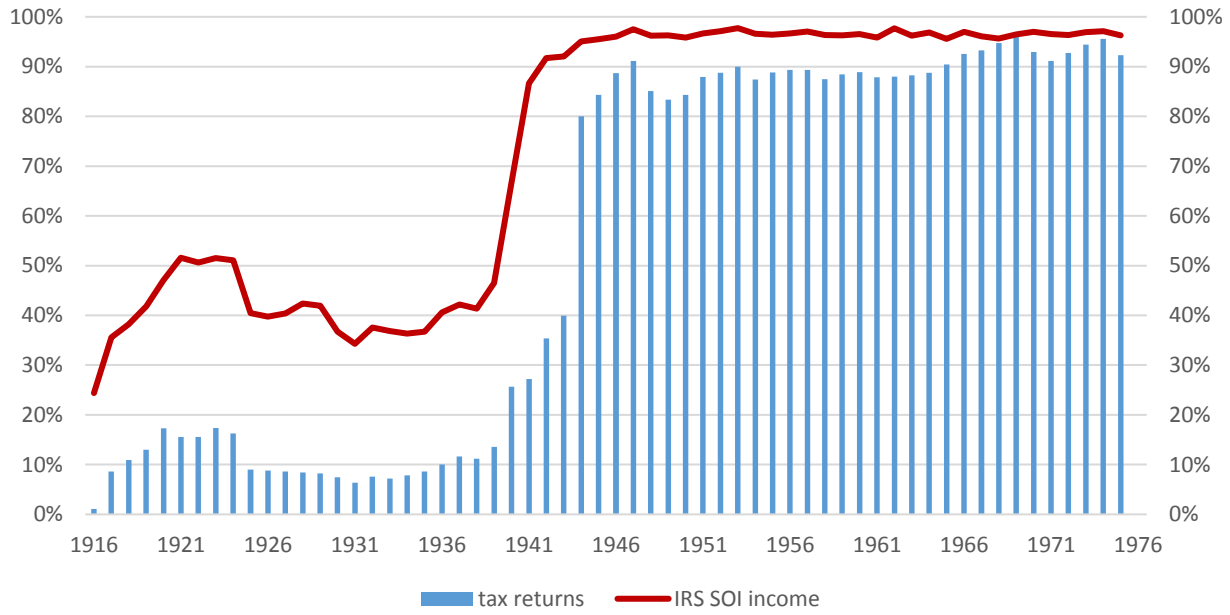


**Figure 4:** Data availability from tax archives, 1917-75: Tax returns filed as a percentage of estimated total tax units; income on tax returns filed to IRS as a percentage of estimated total personal income.

To determine the full income distribution including non-filers, we will test two approaches.

One approach is to simply allocate all missing income on the left side of the income distribution, below a certain threshold where it is assumed that all earners faithfully report their income to the tax authorities. That is the filing threshold of IRS returns. This would not be an unheard-of solution, especially if most of the unreported income was due to a "filing requirement" below which point of income a person or household was not required to file a tax return.

However, it is possible that this line may be too arbitrary: either (a) many non-filers would be spread along the "true" income distribution even above this amount—and to draw the legal line below which to

[2] (After 1945, missing tax units were assumed to average 30% of the non-missing tax units' average income; they were imputed 50% of that average in 1944-45.)

assign all missing income would be to overestimate the bottom portion of the income distribution; or (b), we would be drawing a threshold so high as to be analytically meaningless and lose valuable information about the income distribution below that point.

Instead, in a second approach, we could remain agnostic about the reasons for non-filing,[3] and compare another solution: to allocate all missing tax units with a simple proportional split from the bottom of the distribution up the 90th percentile. Garbinti, Goupille-Lebret and Piketty (2017) applied this solution to missing income data in the distributional national accounting framework from French data. That is, we would first assume there are no missing units from the tax data whose income would place them in the top 10% of the income distribution. Beyond that, we would not presume to know where along the cumulative distribution function the missing observations would fall.

Under that approach, we would thereby preserve the shape of the income distribution that is given by the original tax data, and simply re-weight the existing observations from 0 to the 90th percentile of the overall population, such that the total number of observations in the tax data is equal to the total number of tax units in the earlier demographic calculations from Census data. According to this methodology, for income brackets below the 90th percentile (after inclusion of missing tax units), we would impute a number of missing tax returns per bracket in exact proportion to the number of tax returns that are not missing.

After we assign "missing" tax units (the non-filers) along the overall income distribution from zero to 90th percentiles—whether at the far left, or equal-split—our generalized Pareto curve technique is able to automatically determine the amount of "missing" income that is apportioned to each tax unit (or tax bracket), based on the existing SOI information on average bracket income and the overall average for the distribution.

It should be noted that this method is not intended to give us a precise estimate of the poverty line or a poverty headcount (especially when the number of missing observations is particularly high), but rather at least on orders of magnitude to reproduce a rough distribution of income in the population, such that we can observe top shares of income, and furthermore to draw inferences about the middle class share of income. We could not provide a histogram or income distribution function at the far left of the distribution, without much more information on non-filers (cf. Saez 2016).

[3] Tax avoidance and tax evasion represent another possible source of missing income, according to which we would underestimate the income at the top of the distribution (Zucman 2015). In the case of hidden high incomes, our estimates on inequality here would become the lower bound, and true incomes at the top of the distribution may be even higher than those supposed in the recent scholarly literature. We leave that concern aside for now and rely on tax data as, at least, a more reliable source for top income information than would be, say, survey data.

In fact, a method for allocating missing tax units via simple proportional split can be viewed as either an upper-bound or a lower-bound estimate on inequality. There is a compelling argument that households are less likely to file taxes if their income is lower; but as above, without any data on such households we might not want to assume a concentration of non-filers at the left-hand side of the distribution. In that case, we might view it as the safest assumption to say nothing about the non-filers except that we do not place them among the top 10% of the income distribution. In particular, the IRS "filing requirement" meant that non-filers were more likely to be found below $2000 net income or $5000 gross income before World War II, because below this level of income they were not required to file a tax return.[4] In any case, we draw this level as our lowest income threshold to include in generalized Pareto interpolation. After World War II, the filing threshold was lowered to $600 in gross income, regardless of marital/filing status.[5]

To proportionally split missing tax units might make more sense when there are fewer tax units missing, and when the missing data can be construed as more of a "random" process (and less to do with a "filing requirement" and likely poverty). Therefore, the simple proportional split might make more sense in our dataset after World War II or more recently, and we would have to look for another method to make sense of the full income distribution in the years prior to World War II.

The results from these two approaches is compared in Appendix 2.

From these results, we see that the more robust approach is to impute the non-filers as low-income—as below the filing threshold—and not as equally spread throughout the lower 90 percent of the distribution. We also show several visualizations on this comparison in the appendix section.

From those comparisons, we moved forward with the imputation method that placed missing income and missing tax returns on the lefthand side of the distribution, below the filing threshold, rather than the imputation that allocates non-filers equally among the entire bottom 90 percentiles of the distribution.

Unfortunately not applicable to the current context, a third approach would have been to impute the income of non-filers using disaggregated data about the determinants of their non-filing status. Saez

[4] Checking in the data after 1945, after almost all tax units in the population begin filing, we observe that this level corresponds to the 90th percentile of the income distribution.

[5] Regarding this filing requirement and the left side of the distribution, we should also note that 1951 is the first year in which filers are allowed to claim "no adjusted gross income." We have bottom-coded negative income post-1965 at zero. Before 1951 all filers reported positive income. The exemption levels below which taxpayers would not have filed a return creates the problem of a truncated distribution when studying returns only above the amount giving by the filing requirement. However, it may be for many reasons, not just this one, that we observe a limited distribution until the post-war period, so the truncated distribution at the left-hand side of the distribution may a lesser concern. We return to the question of imputing pre-1945 data in Appendix 2.

(2016) and Rohaly, Carasso and Saleem (2005) studied the recent IRS samples of non-filers since 1999 to predict which income levels (and other demographic characteristics) would determine the absence of an individual record in the SOI statistics. From that function, one can then create a pseudo-sample of non-filing tax units. Indeed, this is the approach selected by Piketty-Saez-Zucman (2018) to infer the distribution of non-filers' income, using micro data on filers and adding an imputed set of observations and income for non-filers.[6]

However, micro data from the Statistics of Income were not available until 1962, so we cannot pursue the same approach here. And before 1945 there are not enough observed tax units on which to anchor a predicted distribution for the unobserved tax units. It would be a stretch of external validity to infer that precisely the same determinants of non-filing after 1999 would hold for non-filing before 1962, or that the same relative distribution of income among non-filing tax units after 1999 would hold for the earlier eras.

*Equal-Split Adults*

Although the United States and other countries often report tabulations in terms of tax units (the unit of observation filing the return—conceptually similar to a household, if on average slightly smaller), to report income inequality statistics on the basis of tax units could give a misleading impression of true inequality. For example, tax units at the top of the income distribution may have a greater propensity to be filing *jointly* rather than as single individuals. In the top tax brackets, it might rare to observe a single adult rather than a complete household. In the lower tax brackets, the reverse could be true. Therefore, if we report income distribution statistics on the basis of tax units, we would overstate the disparity of income at the top.

Instead, our preferred benchmark series is to report income inequality on the basis of *equal-split adults.* Whenever we observe a married couple tax unit filing their return jointly, we split the total income in two. While this is still not a perfect approximation of income distribution among individuals—we would need to know to what extent there are economies of scale within a household; and to what extent income is actually shared equally between the married couple filing jointly—it more closely represents the distribution of income among adults than it would to, say, compare a high-earning individual to the combined income of a middle-income married couple. Therefore we choose to represent an individualized income distribution as our benchmark series.

Before we could split tax units into an individualized income distribution, it was necessary to retrieve from the SOI archive data the entire record of joint vs. nonjoint tax return filing status, per bracket.

[6] For a visual comparison of our results to Piketty-Saez-Zucman (2018) microestimates, please refer to Appendix 3.

Each year, the SOI reports listed for each income bracket ("net income" pre-1944; "adjusted gross income" since then) the number of returns for "joint" married couples filing as a single household tax units, distinguishing these from married couples filing separately or from single adults. We brought all of this information into our long-run dataset.[7]

To equally split the joint incomes in our dataset is accomplished by dividing into two the married couples filing jointly, and then joining the full income distribution as if all earners are single or nonjoint.[8] By construction, the levels and averages of this resulting distribution are lower than is the tax-unit distribution, which is undifferentiated by joint or single filing status.

Non-filers' joint tax-return status depends on our methods for imputation (discussed above). In the method that proportionally splits all missing income among the distribution, non-filers would be assumed the same "propensity to file jointly" as is true of the income bracket into which the tax unit is imputed. By contrast, when we impute the missing tax units as uniformly below the filing threshold, we do not make any assumption about whether they would have filed jointly, if they had filed. Instead, we use the overall average number of adults per tax unit (calculated in Piketty-Saez-Zucman 2018 from historical demographic statistics) and re-weight that average to exclude the joint-filing propensity of observed tax units. In this way, we arrive at a proportion of imputed "joint" tax units among unobserved non-filers below the filing threshold. While it is simply a record of the number of adults per tax unit among missing tax units, this "imputed propensity to file jointly" is actually considerably higher than the proportion of joint tax units just above the filing threshold. However, the result is a plausible—and in our view represents a more robust imputation of "adults per tax unit" than would be the assumption that non-filing tax units follow the same pattern of "joint" households and tax units who do file (even or especially at the precise threshold of the filing requirement—given the changing incentives). In practice, our results on overall shares of income distribution are not greatly affected, since this imputation discusses takes place

[7] In some years, the brackets of income in which joint vs. nonjoint returns were reported varied from the thresholds in which tax unit income itself was reported (with either more or fewer stepwise brackets reported for marital filing status), so it was necessary to correct with linear averages the imputed number of married vs. non-married tax units based on the bracketwise reporting. Furthermore, the "taxable" and "nontaxable" returns were often categorized differently below a certain threshold: The filing requirement could be lower than the exemption level, so within lower income brackets there could be returns that were required to file but were not required to pay any tax. Taxability status was one level of disaggregation of reported statistics during the period of archival reports we examined, as were "optional" taxes and separate filing formats during the World War II era. Finally, we aggregate joint vs. nonjoint returns from differing taxability, to create a unified bracketwise percentage of single filers, by which to split the tax units and individualize the income distribution among all adults.

[8] First, the generalized Pareto curve smoothing function takes into account the income thresholds and bracket averages; and then, on the basis of the percentage of joint vs. nonjoint tax returns per bracket, creates a set of adults with incomes either consistent with the level of the bracket (singles), or of the bracket divided by two (if married). Combining these together again yields the individualized cumulative distribution function.

at the level of the lowest tax brackets. However, we are realistically including more married-couple "joint" tax units among non-filers at the base of the income distribution.

*Toward a Harmonized Income Concept: Adjustments to Raw Income Tabulations*

As in Piketty-Saez (2003), it was necessary here to adjust the "net income" and "adjusted gross income" concepts to create a harmonized fiscal income concept for comparability over time. To create a harmonized fiscal income concept has been a chimera since Scheuren and McCubbin (1989) attempted the effort, and still has not been resolved even by the efforts of Statistics of Income scholars at the IRS (Bryant et al 2010). The changing nature of exemptions and deductions codified into law has meant that net income and adjusted gross income are not the same across time. But we do make some calculations to retrieve a gross income concept, before the tax and transfer system, without pensions, and including capital gains.

As the SOI report for 1939 puts it, "It is not possible… to adjust the 'Total income,' 'Total deductions,' and 'Net income' so that they will be comparable with these items as tabulated for prior years" (SOI 1942). Even the definition of what was deductible changed over time.

More significantly, in 1944 the IRS changed their definition of the tabulated income statistic, from "net income" to "adjusted gross income":

> The income concept applicable to 1951 through 1986 is adjusted gross income (AGI). Introduced in 1944, AGI is generally defined as gross income less (1) allowable trade and business deductions, (2) travel, lodging and other reimbursed expenses connected with employment, (3) deductions attributable to rents and royalties, (4) deductions for depreciation and depletion allowable to beneficiaries of property held in trust, and (5) allowable losses from sales of property. (Personal deductions, such as those for medical expenses, personal interest paid and charitable contributions, are not subtracted from income until later, when the net income of itemizers; is computed.)
>
> The precise definition of AGI did change fairly often during this period, as various tax laws were enacted. The treatment of capital gains and losses was altered the most frequently, although other sources of income were included or exempted from time to time, as well. SOI data suggest, that the definitional changes that occurred in the gross income concept did not greatly affect the distribution of returns with income of $25,000 or more in 1986 dollars in the 1916 to 1950 period. However, the increasing frequency of significant tax law changes in the 1950 to 1986 period make these assertions more problematic. (Scheuren and McCubbin 1989)

The new "adjusted gross income" concept of 1944 was meant to allow a harmonization between self-employment and salary/wage income concepts, as more taxpayers entered the IRS system and SOI reporting framework. However, the income concepts are not immediately comparable over time, even if

they are comparable within a given year. According to the 1944 SOI report on the nature of the new AGI concept and its itemized deductions:

> One group, deductible from gross income in computing adjusted gross income, consists of expenses incurred in trade or business, deductions attributable to the production of rents arid royalties, expenses of travel and lodging in connection with employment, reimbursed expenses in connection with employment, deductions for depreciation and depletion allowable to a life tenant or an income beneficiary of property held in trust, and allowable losses from sales or exchanges of property. These deductions, except losses from sales of property, are not tabulated. The income or loss to which such deductions relate is reported as a net amount.
>
> The second group of deductions consists of the allowable expenses of a nontrade or nonbusiness character, such as contributions, medical expenses, taxes, interest, and casualty losses, which are deductible from the adjusted gross income for the computation of net income… (SOI 1950)

Not only there many more missing returns pre-1944 when "net income" as opposed to "adjusted gross income" was the main fiscal income concept, but the income concepts themselves are very difficult to reconcile. Nonetheless, we tabulate the deductions for each year, within each income bracket, in order to infer a gross income concept.

Revised bracket thresholds and bracket averages are expressed as:

$$s^* = \frac{s}{1 - d}$$

where *s* is the original threshold level or bracket average of net income or AGI, and *d* is the deduction as a percentage of the overall gross income, so *s** gives the new threshold or bracket average for gross income prior to deductions and other adjustments.

The amount of deductions per bracket varied from as much as 40 percent of gross income in the lowest net income brackets to as little as 10 percent of gross income in the highest net income brackets. Fortunately, there is no effect of re-ranking,[9] as the proportion of deductions changes rather smoothly, but we have accounted for the percentage and amount of deductions in the overall gross income for each bracket, for each year.

[9] Re-ranking would occur if the filers in a lower net income bracket had deducted so much more on average than a higher income bracket so as to become in effect *higher* earners in overall gross income. Such an issue of re-ranking would make it necessary to merge the brackets, at which point we would lose valuable information about the shape of the cumulative distribution function.

One further adjustment was necessary in the income tax returns for the years 1941-43. For some filers whose net income was below $3000, it was not necessary to file a return, but rather optional. These taxpayers were accounted for separately in the SOI annual reports, as they had filed a separate return, the simplified 1040A instead of the 1040. Since the overall data from the IRS did not include these "optional" taxpayers within the net income brackets below $3000, instead listing them separately, we codified their gross income from the archive data that listed them separately, and folded them into homologous income brackets with similar earners in the years 1941-43.

*Treatment of Capital Gains*

Beyond these specific tweaks, the notion of capital gains represented a final remaining issue for the treatment of gross income over time.

Treatment of capital gains in tax law (and, therefore, tax return data) changed over time. To deal with this issue, Piketty and Saez (2003) calibrated the resulting effect on net income, in order to calculate a gross income concept prior to the differential reporting of capital gains. In fact, they computed several variants of capital gains treatment in their dataset, including one which excludes capital gains, one which excludes but re-ranks top incomes according to capital gains, and finally a series that fully accounts for capital gains.[10]

In general, they found that the adjustments for capital gains could be given as a 4 percent adjustment upward for the top 0.01% of income earners, a 2 percent adjustment upward for the remaining top 0.5% of earners, and a 1 percent increase to adjust for capital gains in the income of remaining top 5% tax unit earners. These adjustments from Piketty-Saez (2003) and are stable over the period of our study. We revise threshold levels and bracket averages to reflect these capital gains at the top.

Of course, capital gains are a lesser source of income for those below the top percentiles, and indeed negligible on average, so it was not necessary to make adjustments below the top thresholds. Using the Piketty-Saez (2003) capital gains adjustment multipliers allows us to create a harmonized gross income concept that is relatively uniform across years. As will be discussed below, we also end up with results that are consistent with the earlier findings of that paper and of Piketty-Saez-Zucman (2018).

With these corrections the issue of re-ranking can be overcome. For income from capital gains, the re-ranking problem would have arisen as follows: Incomes without capital gains can appear greater on "net" than incomes with capital gains, if the latter are not included in the SOI income concept in certain years

[10] All of this is despite the variable tax treatment of capital gains—including some levels of exclusion of this income source post-1934—or, rather, after adjusting for that variation.

(due to a changing definition of net income or AGI). As we are looking for a harmonized time series on "gross" income, of course, it becomes important to adjust net income and AGI upward by the same as the proportion of missing capital income.

In fact, there is little capital gains correction to be made below the 90th percentile of income earners, as capital gains makes up a very small proportion of income for the average middle class tax unit, and there is almost zero income from capital among the poorest households. Adjustments for the changing definition of capital gains have a greater effect above the 90th percentile, and particularly above the 95th and then 99th percentiles. We adjust accordingly and in tune with the corrections of Piketty-Saez (2003).

More recently, Piketty-Saez-Zucman (2018) and Saez-Zucman (2016) have adjusted post-1962 top incomes based on observations from the Survey of Consumer Finances (SCF) from 1989 to present. While we have not attempted to extrapolate SCF results to pre-1962 data, the smoothing function of Piketty-Saez-Zucman means that the top 99.999th (or 0.001) percentile of income earners shows more volatility in the raw SOI data than in their results.[11] In principle, this does not affect our results on the middle class share of earned income, but is worth bearing mind as we consider pre-1962 results.

The notion of deductions changes slightly for post-war data (as the IRS changes its benchmark concept from "net" to "adjusted gross" income), and especially post-1962. Again, we make the same adjustments as Piketty-Saez (2003) in order to re-adjust the IRS adjusted gross income into our more complete and comparable-over-time gross income concept. After World War II, these adjustments for deductions are less important than they had been beforehand.

*Wage Income Series*

As the largest component of fiscal income among middle class households, wage and salary income is worthy of our particular attention.

In addition to the benchmark series on overall income inequality, we have extended the Piketty-Saez (2003) series on wage income, to track the patterns of gain and loss of the lower 50% and middle 40% shares of wages and salaries, and in particular among equal-split adults in addition to tax units.

Many of the same adjustments from our income series (above) were also necessary in order to create a long-run wage series. We also use the same generalized Pareto curves technique as discussed above. However, the definition of wage income is more constant over time, as this source of income does not admit as many variations of tax status and definition as does overall income, discussed above.

[11] This is discussed further in Appendix 3.

In general, in most years, the SOI reports list the number of tax returns with wages earned per bracket of net income (or, later, AGI). The reports also list amount of wages earned per income bracket. And the reports list the number of returns by *wage* bracket. Only in early years (pre-1935), however, do the reports list the amount of wages by wage bracket.

Therefore, we generalize a wage income distribution on the basis of a general imputation and interpolation following the procedure of Piketty-Saez (2003). For the lower zero to 90$^{th}$ percentiles of the wage income distribution, we infer that the average wage income distribution (which we do not observe) follows the overall income distribution (which we do). This is a safe inference: More than 90% of returns in these income brackets report wage income, and the average size of wage income (among wage earners) in these brackets is very similar to the average size of gross income (among all earners) in these brackets.[12] We can observe these patterns in the following chart:

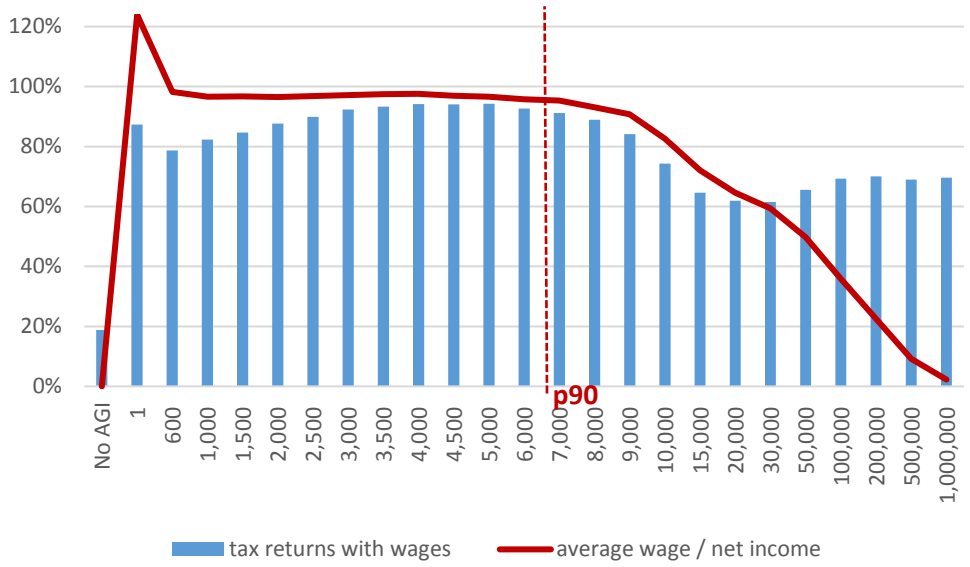


**Figure 5:** Wage income as a proportion of net income, by net income bracket, 1952 (representative year; pattern is stable over time)

The ratio of wage returns to total returns, and average wages to average net income, is stable within the bottom 90 percentiles of net income distribution, and stable over time. We adjust the income bracket averages and thresholds by this ratio (average wage income to average overall income, within the income

[12] Note that average wage income within an SOI net income bracket can *exceed* the average net income of that bracket in one of two ways: Either the average wage income of tax returns with wages (more than 90 percent of the filers, within lower brackets) can exceed the average gross income of tax returns without wages (the remaining less than 10 percent of filers, within lower brackets); or the average wage income is similar to average gross income, which is of course higher than the average net income of the bracket, regardless of any difference between wage earners and non-wage earners within the net income bracket.

bracket), along the entire income distribution until the 90th percentile. This gives us imputed wage brackets up to the 90th percentile.

It is at the 90th percentile or above when wages begin to appear in fewer than 90 percent of returns, and to represent less than 90 percent of the average income of the bracket. At this point, the issue of re-ranking would become too important to ignore.[13] We would no longer be faithfully following the wage distribution if we assumed its shape were the same as the overall income distribution (e.g., higher earners have great proportion of income from capital gains, rent, royalties, etc.). Therefore, we follow Piketty-Saez (2003) and turn back to the limited information on the wage distribution.

At the 90th percentile of the wage distribution, that is, we turn away from the net income distribution (with imputed wages per net income bracket) and now interpolate the wage distribution based on two pieces of data: the number of tax units in and above the 90th percentile, *by wage bracket,* which we observe in the SOI report; and the amount of wage income per wage bracket among the highest returns, which we do not observe in the reports. This is solved in the same way as in Piketty-Saez (2003). From the Pareto distribution function above, they solved:

$$k = (s) * (p)^{\frac{1}{\propto}} \qquad \text{and} \qquad k = (t) * (q)^{\frac{1}{\propto}}$$

where *k* and $\alpha$ are the Pareto parameters and can change from one wage bracket to another, and *s* and *t* are the lower and upper income thresholds of the wage bracket, while *p* is the proportion of the population above *s* and *q* is the proportion above *t*. The parameter $\alpha$ is related to the inverted Pareto coefficient *b* mentioned earlier, simply as:

$$\propto = \frac{b}{b-1}$$

The amount of wage income in the wage bracket can then be given by:

$$Y = N \int_s^t y \, dF(y)$$

with *N* as the number of tax returns in the wage bracket. This is also related to the methods of Kuznets (1953) and Feenberg and Poterba (1993). Scheuren and McCubbin (1988) use a "spline-fitting" approach, but that is not necessary here, as we fit the Pareto distribution to top wage income brackets.

[13] That is, if a household has a high income but does not report much wage income, it would actually be lower on the *wage income* distribution than a household that is lower in the *overall income* distribution whose proportion of income from wages is much higher. This issue of re-ranking could cause us to misidentify the proportion of households at given levels of wage income.

With this procedure, then, we calculate the same top 10% wage shares and wage income levels as Piketty-Saez (2003) observe.

With this imputed and interpolated information on the complete distribution of wage income thresholds and bracket averages, we are now in position to use the generalized Pareto curve technique to estimate the levels and shares of wage income among the entire wage-earning population from zero through the 90$^{th}$ percentiles of the wage income distribution.

For missing wage income and missing wage-earning tax units: As in the overall income series above, and as in Piketty-Saez (2003), the total wage bill and the total number of tax units with wages are estimated from national accounts data 1929-present, and interpolated from Kuznets (1953) prior to that. From these totals, we know the amount of missing income and missing tax units that are not found in the annual SOI reports. We may know very little about missing wage returns (specifically, we do not know where they would fall along the overall income distribution), but we insert missing wage income and missing wage returns according to the first (and more robust) of the two imputations procedures for overall income discussed above. That is, we allocate missing wage-earning tax units below the filing threshold. This again relies on the observation that most income earners below the 90$^{th}$ percentile threshold earn wages, and most income below the 90$^{th}$ percentile is wage income. Therefore, in our interpolation technique, we set the lowest wage income bracket as the one corresponding to the overall income filing requirement, and we assign all missing wage income to the lowest bracket.

When Piketty and Saez (2003) estimated wage inequality among tax units, they made sure to account for the proportion of working wives in the population of married couple tax units. We are now able to disaggregate the wage-earning population into equal-split adults as above, by returning to the SOI reports archive for data on joint vs. nonjoint tax returns. For each income bracket of the wage-earning population, for each year, we record the propensity to file singly or jointly. The SOI did not report the number of wage returns among married couples filing jointly for wage income brackets, but only according to net income brackets, and only after 1954.

For equal-split adults among wage-earning tax units, we follow a similar line of reasoning as above. For the lowest zero to 90$^{th}$ percentiles, we again make use of the fact that there would be little re-ranking between income earners and wage earners. This is especially true when we are only looking at the number of joint returns that filed with wage income. Before 1947, we take the percentage of wage returns for each net income bracket, among joint vs. nonjoint returns, to split equally the (imputed average wage) income of those brackets. Later, when we have information on wage returns specifically within joint returns, we analyze according to the "propensity to file jointly" among wage returns specifically.

For the top 10 percent of wage earners, considering the significant re-ranking among wage returns and returns overall, it would not be safe to assume that the bracket averages among net income returns apply in the same way to wage income returns (which have distinct bracket thresholds, in any case, as derived above)—nor that the top net income brackets look similar to the top wage income brackets in terms of "propensity to file jointly." Rather, we take the average of wage returns filing jointly among all top-ten percent earners, and set this equal in each top-ten (imputed) wage income bracket. It may be the case that top 1% or top 0.01% wage earners actually filed jointly at a greater percentage than would top 10 or top 5% income earners, but the reverse might also be true, so we do not want to make any assumption. In practice, usually an average of 90% of returns are filed jointly within the top ten percent of the distribution.

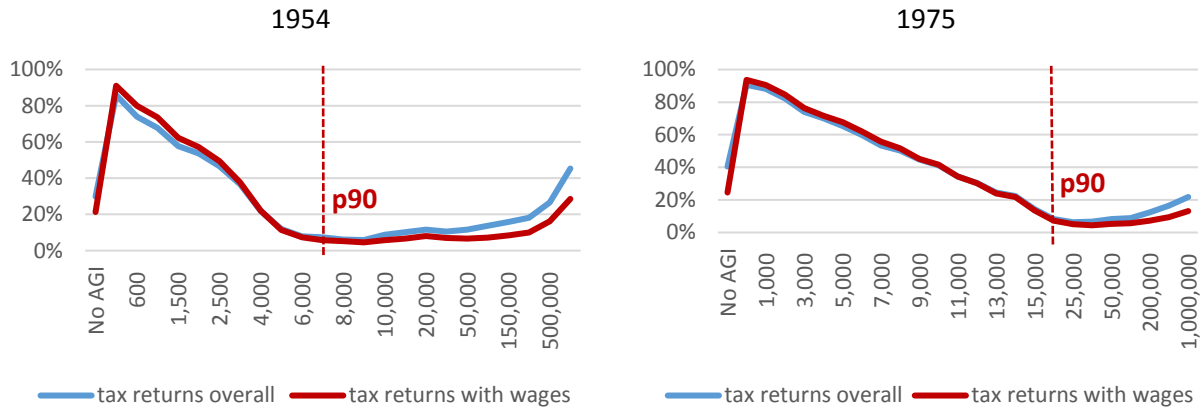


**Figure 6:** Single filers as a proportion of total tax returns, by tax bracket, 1954 and 1975 (current $US): Returns with wages vs. overall, divergent only in net income brackets above the 90th percentile of earners.

We make one further correction to joint vs. single wage income returns: For the period 1947-1953, the number of wage returns filing jointly vs. separate/singly is not reported, and all we have is the overall number of joint vs. single returns per bracket, without knowing whether these varied by wage vs. nonwage returns. Therefore, we study the ratio for filing jointly within wage vs. overall returns from 1954-75, and find constant multipliers for the lower 50th percentiles, the middle 50-90 percentiles, and the top 10 percentiles. We impute the propensity to file jointly among wage earners in 1947-53, from the fraction among earners overall, according to the same ratio in years 1954-75. In practice, the correction is negligible among the lower net income (and wage) brackets, but becomes a more necessary correction among the top 10% of wage earners.

Unfortunately, for the years prior to 1947 we do not want to make the same imputation because the incentives to filing singly or jointly were very different. As discussed in Piketty-Saez (2003), before 1947

there was a single tax schedule applying to all tax units (whether filing jointly or separately, if married), so married couples had an incentive to file separately. This incentive may have impacted filing behavior of wage-earning couples distinctly from the way it impacted nonwage-earning couples, but we do not speculate and instead impute the overall propensity to file jointly among all couples, to be the same propensity as among wage-earning couples. That is, pre-1947 we assign to wage returns the same proportion of single vs. joint returns as is observed overall, per net income bracket, without any adjustment except the one for the top 10% of the distribution, discussed above.

*Incorporating Goldsmith-OBE Data into Income and Wage Estimates*

Our final labor to prepare this new data series consisted of merging survey data from another distribution, into the SOI data.

As we have seen, the central challenge to interpolate the fiscal and wage income distributions prior to World War II is that we do not have many tax returns—often as few as 10 percent of the overall population. On top of this, even when we do have more than 10 percent of the population filing tax units, the high filing requirements (discussed above) make it hard to say whether the returns that we do have are representative of any subsample of the population beyond the top 10 percent of earners. We assume that the highest income earners observed in the tax data are the highest income earners overall, but we cannot be sure where the remaining earners fall on the total distribution that includes missing returns (non-filers). When there are many non-filers—as is the case in the early decades of American income tax data—we do not have enough of a distribution on which to anchor any imputation of missing tax units, even (or especially) if we wanted to split the non-filers equally from zero through 90$^{th}$ income percentiles.

Since we do not have reliable income data below the 90$^{th}$ percentile of tax units in the time period prior to World War II, we supplement the administrative tax data with survey data from the same period. The US Department of Commerce, Office of Business Economics (OBE, what would late become the Bureau of Economic Analysis) produced a periodic *Survey of Current Business* which tabulated the entire income distribution of family "consumer units." This survey gathered data in 1929, 1935-36,[14] 1941, 1944, 1946, 1947 and then annually from 1950 (cf. Fitzwilliams 1964).

While the survey data was harmonized to a large extent by Selma Goldsmith and coauthors (1954), it remained imperfectly comparable, particularly for 1929:

> Unlike 1935-1936, 1941, and postwar years, there was no nationwide sample field survey of family incomes in 1929 on which to base the income distribution estimates. Instead, the Brookings Institution constructed a 1929 distribution for families and unattached

[14] OBE data represents an average for the two years of survey fieldwork, 1935-36.

> individuals by combining a variety of different sets of income statistics for persons (for example, for wage earners and farmers) and then converting them to a family-unit basis. The Brookings distribution is admittedly rough, particularly for the lower end of the income scale. (Goldsmith 1958)

The Brookings Institution data for 1929 was harmonized by Goldsmith and colleagues for use in the long-run OBE income distribution series. They removed capital gains and losses, after which adjustments the top income shares and top tail of the distribution began to resemble those from the SOI data of that time for top earners (ibid.). The 1935-36 data is from the Consumer Purchases Study undertaken by the National Resources Committee and "did not have the benefit of subsequent advances in sampling techniques" (ibid.). The 1941 data is from the Bureau of Labor Statistics, and the 1944 and 1946 and 1947 surveys were carried out by the Census Bureau, with complementary inputs from the Federal Reserve Board. The Commerce Department Office of Business Economics (OBE) reworked these datasets to bring them into line with their own "personal income" concept of total money income (cf. Goldsmith 1951).

In discussing the trends of income distribution and the comparability of income concepts over time, Goldsmith felt that an increasing share of top incomes were given as in-kind benefits, deferred compensation and business expense accounts (1957).[15] The OBE estimates also did not quite agree with Census/CPS estimates of the bottom quintile of the distribution in the year of their comparison, i.e., with data for 1954 (Goldsmith 1958). For higher incomes, however, the two datasets began to match, which to Goldsmith served as testament to their fidelity to the true population parameters.

Even if these Goldsmith-OBE survey estimates prior to IRS comprehensive tax data are admittedly "rough," as Goldsmith put it (1958), they remain our best source of information on nationwide income distribution below the 90$^{th}$ percentile, prior to World War II.[16]

Since this OBE series is the only known survey of the *full* distribution of income prior to the mid-1940s expansion of comprehensive SOI data, we will use this source to draw some inferences about the shape of the distribution. Specifically, we use the SOI data above the 90$^{th}$ percentile, and the OBE data below the 90$^{th}$ percentile, and harmonize the estimates at this juncture.

[15] If income components and income concepts that change over time, by bracket, this highlights one significant part of the appeal of creating a distributional national accounts measure—such that 100 percent of national income is allocated according to its distribution, regardless of whether it accrues to households as salaries, capital gains, benefits, or other forms of income.

[16] A few scholars have examined state-level income distributions for the era, a possibility we will return to in discussing further research below.

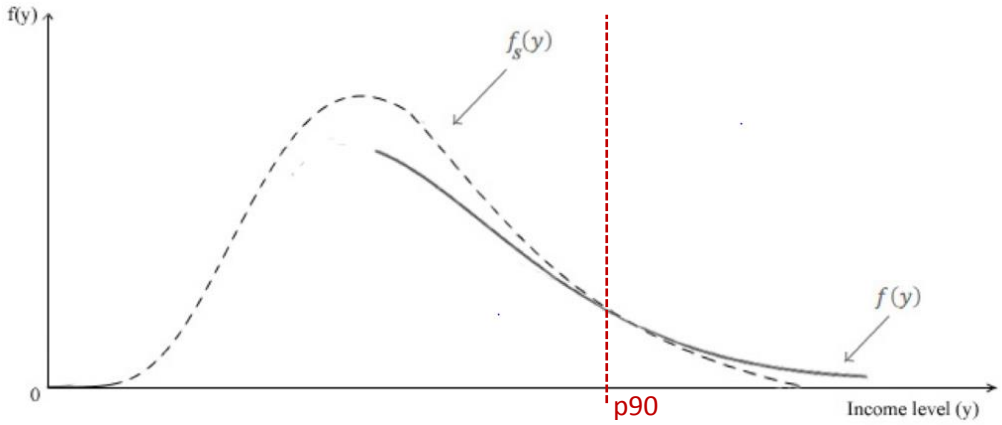


**Figure 7:** Harmonizing survey data with tax data. Adapted from Morgan (2018).

We rescale the bottom 90 percent distribution of the OBE distribution according to the known average income level (and total income) from SOI statistics and the national accounts (discussed above), so that the OBE bottom 90 average and levels match that of the SOI bottom 90. Then we reweight the OBE distribution to accommodate missing tax units, such that family units of the OBE distribution match the tax units of the SOI distribution, with an imputed propensity of joint vs. single filers to seamlessly fit our calculation of a series for equal-split adults. We can only assume that the number of tax units per household is constant over the income distribution from zero to the 90$^{th}$ percentile, and that the propensity to file jointly among OBE households would be that of the SOI population average (making no distinction for tax bracket).

Since we have observed that the majority of income among bottom-90$^{th}$ percentile income earners comes from wages and salaries, we can repeat the above exercise among the OBE bottom 90% distribution to move from overall income to wage income. That is, we rescale the OBE income averages according to the known averages of the bottom-90 wage distribution, and we reweight the distribution up to the 90$^{th}$ percentile according to the known population of wage earners.

After these adjustments and the above method of interpolation, we now have estimates for 1929, 1935-36,[17] 1941, and 1944 that cover the whole population, for overall income and for wage income, for both tax units and equal-split adults.

[17] As the Goldsmith-OBE dataset is averaged for calendar years 1935-36, we have done the same with the SOI administrative tax records for those years.

First, it is important to show that these estimates agree with the benchmark series on top shares. We compare these on a tax-unit basis, which is the only comparison available, as previous estimates could not examine equal-split adults:

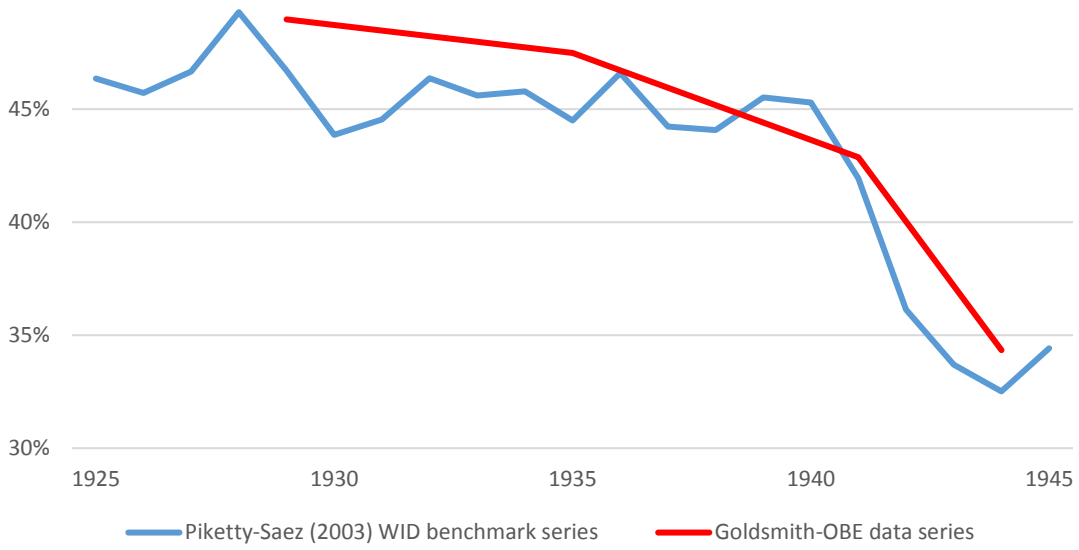


**Figure 8:** Top 10% share of total fiscal income, tax units, 1925-45: Goldsmith-OBE pre-World War II interpolations compared to Piketty-Saez (2003) benchmark estimates.

Indeed, the data from Selma Goldsmith and the US Commerce Department OBE do match Piketty-Saez (2003) and PSZ (2018) on the top 10% shares of fiscal income, which should not be surprising because we are using SOI data on top 10% shares to harmonize the OBE data. Estimates from the Goldsmith-OBE series are by necessity very rough, given the limitations of the source material, but at the same time they appear to be in the appropriate range to scrutinize further their depth and substance. We have also tested the fidelity of Goldsmith-OBE estimates in 1946, 1955 and 1962, to ensure the similarity with Piketty-Saez (2003), Piketty-Saez-Zucman (2018) and our own estimates. These results are shown in Appendix 4.

These pre-1945 results can tie seamlessly together with our annual estimates of post-1945 income and wage inequality for the full distribution of equal-split adults. Furthermore, for the pre-1945 years we observe top 10% shares every year, so we can extrapolate shares within the bottom 90% in years for which we do not have survey data, by way of a simple ratio. That is, we take the ratio of distributions within the bottom 90%, to the top 10%, in years for which we do have data, and extend these backward for the bottom 90% in years for which we only have top 10% data.

In this way we show tabulations for bottom 90 percentiles, and a representation of their income distribution, for several years even before the comprehensive SOI data series began in the 1940s. For the post-war years, we have much more solid evidence from the entire population of tax filers. In all cases, we now can draw inferences on the entire adult population, as well, and not only the tax units. We can now look inside the bottom 90$^{th}$ percentiles of fiscal and wage income distributions for all years 1917-75.[18] On this note, we turn to the main results.

[18] Further research could extend these results from SOI raw tabulated data even into the 21$^{st}$ century, although we show below that this method already matches closely with the Piketty-Saez-Zucman microdata estimates for the period of overlap from 1962-75. Microdata files are available from 1962.

## Results

*Income Inequality, 1917-75*

Using the method discussed above to harmonize survey data with administrative tax tabulations, we were able to extend estimates of the lower 90% income distribution to the pre-World War II period. That is, we complement the Piketty-Saez (2003) and PSZ (2018) benchmark series on top shares with data even for the bottom 50% and middle 40% of earners.

We have harmonized the Goldsmith-OBE series with the SOI tax data to create a unified long-run series on income distribution that includes pre-1945 fiscal income shares. Compared to the Piketty-Saez (2003), this new series is robust and comparable in most years.

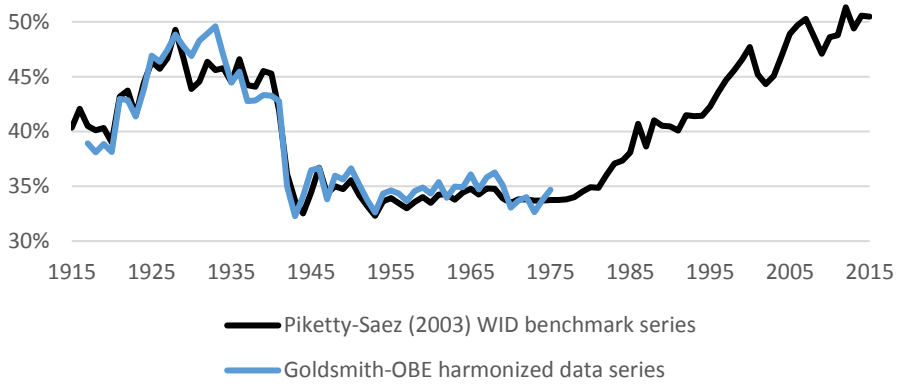


**Figure 9:** Top 10% share of total fiscal income, tax units, 1917-75: Harmonized Goldsmith-OBE pre-war interpolations and raw SOI data post-war, compared to Piketty-Saez (2003) benchmark estimates.

These estimates also match closely at the level of top 1% shares:

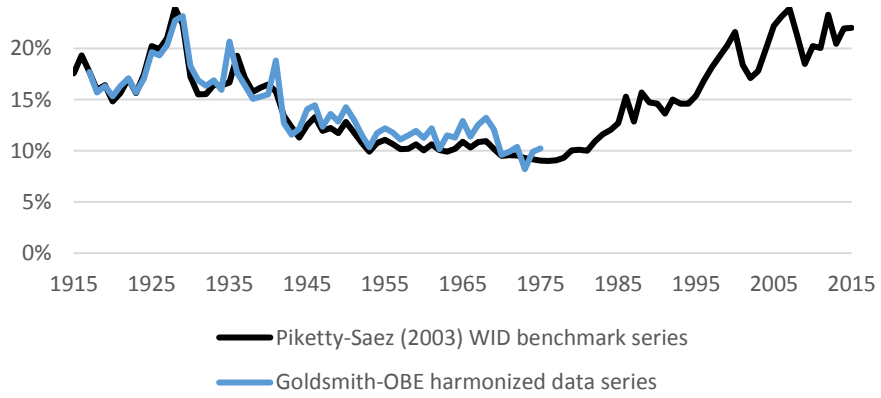


**Figure 10:** Top 1% share of total fiscal income, tax units, 1917-75: Harmonized Goldsmith-OBE pre-war interpolations and raw SOI data post-war, compared to Piketty-Saez (2003) benchmark estimates.

These graphs above are similar to those in Piketty-Saez (2003) and Piketty-Saez-Zucman (2018), and match closely. But the advantage of using this new dataset for the pre-war years goes beyond the appeal of a replication study.

From the harmonized Goldsmith data series, we can now estimate the lower 90$^{th}$ percentile income distribution, and for equal-split adults, as well. Therefore, we present the new data series, first for tax units and then for equal-split adults:

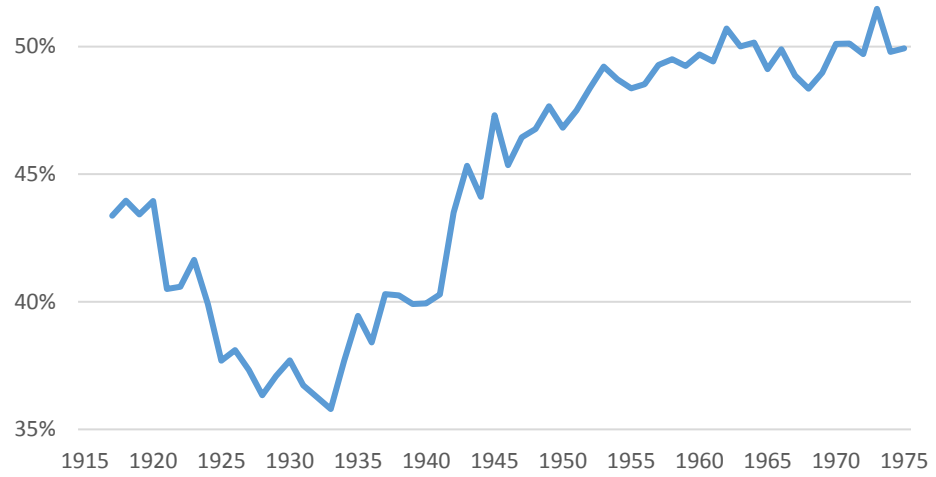


**Figure 11:** Middle 40% share of total fiscal income, tax units, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

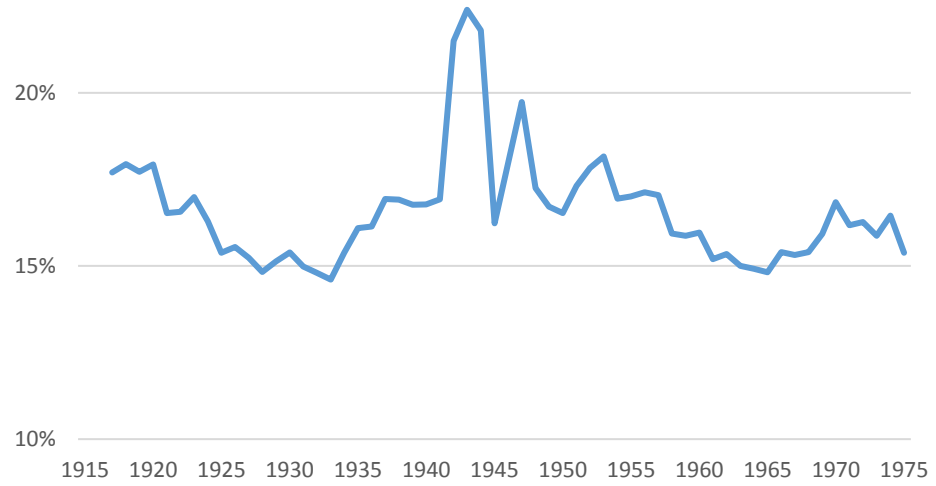


**Figure 12:** Bottom 50% share of total fiscal income, tax units, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

Immediately apparent is the dramatic rise of top incomes in the pre-World War II era, and its fall in the wartime and post-war era. These tectonic shifts predominantly affected the middle class households (tax units) in the 50th to 90th percentile distributions. Of course, incomes of the lower 50% of households fell sharply during the Great Depression and rose even more notably during and after the war, but the magnitude of these changes was not as large as that of the "middle" 40% households.[19] The spike from 1941-45 likely indicates the effect of armed forces mobilization among lower 50% earners, particularly soldiers' wages.

We will discuss the implications of these results further below, but it is also worthwhile to show the long-run trends for equal-split adults (which accounts for changes in the size of a tax unit and household over the span of the income distribution).

First we show top 10% and top 1% fiscal income shares, to add detail to the Piketty-Saez (2003) series and extend this feature from Piketty-Saez-Zucman (2018) to the pre-1962 data. The distribution among tax units (same as above) is highlighted here in gray.


**Figure 13:** Top 10% share of total fiscal income, equal-split adults, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

[19] Of course, a 10% fall or rise in income for a poor family may imply a much harsher change in standard of living than even a 20% fall or rise in income for a middle-class family. And a smaller level of change among poor households may still be a larger percentage change than the one experienced by the middle-class household.

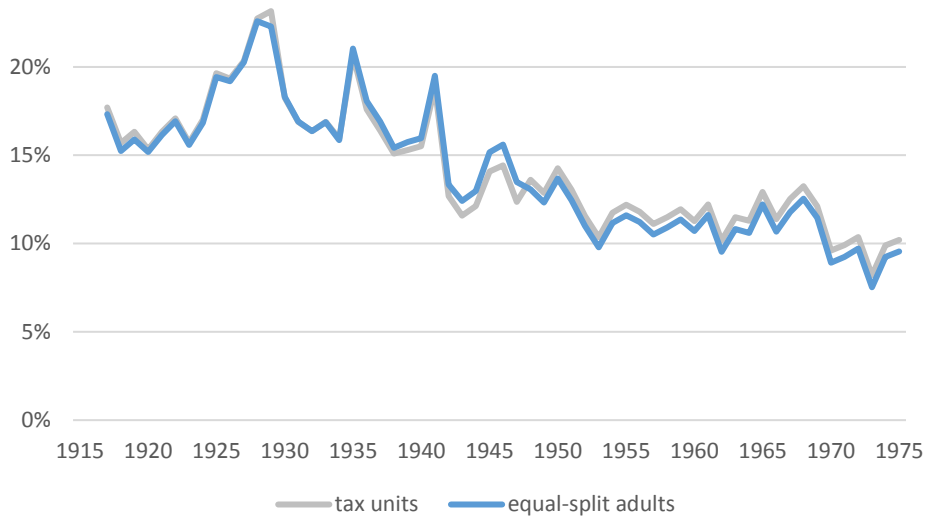


**Figure 14:** Top 1% share of total fiscal income, equal-split adults, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

In the case of topmost income shares, the breakdown of data by equal-split adults does not make a great difference, although the level is slightly higher for top 10% shares before the war, and slightly lower after. If higher-earning households are less likely than lower-earning households to file tax returns jointly (the *lowest* income brackets have the lowest proportion of joint filers), this was more true before the war than after. In fact, the turning point was tax legislation in 1947. Before 1947 married couples with two incomes had incentive to file separately—the tax scale was the same for additive or separate incomes, which under progressive taxation particularly favored two-high-income households.

Next we turn to the middle 40% and bottom 50% of equal-split adults, again showing the previous distribution (tax units) in gray for comparison.

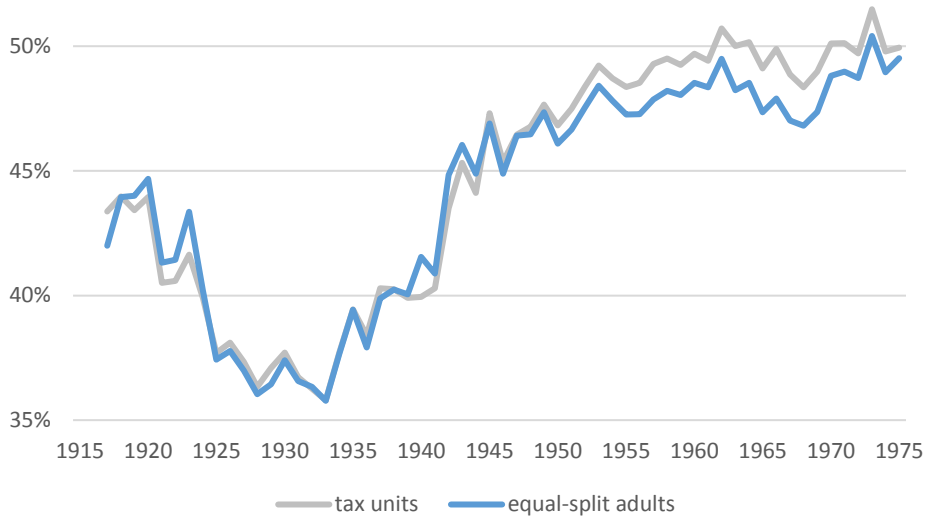


**Figure 15:** Middle 40% share of total fiscal income, equal-split adults, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

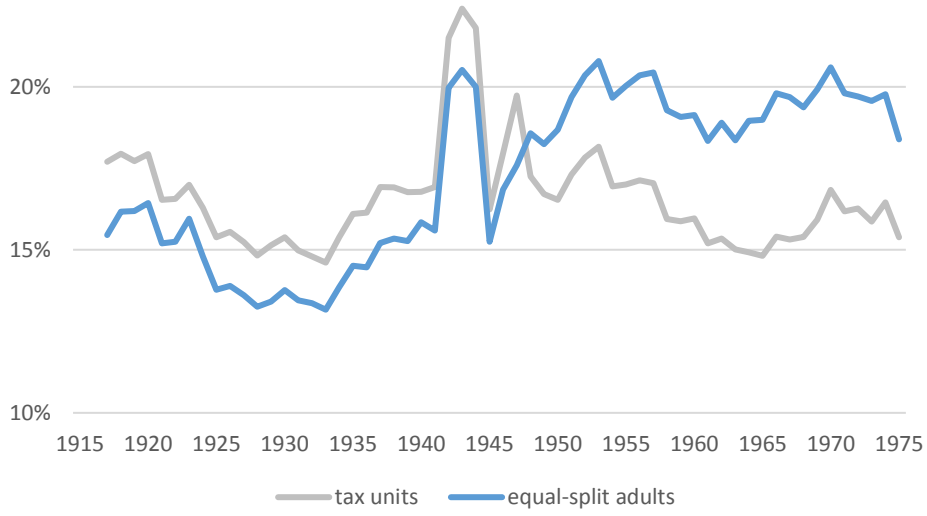


**Figure 16:** Bottom 50% share of total fiscal income, equal-split adults, 1917-75: Goldsmith-OBE pre-World War II interpolations harmonized with SOI tax data.

What seems immediately clear from the Goldsmith-OBE data is the rapid rise in both bottom-50% and middle-40% shares of fiscal income during the Great Depression and into the post-World War II era. While this follows logically from the previously observed (and well documented) fall in top 10% shares, before now we could not be sure that this was not merely an effect of the composition of tax units. It is not. We will return to this finding in the discussion section below.

Meanwhile, we can examine these trends further by showing the progression of wage income over the same time period.

*Wage Inequality, 1927-75*

First of all, we can compare the new results to Piketty-Saez (2003) top 10% shares of wage income inequality:

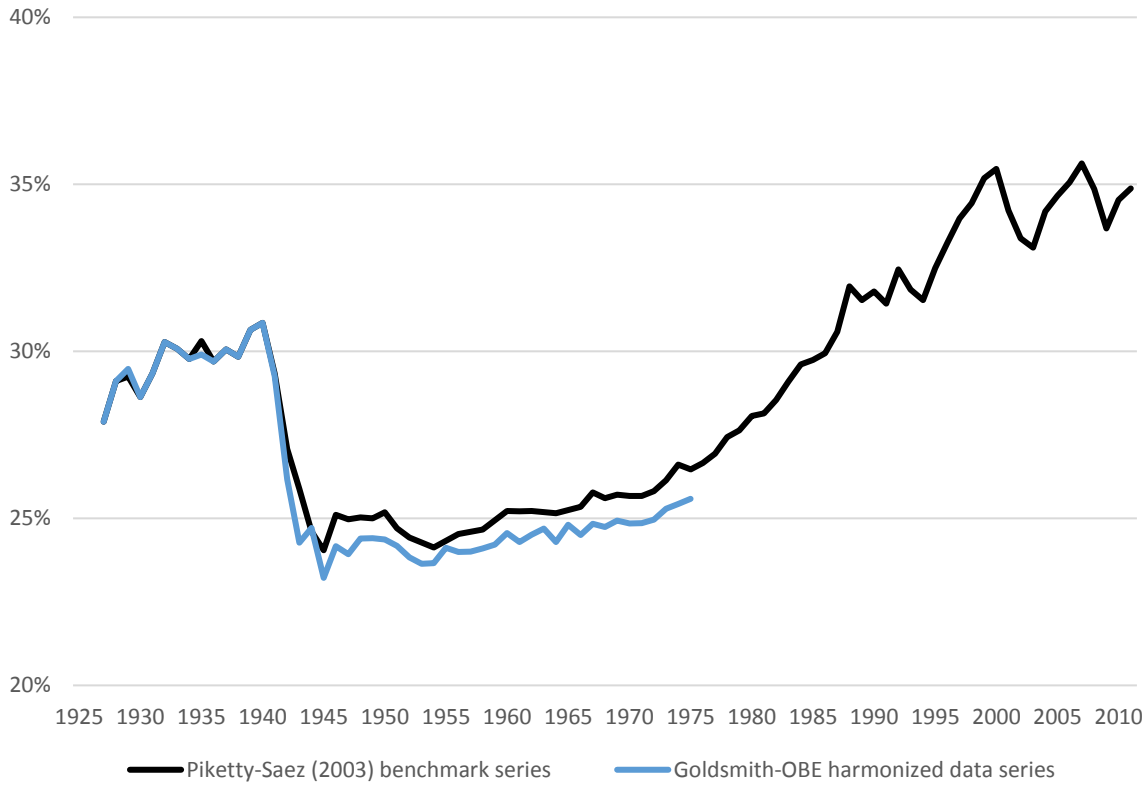


**Figure 17:** Top 10% share of total wage income, tax units, 1927-2011: Goldsmith-OBE harmonized data series, compared to Piketty-Saez (2003) benchmark series.

On a tax unit basis, we observe a close match between the newly interpolated wage income distribution, and the previous Piketty-Saez (2003, updated to 2015) and PSZ (2018) benchmark series.[20]

We can show an even closer match at the top 1% of the distribution:

[20] If the new series is slightly lower in its interpretation of income going to the top 10% share, this may be a function of imputing all missing wage income and missing tax units at the far left of the income distribution, below the filing requirement threshold. However, the error is small, within less than 1% of total wage income, and does not affect the direction and pattern of the overall trend.

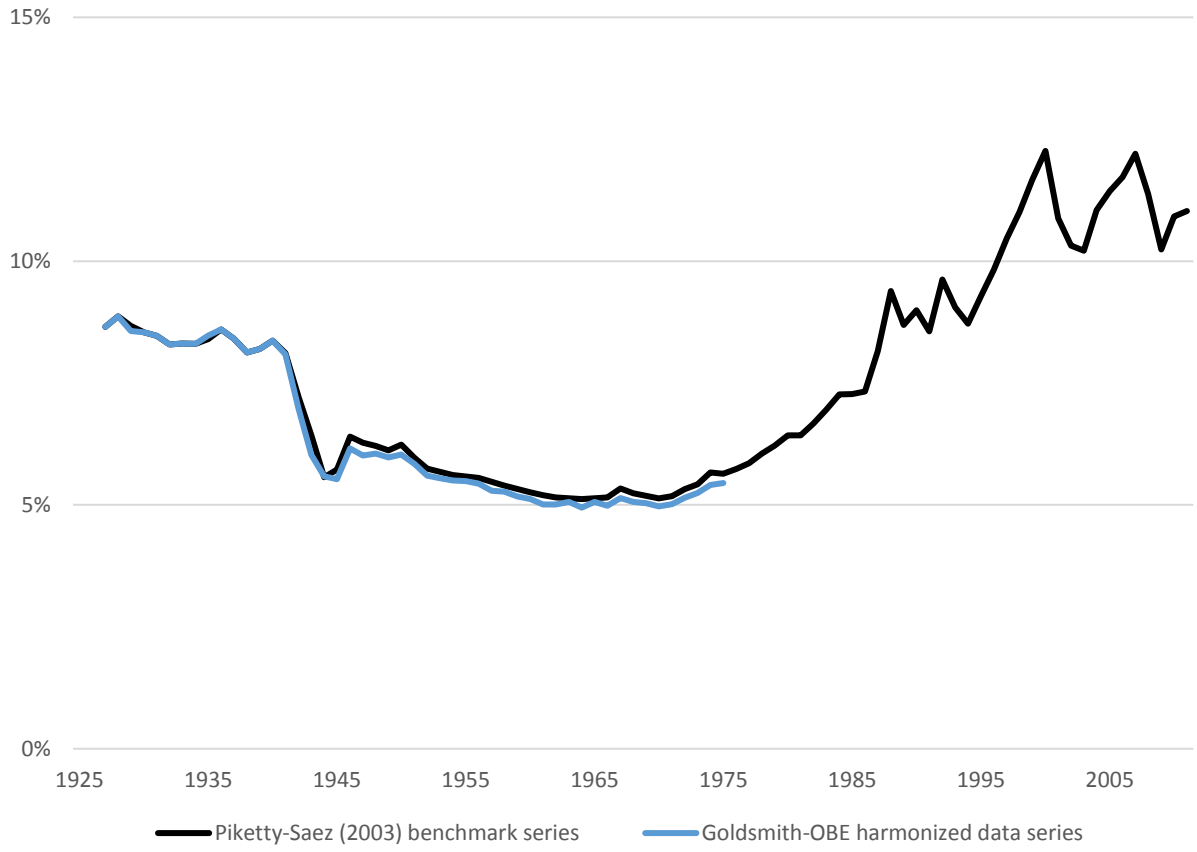


**Figure 18:** Top 1% share of total wage income, tax units, 1927-2011: Goldsmith-OBE harmonized data series, compared to Piketty-Saez (2003) benchmark series.

We also see a close match in the overall average wage income (see Appendix 5), and the same is true for wage income thresholds (e.g., median, 90$^{th}$ and 99$^{th}$ percentiles).

Since we observe a close fidelity of the new series to the earlier picture of top 10% shares offered by the benchmark series, we have confidence in our further inferences on the inner working of the wage distribution, below the 90$^{th}$ percentile: the share of wage income going to the bottom 50% and the share going to the middle 40%. As with fiscal income, neither of these have been previously observed for the pre-1962 wage income distribution, neither for equal-split adults nor for tax units.

These results are as follows, with equal-split adults in dark red and tax units in dark green:

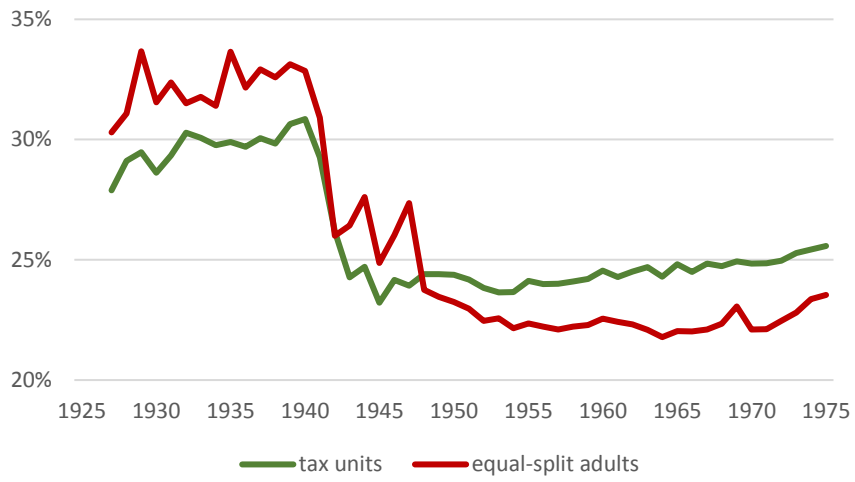


**Figure 19:** Top 10% share of total wage income, 1927-75: Goldsmith-OBE harmonized data series.

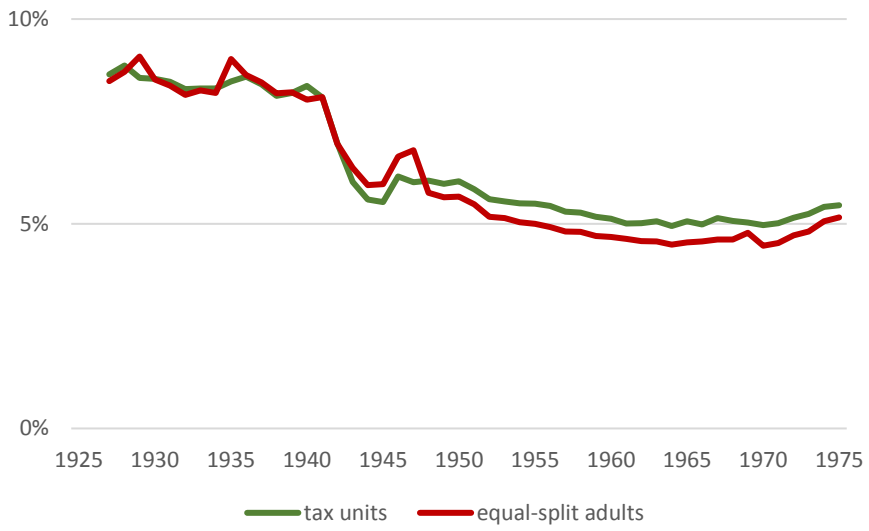


**Figure 20:** Top 1% share of total wage income, 1927-75: Goldsmith-OBE harmonized data series.

These results follow those above (indeed for tax units they are the same as presented in the comparison above), forming the early part of the U-curve that we see in both income and wage inequality over the 20th century into the 21st. As above for fiscal income, here for wages we see the significance of tracking equal-split adults and not just tax units—and indeed the effect switches at 1947 here, too. Before 1947, higher-earning households would file separately more frequently than lower-earning households (when weighted by the size of the income concerned), and after 1947 less frequently.

Beyond the ability to examine these top shares according to equal-split adults, we can now look inside the bottom 90% of the overall wage income distributions to show the evolution of wage income accruing to the poorest 50% of earners, over the entire period 1927-75.

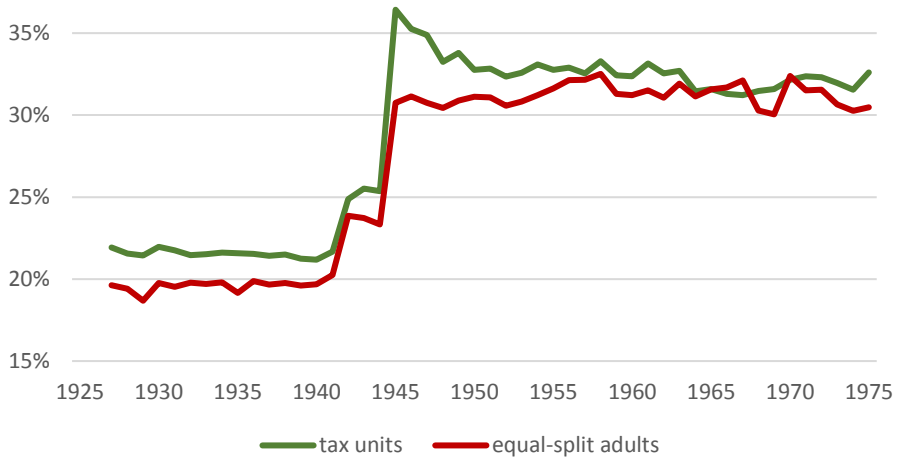


**Figure 21:** Bottom 50% share of total wage income, 1927-75: Goldsmith-OBE harmonized data series.

The results are similar between tax units and equal-split adults—a sharp and durable increase in wage income to the bottom 50% during and after World War II. Perhaps it is worth noting that the post-war spike in income shares to the bottom 50% is not quite as strong among equal-split adults as among tax units. This could be an artifact of the number of working spouses that joined the workforce during and after the war and could be found in tax units disproportionately toward the base of the income distribution. Among poorer families the rise in two-earner households filing taxes jointly would have been sharper than among wealthier families. To split equally the income of tax units filing jointly dampens the wage increase, but that increase was powerful nonetheless.

We actually see the reverse effect among the middle 40% of wage earners.

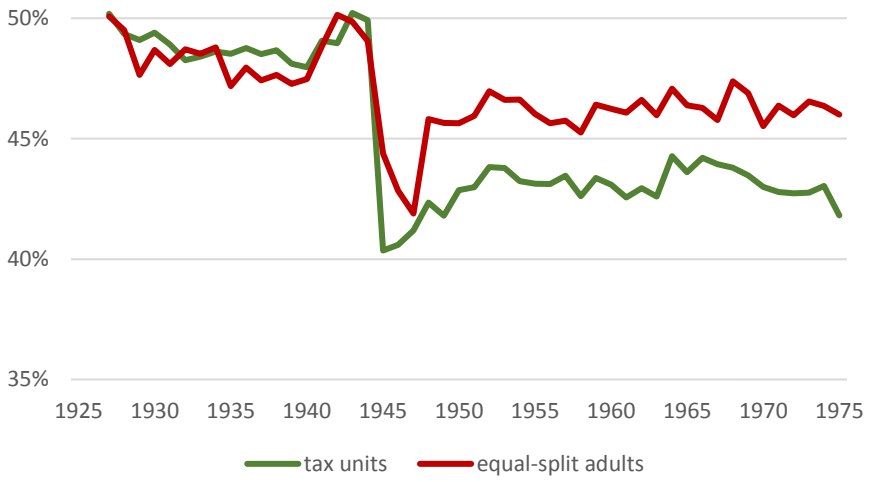


**Figure 22:** Middle 40% share of total wage income, 1927-75: Goldsmith-OBE harmonized data series.

The war marked a decline in the share of total wage income accruing the middle 40% of earners. Again, however, this depends on the perspective. Whereas the tax units' approach shows a more precipitous drop in wage income share after the war, the approach among equal-split adults suggests instead a steady share of wage income accruing to middle-class workers.

After 1945, the trends for bottom 50% wage income seem to move in tandem, and we do not see much, if any, difference driven by a distinction on joint vs. single filers (comparing tax units vs. equal-split adults series), as may have been expected if households continued to file differently over this part of the income distribution in a proportion other than the one by which they earned wages jointly or doubly.

However, the middle 40% series shows a persistent 3- to 5-percentage-point gap in the post-war period, between tax units (lower share) and equal-split adults (higher). If middle-class tax units appear to less of a share wage income than middle-class adults equally-split, the trend is inverse among top 10% earners.

Among the top 10% wage earners, there is a similarly persistent post-war gap, but a gap where tax units claim the higher share of total wage incomes, and equal-split adults the lower. Such effect may be the consequence of post-1947 filing changes in which high-earning couples started filing jointly more frequently; or it may signal a rise in upper middle-class earners who assortatively match and file jointly; or both.

The sum total of these above results offers many points of entry for discussion and further consideration.

Before returning to a discussion of the levels of these results, the reader may find it useful to consider the robustness of the results, where we choose a preferred approach to imputation inference on the full income distribution. Please refer to Appendix 2 for this discussion.

Otherwise, we are now in position to discuss the general significance of these results in the larger context of the economic history of the era.

## Discussion

*Wage Compression and the Great Leveling*

What was the position of middle class income earners in the early 20th century, in both relative and absolute terms? Using advanced data interpolation and imputation techniques to create a unique new dataset for the early 20th century US context, our goal has been to bring new evidence to the continuing inquiry and historical canvas of income inequality.

The purpose and primary contribution of this study has been to impute, interpolate, and interpret pre-1962 income inequality for the lower 90 percent of American earners. In brief, it is indisputable that inequality of top income shares decreased over the middle of 20th century, before increasing again. If our results can be summarized in a single graph, it is the following portrait of 100 years of fiscal income:

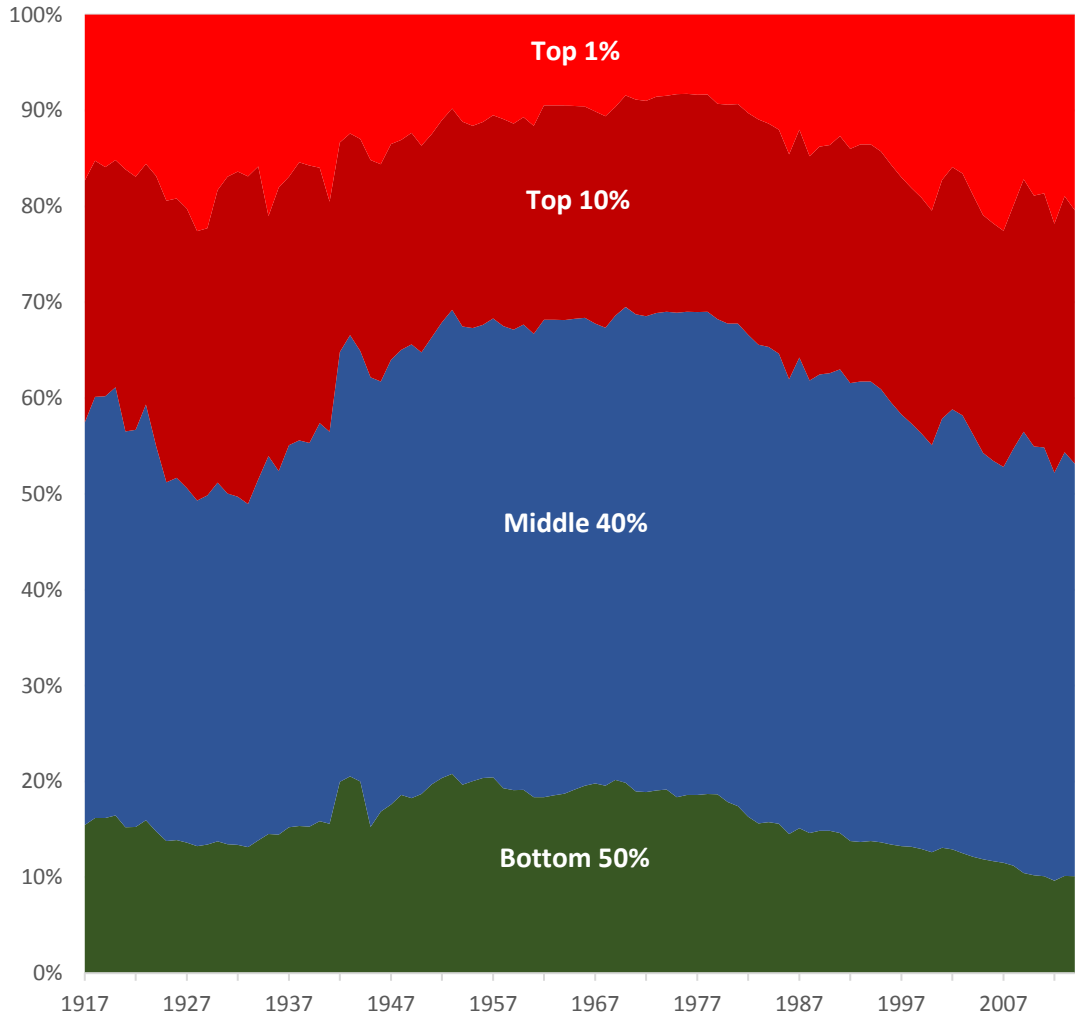


**Figure 23:** Shares of total fiscal income, equal-split adults, 1917-2014: Estimates for 1917-61 are new.

More than echoing the earlier findings, our results show that the fall (and rise) of inequality has disproportionately been to the benefit (and detriment) of the middle 40% of income earners, more than to the poorest half of the population. The greatest drama in the story has been the changing proportion of income shares to middle- and upper-middle-class earners. Changes in top income shares have represented a conflict between the upper and middle classes, more than any opportunity for gains among the poorest.

However, if it appears that the bottom 50% were not invited to the long 20th century pie-slicing contest, one exception has been the story of midcentury wage inequality. The durable (1945-75) gains in wage income shares among the working poor deserve our further attention (and research). In fact, the fiscal income share accruing to the bottom 50% of the population remained stable during the entire post-war era, to such an extent that it may have begun to resemble an immutable macroeconomic parameter (cf. Feldstein 1980). Recent history has taught us otherwise. Nonetheless, it would be interesting to further examine the sizable increase in wage income shares accruing to the working poor, which exceeded the gains to the middle class (unlike changes in shares of total income) and outlasted wartime mobilization.

Lindert and Williamson (2016) followed Goldin and Katz (2008) in an attempt to explain changes in income and wage inequality over the course of the 20th century. Downplaying the role of fiscal policy and world war, they point to:

- demographic factors (a slowdown in labor supply growth);
- trade policy (a relatively closed domestic economy and lack of international competition);
- financial sector retrenchment (due to tight regulation);
- technological change (favoring unskilled workers); and
- returns to education and skill (with unparalleled increases in human capital attainment).

All of these potential forces are complementary to the fiscal policy hypothesis, and perhaps only further research would settle the debate on what causes inequality and its "leveling." While we must leave causal inference to further research (discussed below), we hope our inference to identify the trends we do observe will provide a firm foundation for subsequent analysis.

*Structural Change in the American Economy*

To some extent, the changes in inequality that we observe must also be a function of change in the structure of production of the economy as a whole.

In other words, changes in inequality must be studied in the context of changes in legislation and incentives, employment patterns, industry-specific profit and value-added per worker, returns to education human capital investment, trade policy, and technological change both domestically and internationally. Any among a multitude of dynamics of economic change may contribute to changes in the patterns of

income inequality. And while Herrendorf et al (2013) conclude that "there remains no consensus on the economic forces that drive the process of structural change," we can begin to examine changing economic structures by describing industry-specific changes in employment and value-added.

This approach is the one chosen by Rodrik and coauthors (Rodrik 2013; McMillan and Rodrik 2011; McMillan, Rodrik and Sepulveda 2017) to study structural change in developing countries. In the brief discussion here, we apply the same method to the United States from 1950 (the earliest year for which industry-specific data is available).

Following McMillan-Rodrik (2011) and de Vries et al (2015), GDP growth can be decomposed into "within-sector" productivity growth and "between-sector" structural change (the shift of workers into higher or lower-productivity employment). Thus we have the following expression:

$$\Delta P = \sum \theta_{i,t-k} * \Delta P_{i,t} \; + \; \sum P_{i,t-k} * \Delta \theta_{i,t} \; + \; \sum \Delta \theta_{i,t} * \Delta P_{i,t}$$

where $\theta$ represents the employment share in a given sector *i; P* the productivity level (value-added per worker) in the sector; and from *t-k* to *t* is the time period of change.

To explain or at least describe overall productivity growth, the first term on the right-hand side shows GDP growth due to technological advances and productivity improvements (holding constant employment share by sector); the second term is the "static" structural change term (a shift in employment share, holding productivity constant); while the third term is the "dynamic" structural change term (employment change interacting with productivity change). In other words, we calculate not only sector-specific productivity growth on its own, but also—and more importantly for our purpose—the "static" shift in employment structure (regardless of productivity changes) and a "dynamic" shift in employment structure (interacting with productivity changes).

In the graphs that follow, we show splits for the period 1950-1980 and for 1981-2010. The justification for our choice of a 1980 split is in the sharp reversal observed above in national inequality trends, and in US social and fiscal policymaking of the era (Piketty-Saez-Zucman 2018). We will argue that structural change in the United States, 1950-2010, follows a trend best explained with both "static" and "dynamic" approaches.

[Note: In these graphs, following Rodrik-McMillan notation, the nine sectors are abbreviated as follows: *agr* (agriculture); *con* (construction); *cspsgs* (community and government services); *fire* (finance and business services); *man* (manufacturing); *min* (mining); *pu* (utilities); *tsc* (transport and communications); and *wrt* (trade).]

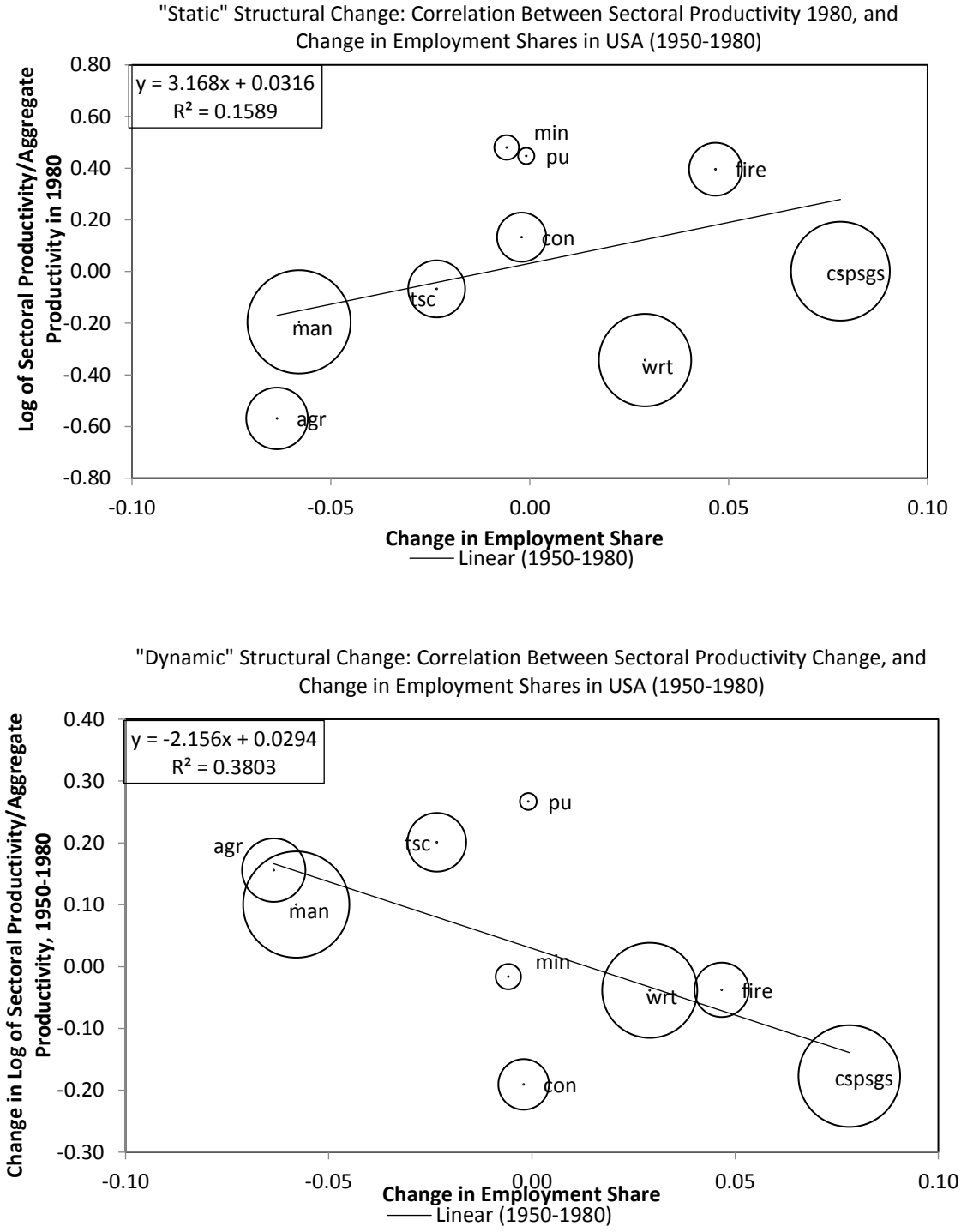


**Figure 24:** "Static" (above) and "dynamic" (below) structural change, 1950-1980. *Source:* Author's own elaboration, after McMillan-Rodrik (2011) with data from Timmer et al (2015).

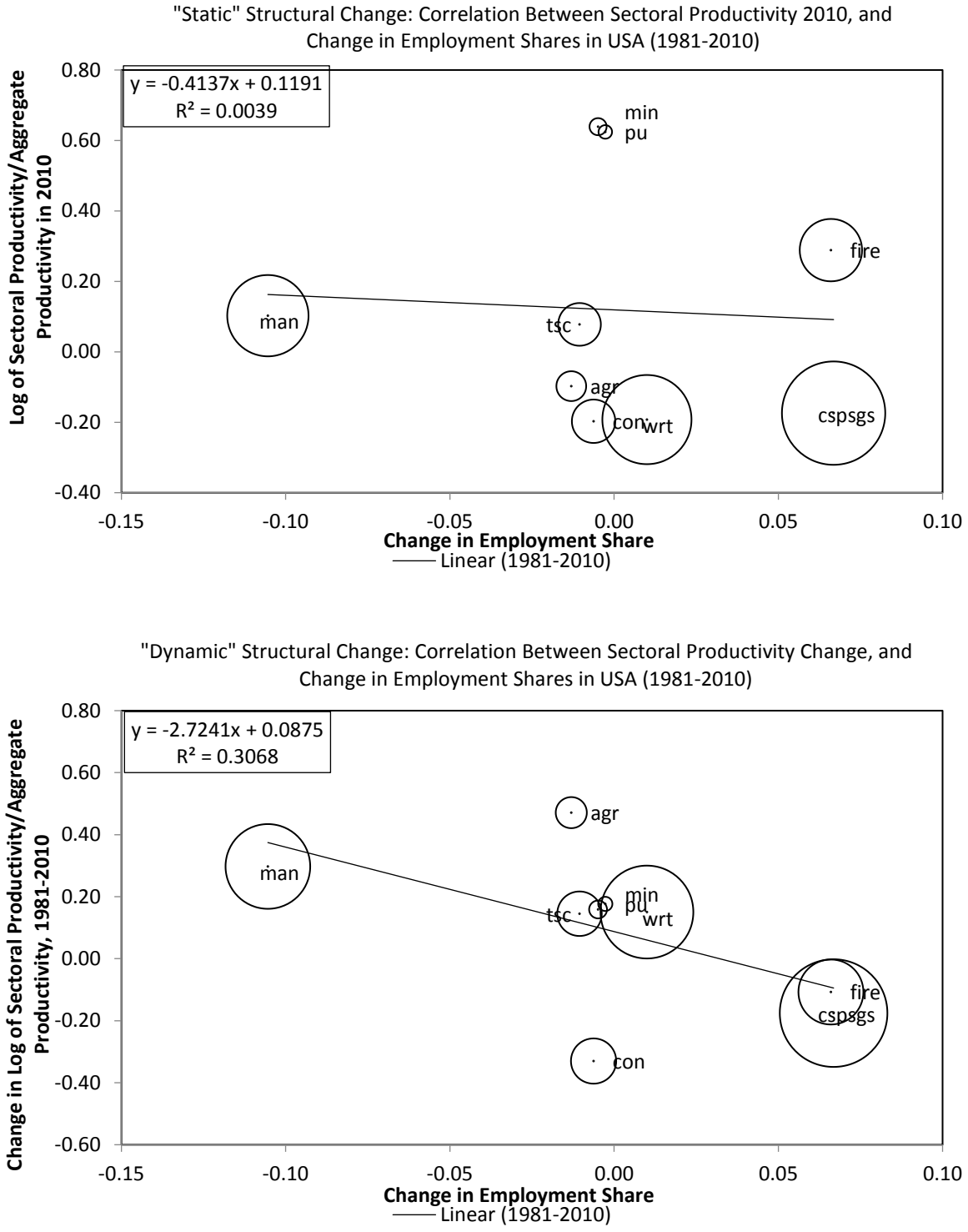


**Figure 25:** "Static" (above) and "dynamic" (below) structural change, 1981-2010. *Source:* Author's own elaboration, after McMillan-Rodrik (2011) with data from Timmer et al (2015).

Overall, "dynamic" structural change shows a consistent pattern in both time periods—workers migrating away from the sectors that gained in productivity. But the earlier time period showed that workers at least migrated toward the highest-level productive sectors in the economy, even if these sectors were not becoming more productive. This "static" structural change was no longer occurring by the second period, 1981-2010. Labor, even if mobile across sectors, was no longer moving to the sectors at the technological frontier. Change in sector-specific employment shares occurred even as technological change favored the sectors that were releasing labor into other sectors.

The most striking employment transition from 1981-2010, of course, is the shift of American workers away from the manufacturing sector. However, this pattern was already in place during the earlier period 1950-1980, when laborers were also shifting away from agriculture. It is interesting to note that agriculture and manufacturing industry gained in productivity per worker even while, or perhaps because workers were leaving these sectors. In the earlier time period "released" workers were able to find relatively high-productivity work in the public sector and civil society, as well as in construction. Both of these areas have since stagnated in terms of per-worker productivity, and indeed have been two of the sectors with the largest decreases in relative productivity. Unsurprisingly, the financial services industry has been the largest source of employment gains, absorbing workers with little loss to its relatively high productivity per worker.[21] A more disaggregated dataset may be able to tell us more about the overall trends in industry-specific productivity gains and losses (Rodrik 2013; Bourguignon 2018), but the above decomposition at least begins to reveal the contours of economic change.

The initial steps taken here offer a plethora of exciting new ways forward: in the analysis of these new estimates; in complementary approaches for other countries; in extending these estimates farther into American history; and in undertaking related research to identify the drivers of these trends.

*Further Research*

First of all, from these estimates of fiscal and wage income inequality we will be able to estimate pre-tax national income (cf. Piketty-Saez-Zucman 2018; Garbinti-Goupille-Piketty 2017). The pre-tax income concept estimates the sum total of all national income and receipts prior to the tax and transfer system, which can then be used to study in-kind and indirect benefits both before fiscal policy and after. To

[21] Since the financial services sector has been the largest winner of the recent era, it may be worthwhile to examine inequality among income earners in that industry. In fact, the rise of "supermanagers" in this sector is a phenomenon of particular note to our discussion of wage income inequality. The salaries in this sector are intimately tied to capital return. As Goldsmith foresaw in 1958, the boundaries between wage income and capital income may be blurred (cf. Piketty 2014; Piketty, Saez and Stantcheva 2014).

account for 100 percent of income in the national accounts also permits more extensive and robust inferences on macroeconomic growth decomposition and the incidence of fiscal policy.

Meanwhile, to extend these estimates even before 1917, we could also draw from the research of Goldin and Katz (2015), who have used 1915 Iowa state-level census data to study the effect of education on earned income trajectories. In principle, this data could be extrapolated as a measure for inequality writ large, in the country as a whole. However, we know that early 20th-century patterns of inequality in Iowa cities are *not* representative of the country as a whole (Sommeiller 2006; Sommeiller and Price 2016). Even if the state itself is not an outlier, Iowa does have lower inequality during the earlier 20th century than do other states, and a lower threshold of top incomes than do states of the east and northeast United States. If it is possible to adjust for these selection issues, the Iowa census data remains one area for possible extension of nationwide research to earlier eras.

Moreover, it is interesting to note that the Integrated Public Use Microdata Series (IPUMS) of historical census data does have an indicator of occupational prestige scores, and socioeconomic and education indices that extends to dates long before the Census began asking about money income in the 1940s (Ruggles et al 2017). The IPUMS occupational classification definition of 1950 has been standardized across all decennial censuses from 1850 to present.[22] Additional possibilities with this dataset include the Duncan socioeconomic index of occupational prestige, the Hauser-Warren index, and the Siegel prestige score. These derivative measures (often regressing income on education, for example) do contain some "black box" assumptions that perhaps we are not yet ready to make. However, if we are able to calibrate these variables as proxies for income, that too could give us a greater sense of the full income distribution even into the 19th century.

Perhaps the original contribution of this research has been the assembly and analysis of new long-run series on American income inequality, but the most intricate aspect of the work has been methodological, in the patience, rigor and attention to detail required to harmonize various estimates into a dataset worthy of analysis. Since the final dataset required several steps of carefully calibrated imputation and interpolation, it would be interesting to devote further research to an even more extensive sensitivity analysis than the one which can be found in Appendix 2—and further test several of the most important assumptions.

Such an effort would respond to the exercises of Geloso et al (2018), who have argued that a different treatment of tax data in the 1920s and 1930s drastically alters the patterns of income distribution and

[22] In this definition there are ten occupational groupings: professional; farmers; managers/officials/proprietors, clerical, sales, craftsmen, operatives, service, farm laborers, and laborers.

inequality that we have observed (cf. Smiley and Keehn 1995). Like Goldin and Katz (2015), Geloso and Magness (2017) have also made use of state-level data to complement nationwide sources for pre-war estimates, in this case Wisconsin, while also noting available records in several other states. Their argument that historical top income shares are subject to less volatility than those observed by Piketty-Saez (2003) (as well as Piketty-Saez-Zucman 2018, and the present study) accompanies a similar debate on the recent American inequality increases (cf. Auten and Splinter 2017). If the fall and rise again of inequality were in fact less pronounced than has been here observed, we might in turn consider long-run inequality as a stable parameter of capitalist economies, one that is subject to neither policy levers nor to changes in industrial organization such as those witnessed over the past 100 years. That hypothesis would also demand an explanation.

Further research could also extend the Sommeiller-Price (2016) data, state by state, for an interpolated full percentile distribution of income within each state and across regions, based largely on the important work that has been done in this direction with comprehensive state-level top shares since the early 20$^{th}$ century. An analysis of regional economic history may show patterns of beta convergence (Sotura and Bonnet 2018) and divergence over the course of the 20$^{th}$ century, from which source we could analyze the determinants and patterns of economics structural change.

There are important policy and political economy implications to the study of inequality in American history (Piketty 2018; Cogneau 2012). Would it be possible to identify ties from midcentury economic structures to the more recent epicenters of social, economic and political malaise? Without "compressing history" (Austin 2008), it would be interesting to test for quantifiable traces of political outcomes in county-level patterns of structural change and inequality, while accounting for covariates along demographic lines (race, age, sex, religion, education). To find an exogenous shock, perhaps in a sudden policy shift or in commodity/input prices and global supply chain decisions, would be a complementary natural experiment. The more disaggregated our historical dataset—in terms of the entire income distribution but also according to place and demographics—the sharper can be our conclusions.

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## Appendices

1. Full yearly tables for bottom 50, middle 40, top 10, and top 1% shares of fiscal and wage income

2. Robustness Checks and Sensitivity Analysis

3. Match of new SOI estimates (1917-75) to PSZ (2018) estimates for 1962-75 overlap

4. Match of Goldsmith-OBE harmonized data series to estimates from SOI only

5. Match of new estimates of wage income to Piketty-Saez (2003) benchmark series

6. Example full g-percentile tables

## Appendix 1: Full yearly tables, 1917-75

**Table 1:** Fiscal income shares, tax units: Bottom 50%, Middle 40%, Top 10%, Top 1%

| series | Bottom 90% | | Bottom 50% | | Middle 40% | | Top 10% | | Top 1% | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Year* | PSZ 2018 | new | PSZ | new | PSZ | new | PSZ | new | PSZ | new |
| *1917* | 59% | 61% | | 18% | | 43% | 41% | 39% | 18% | 18% |
| *1918* | 60% | 62% | | 18% | | 44% | 40% | 38% | 16% | 16% |
| *1919* | 60% | 61% | | 18% | | 43% | 40% | 39% | 16% | 16% |
| *1920* | 61% | 62% | | 18% | | 44% | 39% | 38% | 15% | 15% |
| *1921* | 57% | 57% | | 17% | | 41% | 43% | 43% | 16% | 16% |
| *1922* | 56% | 57% | | 17% | | 41% | 44% | 43% | 17% | 17% |
| *1923* | 59% | 59% | | 17% | | 42% | 41% | 41% | 16% | 16% |
| *1924* | 56% | 56% | | 16% | | 40% | 44% | 44% | 17% | 17% |
| *1925* | 54% | 53% | | 15% | | 38% | 46% | 47% | 20% | 20% |
| *1926* | 54% | 54% | | 16% | | 38% | 46% | 46% | 20% | 19% |
| *1927* | 53% | 53% | | 15% | | 37% | 47% | 47% | 21% | 20% |
| *1928* | 51% | 51% | | 15% | | 36% | 49% | 49% | 24% | 23% |
| *1929* | 53% | 52% | | 15% | | 37% | 47% | 48% | 22% | 23% |
| *1930* | 56% | 53% | | 15% | | 38% | 44% | 47% | 17% | 18% |
| *1931* | 55% | 52% | | 15% | | 37% | 45% | 48% | 15% | 17% |
| *1932* | 54% | 51% | | 15% | | 36% | 46% | 49% | 16% | 16% |
| *1933* | 54% | 50% | | 15% | | 36% | 46% | 50% | 16% | 17% |
| *1934* | 54% | 53% | | 15% | | 38% | 46% | 47% | 16% | 16% |
| *1935* | 56% | 56% | | 16% | | 39% | 44% | 44% | 17% | 21% |
| *1936* | 53% | 55% | | 16% | | 38% | 47% | 45% | 19% | 18% |
| *1937* | 56% | 57% | | 17% | | 40% | 44% | 43% | 17% | 16% |
| *1938* | 56% | 57% | | 17% | | 40% | 44% | 43% | 16% | 15% |
| *1939* | 54% | 57% | | 17% | | 40% | 46% | 43% | 16% | 15% |
| *1940* | 55% | 57% | | 17% | | 40% | 45% | 43% | 16% | 16% |
| *1941* | 58% | 57% | | 17% | | 40% | 42% | 43% | 16% | 19% |
| *1942* | 64% | 65% | | 21% | | 44% | 36% | 35% | 13% | 13% |
| *1943* | 66% | 68% | | 22% | | 45% | 34% | 32% | 12% | 12% |
| *1944* | 67% | 66% | | 22% | | 44% | 33% | 34% | 11% | 12% |
| *1945* | 66% | 64% | | 16% | | 47% | 34% | 36% | 13% | 14% |
| *1946* | 63% | 63% | | 18% | | 45% | 37% | 37% | 13% | 14% |
| *1947* | 66% | 66% | | 20% | | 46% | 34% | 34% | 12% | 12% |
| *1948* | 65% | 64% | | 17% | | 47% | 35% | 36% | 12% | 14% |
| *1949* | 65% | 64% | | 17% | | 48% | 35% | 36% | 12% | 13% |
| *1950* | 64% | 63% | | 17% | | 47% | 36% | 37% | 13% | 14% |
| *1951* | 66% | 65% | | 17% | | 47% | 34% | 35% | 12% | 13% |
| *1952* | 67% | 66% | | 18% | | 48% | 33% | 34% | 11% | 12% |
| *1953* | 68% | 67% | | 18% | | 49% | 32% | 33% | 10% | 10% |
| *1954* | 66% | 66% | | 17% | | 49% | 34% | 34% | 11% | 12% |
| *1955* | 66% | 65% | | 17% | | 48% | 34% | 35% | 11% | 12% |
| *1956* | 67% | 66% | | 17% | | 49% | 33% | 34% | 11% | 12% |
| *1957* | 67% | 66% | | 17% | | 49% | 33% | 34% | 10% | 11% |
| *1958* | 66% | 65% | | 16% | | 50% | 34% | 35% | 10% | 11% |
| *1959* | 66% | 65% | | 16% | | 49% | 34% | 35% | 11% | 12% |
| *1960* | 67% | 66% | | 16% | | 50% | 33% | 34% | 10% | 11% |
| *1961* | 66% | 65% | | 15% | | 49% | 34% | 35% | 11% | 12% |
| *1962* | 66% | 66% | 15% | 15% | 51% | 51% | 34% | 34% | 10% | 10% |
| *1963* | 66% | 65% | 15% | 15% | 51% | 50% | 34% | 35% | 10% | 11% |
| *1964* | 66% | 65% | 14% | 15% | 51% | 50% | 34% | 35% | 10% | 11% |
| *1965* | 65% | 64% | 15% | 15% | 51% | 49% | 35% | 36% | 11% | 13% |
| *1966* | 66% | 65% | 15% | 15% | 51% | 50% | 34% | 35% | 10% | 11% |
| *1967* | 66% | 64% | 15% | 15% | 50% | 49% | 34% | 36% | 11% | 13% |
| *1968* | 65% | 64% | 15% | 15% | 50% | 48% | 35% | 36% | 11% | 13% |
| *1969* | 66% | 65% | 16% | 16% | 50% | 49% | 34% | 35% | 10% | 12% |
| *1970* | 67% | 67% | 16% | 17% | 51% | 50% | 33% | 33% | 9% | 10% |
| *1971* | 67% | 66% | 15% | 16% | 51% | 50% | 33% | 34% | 9% | 10% |
| *1972* | 66% | 66% | 15% | 16% | 51% | 50% | 34% | 34% | 10% | 10% |
| *1973* | 67% | 67% | 15% | 16% | 51% | 51% | 33% | 33% | 9% | 8% |
| *1974* | 67% | 66% | 15% | 16% | 51% | 50% | 33% | 34% | 9% | 10% |
| *1975* | 67% | 65% | 15% | 15% | 51% | 50% | 33% | 35% | 9% | 10% |

**Table 2:** Fiscal income shares, equal-split adults: Bottom 50%, Middle 40%, Top 10%, Top 1%

| series | Bottom 90% | | Bottom 50% | | Middle 40% | | Top 10% | | Top 1% | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Year* | PSZ 2018 | new | PSZ | new | PSZ | new | PSZ | new | PSZ | new |
| *1917* | | 57% | | 15% | | 42% | | 43% | | 17% |
| *1918* | | 60% | | 16% | | 44% | | 40% | | 15% |
| *1919* | | 60% | | 16% | | 44% | | 40% | | 16% |
| *1920* | | 61% | | 16% | | 45% | | 39% | | 15% |
| *1921* | | 57% | | 15% | | 41% | | 43% | | 16% |
| *1922* | | 57% | | 15% | | 41% | | 43% | | 17% |
| *1923* | | 59% | | 16% | | 43% | | 41% | | 16% |
| *1924* | | 55% | | 15% | | 40% | | 45% | | 17% |
| *1925* | | 51% | | 14% | | 37% | | 49% | | 19% |
| *1926* | | 52% | | 14% | | 38% | | 48% | | 19% |
| *1927* | | 51% | | 14% | | 37% | | 49% | | 20% |
| *1928* | | 49% | | 13% | | 36% | | 51% | | 23% |
| *1929* | | 50% | | 13% | | 36% | | 50% | | 22% |
| *1930* | | 51% | | 14% | | 37% | | 49% | | 18% |
| *1931* | | 50% | | 13% | | 37% | | 50% | | 17% |
| *1932* | | 50% | | 13% | | 36% | | 50% | | 16% |
| *1933* | | 49% | | 13% | | 36% | | 51% | | 17% |
| *1934* | | 52% | | 14% | | 38% | | 48% | | 16% |
| *1935* | | 54% | | 15% | | 39% | | 46% | | 21% |
| *1936* | | 52% | | 14% | | 38% | | 48% | | 18% |
| *1937* | | 55% | | 15% | | 40% | | 45% | | 17% |
| *1938* | | 56% | | 15% | | 40% | | 44% | | 15% |
| *1939* | | 55% | | 15% | | 40% | | 45% | | 16% |
| *1940* | | 57% | | 16% | | 42% | | 43% | | 16% |
| *1941* | | 56% | | 16% | | 41% | | 44% | | 20% |
| *1942* | | 65% | | 20% | | 45% | | 35% | | 13% |
| *1943* | | 67% | | 21% | | 46% | | 33% | | 12% |
| *1944* | | 65% | | 20% | | 45% | | 35% | | 13% |
| *1945* | | 62% | | 15% | | 47% | | 38% | | 15% |
| *1946* | | 62% | | 17% | | 45% | | 38% | | 16% |
| *1947* | | 64% | | 18% | | 46% | | 36% | | 13% |
| *1948* | | 65% | | 19% | | 46% | | 35% | | 13% |
| *1949* | | 66% | | 18% | | 47% | | 34% | | 12% |
| *1950* | | 65% | | 19% | | 46% | | 35% | | 14% |
| *1951* | | 66% | | 20% | | 47% | | 34% | | 12% |
| *1952* | | 68% | | 20% | | 48% | | 32% | | 11% |
| *1953* | | 69% | | 21% | | 48% | | 31% | | 10% |
| *1954* | | 67% | | 20% | | 48% | | 33% | | 11% |
| *1955* | | 67% | | 20% | | 47% | | 33% | | 12% |
| *1956* | | 68% | | 20% | | 47% | | 32% | | 11% |
| *1957* | | 68% | | 20% | | 48% | | 32% | | 11% |
| *1958* | | 67% | | 19% | | 48% | | 33% | | 11% |
| *1959* | | 67% | | 19% | | 48% | | 33% | | 11% |
| *1960* | | 68% | | 19% | | 49% | | 32% | | 11% |
| *1961* | | 67% | | 18% | | 48% | | 33% | | 12% |
| *1962* | 68% | 68% | 18% | 19% | 50% | 49% | 32% | 32% | 9% | 10% |
| *1963* | 68% | 67% | 19% | 18% | 50% | 48% | 32% | 33% | 9% | 11% |
| *1964* | 68% | 67% | 19% | 19% | 49% | 49% | 32% | 33% | 9% | 11% |
| *1965* | 68% | 66% | 19% | 19% | 49% | 47% | 32% | 34% | 10% | 12% |
| *1966* | 68% | 68% | 20% | 20% | 49% | 48% | 32% | 32% | 10% | 11% |
| *1967* | 68% | 67% | 20% | 20% | 48% | 47% | 32% | 33% | 10% | 12% |
| *1968* | 67% | 66% | 20% | 19% | 48% | 47% | 33% | 34% | 11% | 13% |
| *1969* | 69% | 67% | 20% | 20% | 48% | 47% | 31% | 33% | 10% | 11% |
| *1970* | 69% | 69% | 20% | 21% | 50% | 49% | 31% | 31% | 8% | 9% |
| *1971* | 69% | 69% | 19% | 20% | 50% | 49% | 31% | 31% | 9% | 9% |
| *1972* | 69% | 68% | 19% | 20% | 50% | 49% | 31% | 32% | 9% | 10% |
| *1973* | 69% | 70% | 19% | 20% | 50% | 50% | 31% | 30% | 9% | 8% |
| *1974* | 69% | 69% | 19% | 20% | 50% | 49% | 31% | 31% | 8% | 9% |
| *1975* | 69% | 68% | 18% | 18% | 51% | 50% | 31% | 32% | 8% | 10% |

**Table 3:** Wage income shares, tax units: Bottom 50%, Middle 40%, Top 10%, Top 1%

| series | Bottom 90% | | Bottom 50% | Middle 40% | Top 10% | | Top 1% | |
|---|---|---|---|---|---|---|---|---|
| *Year* | PS 2003 | new | new | new | PS 2003 | new | PS 2003 | new |
| *1927* | 72% | 72% | 22% | 50% | 28% | 28% | 9% | 9% |
| *1928* | 71% | 71% | 22% | 49% | 29% | 29% | 9% | 9% |
| *1929* | 71% | 71% | 21% | 49% | 29% | 29% | 9% | 9% |
| *1930* | 71% | 71% | 22% | 49% | 29% | 29% | 9% | 9% |
| *1931* | 71% | 71% | 22% | 49% | 29% | 29% | 8% | 8% |
| *1932* | 70% | 70% | 21% | 48% | 30% | 30% | 8% | 8% |
| *1933* | 70% | 70% | 22% | 48% | 30% | 30% | 8% | 8% |
| *1934* | 70% | 70% | 22% | 49% | 30% | 30% | 8% | 8% |
| *1935* | 70% | 70% | 22% | 49% | 30% | 30% | 8% | 8% |
| *1936* | 70% | 70% | 22% | 49% | 30% | 30% | 9% | 9% |
| *1937* | 70% | 70% | 21% | 49% | 30% | 30% | 8% | 8% |
| *1938* | 70% | 70% | 21% | 49% | 30% | 30% | 8% | 8% |
| *1939* | 69% | 69% | 21% | 48% | 31% | 31% | 8% | 8% |
| *1940* | 69% | 69% | 21% | 48% | 31% | 31% | 8% | 8% |
| *1941* | 71% | 71% | 22% | 49% | 29% | 29% | 8% | 8% |
| *1942* | 73% | 74% | 25% | 49% | 27% | 26% | 7% | 7% |
| *1943* | 74% | 76% | 26% | 50% | 26% | 24% | 6% | 6% |
| *1944* | 75% | 75% | 25% | 50% | 25% | 25% | 6% | 6% |
| *1945* | 76% | 77% | 36% | 40% | 24% | 23% | 6% | 6% |
| *1946* | 75% | 76% | 35% | 41% | 25% | 24% | 6% | 6% |
| *1947* | 75% | 76% | 35% | 41% | 25% | 24% | 6% | 6% |
| *1948* | 75% | 76% | 33% | 42% | 25% | 24% | 6% | 6% |
| *1949* | 75% | 76% | 34% | 42% | 25% | 24% | 6% | 6% |
| *1950* | 75% | 76% | 33% | 43% | 25% | 24% | 6% | 6% |
| *1951* | 75% | 76% | 33% | 43% | 25% | 24% | 6% | 6% |
| *1952* | 76% | 76% | 32% | 44% | 24% | 24% | 6% | 6% |
| *1953* | 76% | 76% | 33% | 44% | 24% | 24% | 6% | 6% |
| *1954* | 76% | 76% | 33% | 43% | 24% | 24% | 6% | 6% |
| *1955* | 76% | 76% | 33% | 43% | 24% | 24% | 6% | 5% |
| *1956* | 75% | 76% | 33% | 43% | 25% | 24% | 6% | 5% |
| *1957* | 75% | 76% | 33% | 43% | 25% | 24% | 5% | 5% |
| *1958* | 75% | 76% | 33% | 43% | 25% | 24% | 5% | 5% |
| *1959* | 75% | 76% | 32% | 43% | 25% | 24% | 5% | 5% |
| *1960* | 75% | 75% | 32% | 43% | 25% | 25% | 5% | 5% |
| *1961* | 75% | 76% | 33% | 43% | 25% | 24% | 5% | 5% |
| *1962* | 75% | 75% | 33% | 43% | 25% | 25% | 5% | 5% |
| *1963* | 75% | 75% | 33% | 43% | 25% | 25% | 5% | 5% |
| *1964* | 75% | 76% | 31% | 44% | 25% | 24% | 5% | 5% |
| *1965* | 75% | 75% | 32% | 44% | 25% | 25% | 5% | 5% |
| *1966* | 75% | 76% | 31% | 44% | 25% | 24% | 5% | 5% |
| *1967* | 74% | 75% | 31% | 44% | 26% | 25% | 5% | 5% |
| *1968* | 74% | 75% | 31% | 44% | 26% | 25% | 5% | 5% |
| *1969* | 74% | 75% | 32% | 43% | 26% | 25% | 5% | 5% |
| *1970* | 74% | 75% | 32% | 43% | 26% | 25% | 5% | 5% |
| *1971* | 74% | 75% | 32% | 43% | 26% | 25% | 5% | 5% |
| *1972* | 74% | 75% | 32% | 43% | 26% | 25% | 5% | 5% |
| *1973* | 74% | 75% | 32% | 43% | 26% | 25% | 5% | 5% |
| *1974* | 73% | 75% | 32% | 43% | 27% | 25% | 6% | 5% |
| *1975* | 74% | 74% | 33% | 42% | 26% | 26% | 6% | 5% |

**Table 4:** Wage income shares, equal-split adults: Bottom 50%, Middle 40%, Top 10%, Top 1%

| new series<br>*Year* | Bottom 90% | Bottom 50% | Middle 40% | Top 10% | Top 1% |
|---|---|---|---|---|---|
| *1927* | 70% | 20% | 50% | 30% | 8% |
| *1928* | 69% | 19% | 50% | 31% | 9% |
| *1929* | 66% | 19% | 48% | 34% | 9% |
| *1930* | 68% | 20% | 49% | 32% | 9% |
| *1931* | 68% | 20% | 48% | 32% | 8% |
| *1932* | 68% | 20% | 49% | 32% | 8% |
| *1933* | 68% | 20% | 49% | 32% | 8% |
| *1934* | 69% | 20% | 49% | 31% | 8% |
| *1935* | 66% | 19% | 47% | 34% | 9% |
| *1936* | 68% | 20% | 48% | 32% | 9% |
| *1937* | 67% | 20% | 47% | 33% | 8% |
| *1938* | 67% | 20% | 48% | 33% | 8% |
| *1939* | 67% | 20% | 47% | 33% | 8% |
| *1940* | 67% | 20% | 47% | 33% | 8% |
| *1941* | 69% | 20% | 49% | 31% | 8% |
| *1942* | 74% | 24% | 50% | 26% | 7% |
| *1943* | 74% | 24% | 50% | 26% | 6% |
| *1944* | 72% | 23% | 49% | 28% | 6% |
| *1945* | 75% | 31% | 44% | 25% | 6% |
| *1946* | 74% | 31% | 43% | 26% | 7% |
| *1947* | 73% | 31% | 42% | 27% | 7% |
| *1948* | 76% | 30% | 46% | 24% | 6% |
| *1949* | 77% | 31% | 46% | 23% | 6% |
| *1950* | 77% | 31% | 46% | 23% | 6% |
| *1951* | 77% | 31% | 46% | 23% | 5% |
| *1952* | 78% | 31% | 47% | 22% | 5% |
| *1953* | 77% | 31% | 47% | 23% | 5% |
| *1954* | 78% | 31% | 47% | 22% | 5% |
| *1955* | 78% | 32% | 46% | 22% | 5% |
| *1956* | 78% | 32% | 46% | 22% | 5% |
| *1957* | 78% | 32% | 46% | 22% | 5% |
| *1958* | 78% | 33% | 45% | 22% | 5% |
| *1959* | 78% | 31% | 46% | 22% | 5% |
| *1960* | 77% | 31% | 46% | 23% | 5% |
| *1961* | 78% | 32% | 46% | 22% | 5% |
| *1962* | 78% | 31% | 47% | 22% | 5% |
| *1963* | 78% | 32% | 46% | 22% | 5% |
| *1964* | 78% | 31% | 47% | 22% | 4% |
| *1965* | 78% | 32% | 46% | 22% | 5% |
| *1966* | 78% | 32% | 46% | 22% | 5% |
| *1967* | 78% | 32% | 46% | 22% | 5% |
| *1968* | 78% | 30% | 47% | 22% | 5% |
| *1969* | 77% | 30% | 47% | 23% | 5% |
| *1970* | 78% | 32% | 46% | 22% | 4% |
| *1971* | 78% | 32% | 46% | 22% | 5% |
| *1972* | 78% | 32% | 46% | 22% | 5% |
| *1973* | 77% | 31% | 47% | 23% | 5% |
| *1974* | 77% | 30% | 46% | 23% | 5% |
| *1975* | 76% | 30% | 46% | 24% | 5% |

## Appendix 2: Robustness Checks and Sensitivity Analysis

To assess the validity of our findings, and select one method rather than another for the imputation of missing income and missing tax units, it is useful to compare our results to those of Piketty-Saez-Zucman (2018, hereafter PSZ) in the years that they were able to calculate inequality estimates using microdata and IRS public use files. That is, we calibrate our results against PSZ the years after 1962. We show our estimates, then, comparing to the benchmark series, for the years 1962-1975. The imputation method that matches microdata after 1962 would be the better method for imputing data pre-1962, when there is no microdata.

If we assign all "non-filing" tax units to the lefthand side of the income distribution as discussed above, we observe the following pattern (in blue) of top 10% fiscal income shares during the period 1917-1975. By contrast, when we allocate a simple proportional split of non-filing tax units across the income distribution, then we observe a lower level of inequality (in red), albeit a similar pattern. Our comparison of the two methods shows that one follows PSZ (2018) microdata estimates much more closely on top 10% shares of the income distribution:

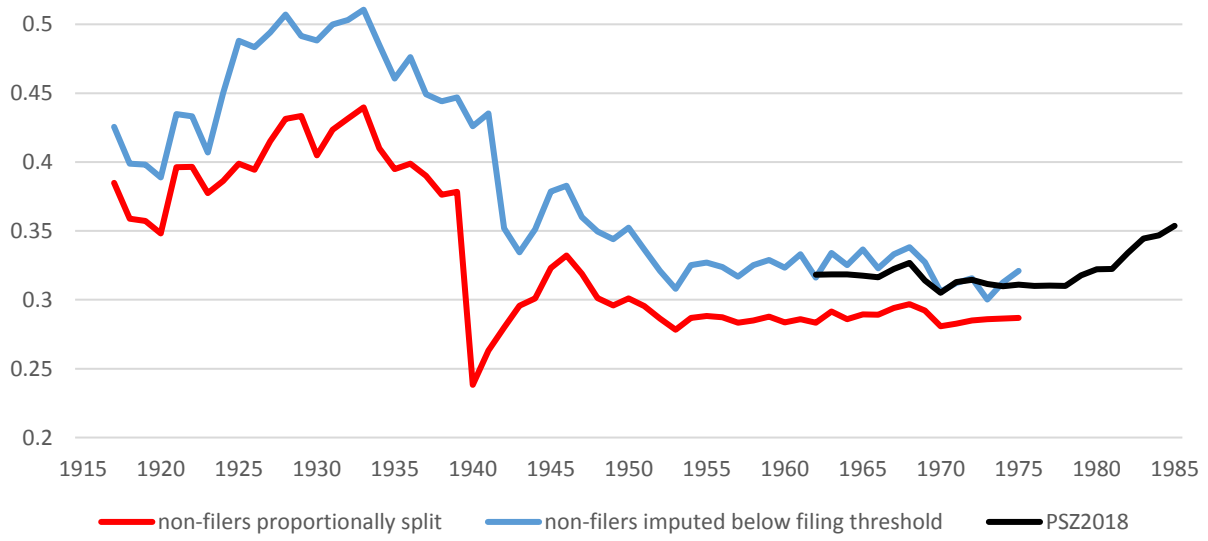


**Figure 26:** Top 10% fiscal income shares, equal-split adults, 1917-85: imputing non-filers to the lefthand side of the income distribution, vs. imputing non-filers with a proportional split along the entire income distribution (to p90)—both compared to PSZ microestimates.

According to these results comparing imputation to microdata estimates, it would seem to make more sense to assign the missing tax units to the leftmost side of the income distribution, and not proportionally split them among all tax units in the distribution of filers. This imputation strategy which allocates

missing income and missing people to the leftmost side of the distribution as opposed to simple proportional split throughout the distribution, also shows a goodness of fit that can be observed in the top 1% shares of fiscal income. We zoom in on the post-war period to make this comparison:

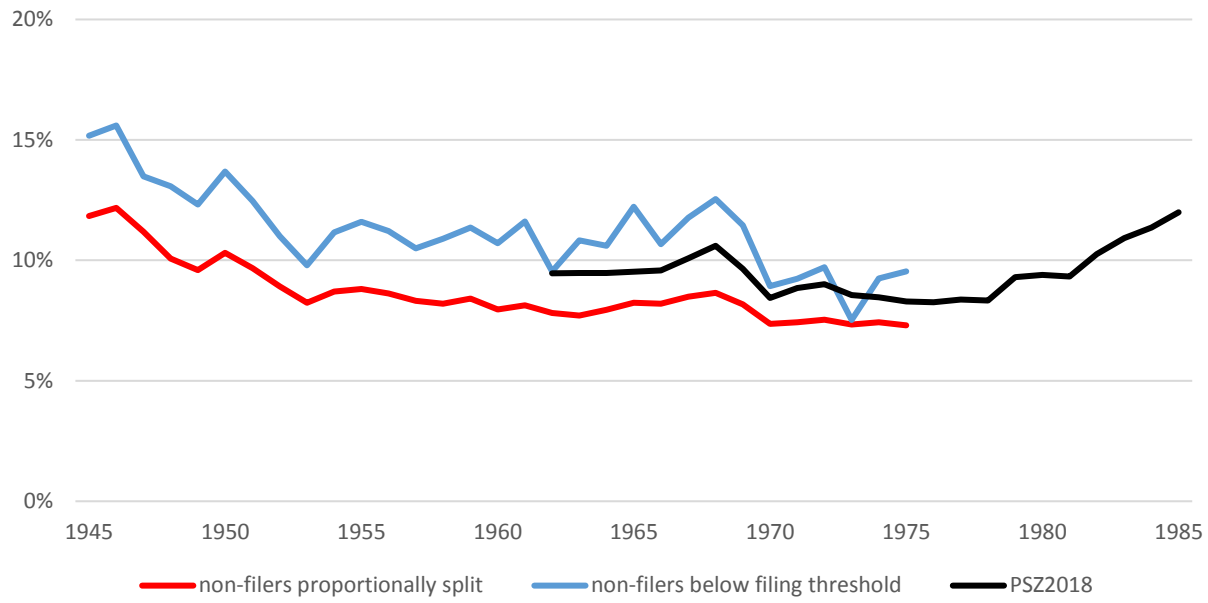


**Figure 27:** Top 1% share of total fiscal income, equal-split adults, 1945-85: imputing non-filers with a proportional split along the entire income distribution (to p90), vs. imputing non-filers as low-income—both compared to PSZ microestimates.

These lefthand-allocation results are also a closer match to microdata estimates of the bottom 50% and middle 40% shares of fiscal income between 1962 and 1975, as well:

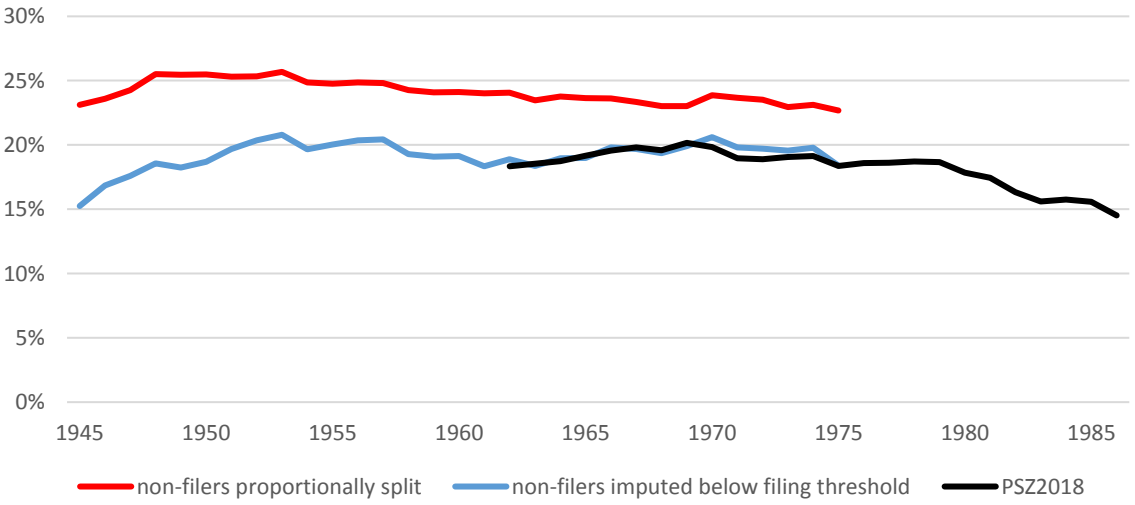


**Figure 28:** Bottom 50% share of total fiscal income, equal-split adults, 1945-85: imputing non-filers with a proportional split along the entire income distribution (to p90), vs. imputing non-filers as low-income—both compared to PSZ microestimates.

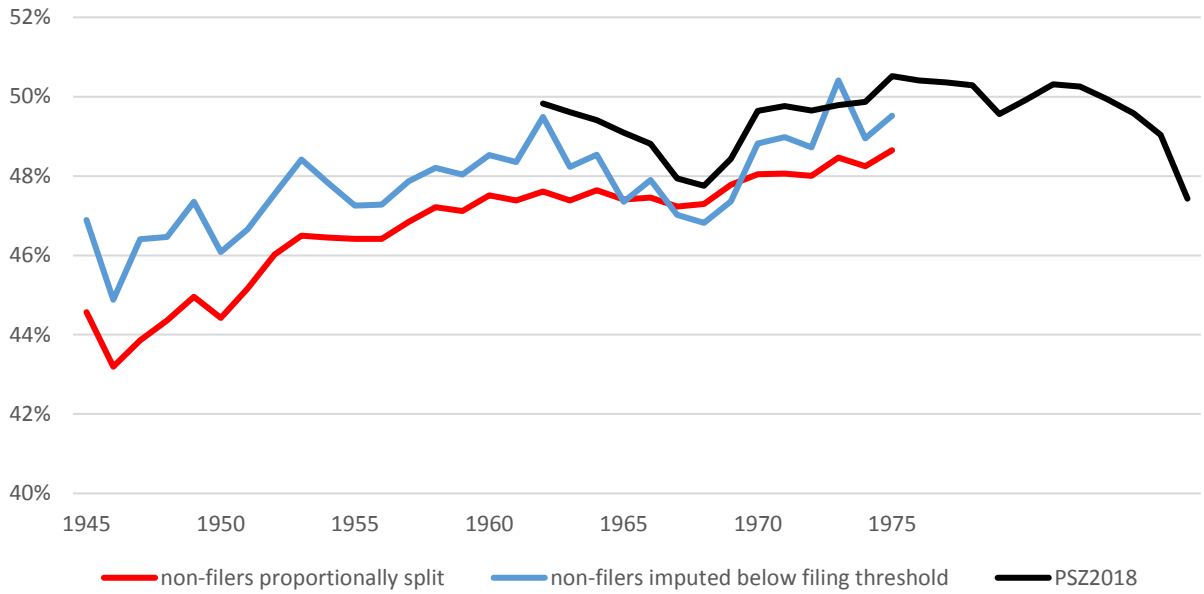


**Figure 29:** Middle 40% share of total fiscal income, equal-split adults, 1945-85: imputing non-filers with a proportional split along the entire income distribution (to p90), vs. imputing non-filers as low-income—both compared to PSZ microestimates.

In fact, the method where we impute all non-filers to below the filing threshold is almost a perfect match for bottom 50% income share. No matter which method of imputation we choose for the nonfilers, we do see that PSZ (2018) find a higher share of income going to the middle 40%. However, if we assign nonfilers to the lefthand side of the distribution, the estimate is closer than if we assign according to a simple proportional split. The remaining difference is within the range of methodological difference: sampling error combined with the small range of error from generalized Pareto curves from bracket tabulations (Blanchet, Fournier and Piketty 2017). The microdata public use files are a sample, while the bracket tabulations are interpolated to yield a smooth income distribution function. Some discrepancy is reasonable, and 1% is likely not unreasonable, but it would be interesting in further research to consider the difference between the result here and the PSZ (2018) result.

In any case, from the results above, we see that the more robust approach is to impute the non-filers as low-income—as below the filing threshold—and not as equally spread throughout the lower 90 percent of the distribution. From these comparisons, we moved forward with the imputation method that placed missing income and missing tax returns on the lefthand side of the distribution, below the filing threshold, rather than the imputation that allocates non-filers equally among the entire bottom 90 percentiles of the distribution.

**Appendix 3: Match of new SOI estimates (1917-75) to PSZ 2018 estimates, for 1962-75 overlap**

As in the text, it is clear that we have a good match at the top 10% share, but it worth showing and exploring this in more detail.

To compare our two methods of non-filer imputation, it is also important to take stock of what is happening at the different thresholds of the income distribution. Here we look at the overall average, and again find that imputing non-filers below the filing threshold is a better match with microdata estimates:

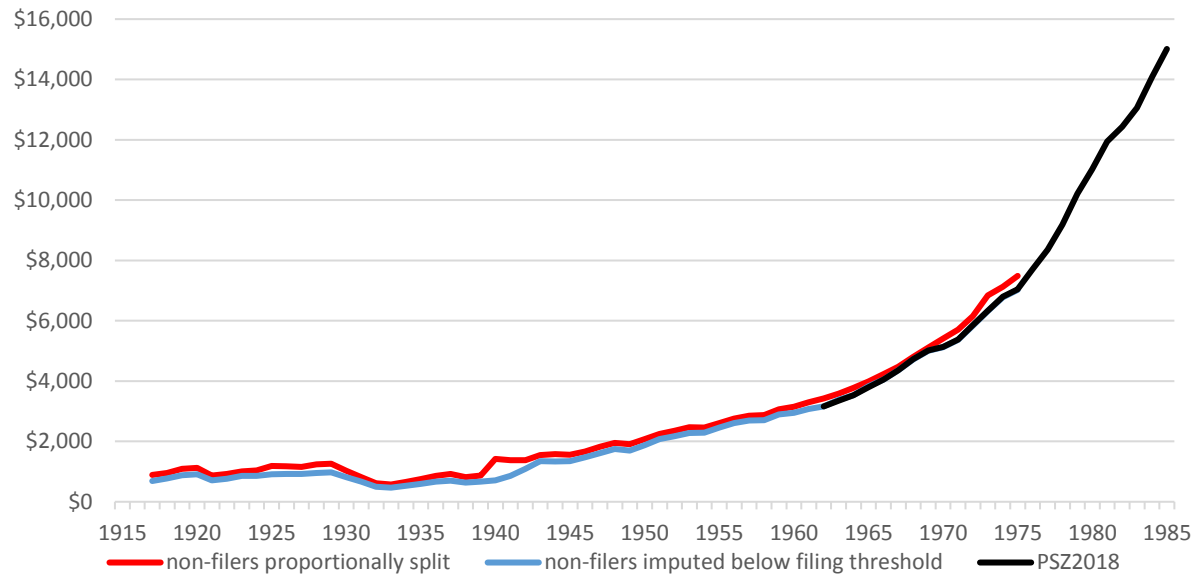


**Figure 30:** Overall average fiscal income (current $US), equal-split adults, 1917-85: imputing non-filers with a proportional split along the entire income distribution (to p90), vs. imputing non-filers as low-income—both compared to PSZ microestimates.

While the method of imputing non-filers as low-income (placing them at the lefthand side of the distribution) decreases the overall average, it does not do so by much, and in some years not at all. In fact, the only reason it should do this would be by the mechanics of our smoothing function. In principle, the 90$^{th}$ percentile should be the same income level in both distributions, and so should the overall average, but when we assume non-filers have a very low income, the generalized Pareto curve income distribution function notes the overall income of the distribution and imputes more of it to the lowest earners. The smoothing function has to adjust some of the percentile thresholds and bracket averages of the distribution, based on the parameter we have attributed to the distribution (in the discussion above), and fitted to the information about the number of tax units in each bracket.

Once we have selected the method that imputes non-filers below the filing threshold, it is also worthwhile to examine comparisons and estimates further. First, we see that the 90th percentile is almost an exact fit between newly tabulated and disaggregated data, and the benchmark PSZ 2018 series:

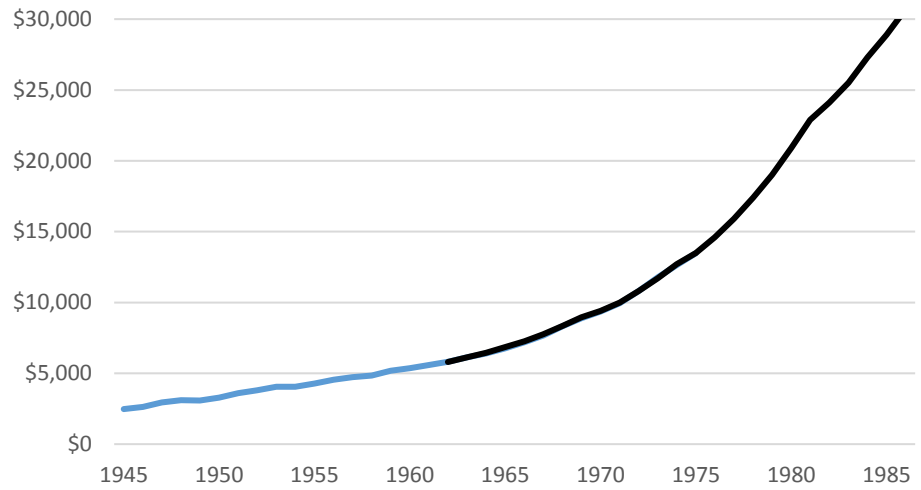


**Figure 31:** Top 10% threshold of total fiscal income (current $US), equal-split adults, 1945-85: new estimates compared to PSZ (2018) microestimates during the period of overlap 1962-75.

We can also show that the Pareto coefficient is very similar between both estimates, at the 90th percentile:

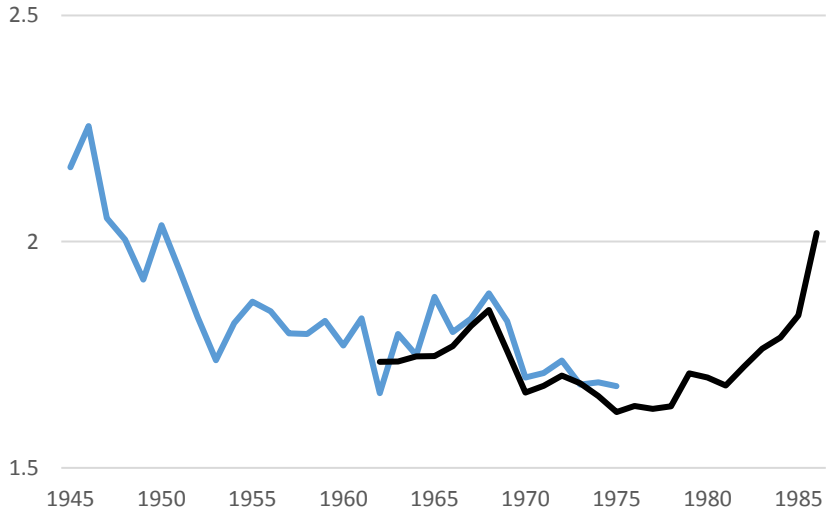


**Figure 32:** Pareto coefficient *b(p)* above top 10% threshold of fiscal income, equal-split adults, 1945-85: new estimates compared to PSZ microestimates during the period of overlap 1962-75.

However, we begin to see some differences in the very top 1%, not much in the top percentile threshold, nor in the top 1% share of overall income, but in the Pareto coefficient.

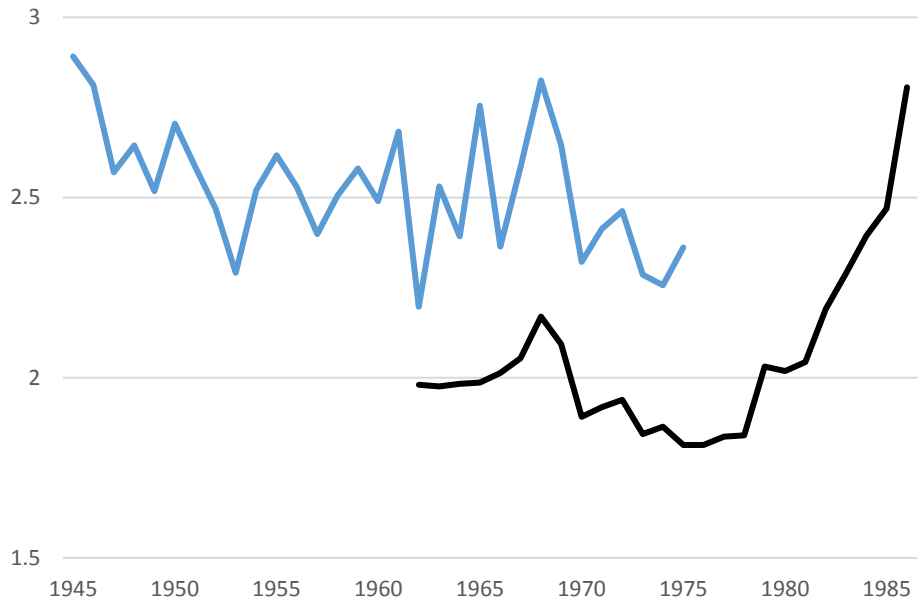


**Figure 33:** Pareto coefficient *b(p)* above top 1% threshold of fiscal income, equal-split adults, 1945-85: new estimates compared to PSZ microestimates during the period of overlap 1962-75.

In fact, this probably has less to do with our imputation strategy than with our particular method of calculating income at the very top. The disparity can be seen in closest detail at the 99.999$^{th}$ percentile. Even there, the threshold levels are similar between both series' estimates:

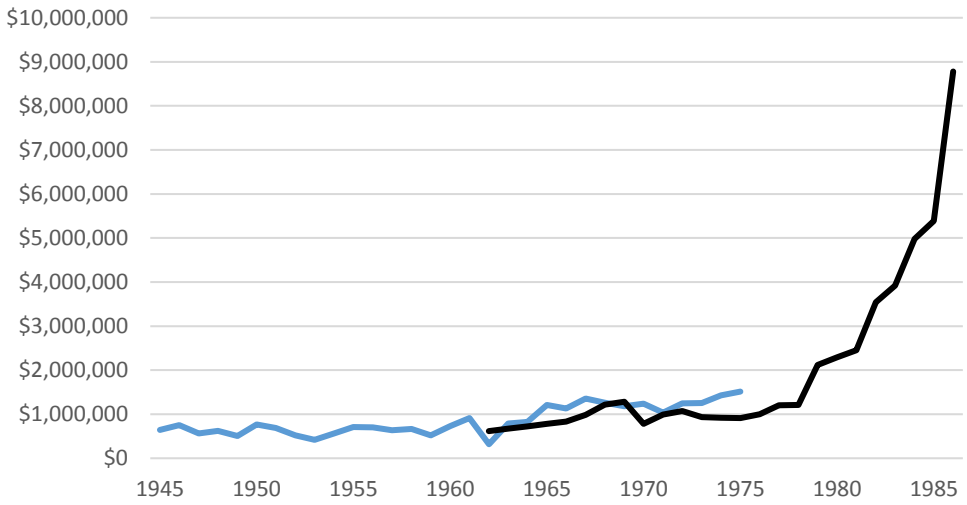


**Figure 34:** Level of top 0.001% threshold of fiscal income (current $US), equal-split adults, 1945-85: new estimates compared to PSZ microestimates during the period of overlap 1962-75.

The estimates up to this point are close. However, our income levels above this point are much more volatile. While the top Pareto coefficient of the PSZ 2018 estimates remains steady, that of the new series swings up and down between years.

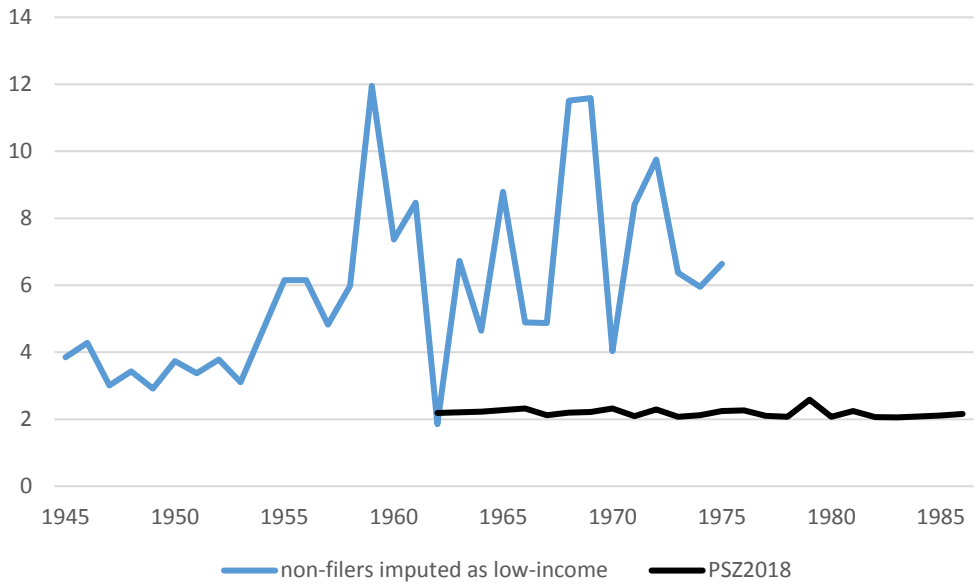


**Figure 35:** Pareto coefficient *b(p)* above top 0.001% threshold of fiscal income, equal-split, 1945-85: new estimates compared to PSZ microestimates during the period of overlap 1962-75.

This can likely be explained by the different treatment of income at the very top. While the PSZ (2018) series creates a more nuanced and multiply imputed top-income measure from use of the Survey of Consumer Finances and asset capitalization methods drawn from Saez-Zucman (2016), our the new estimate from tabulated tax data relies solely on that source and does not benefit from neither microdata nor any similar refinement as in the former case. These adjustments would bring the two series into harmony at the top 0.001%, and in so doing a more perfect overlap on the *entire* annual income distribution.

There is no such similar question for the wage distribution, which agrees at the very top as it does all along the distribution in the percentiles farther below.

## Appendix 4: Comparing Goldsmith-OBE harmonized series estimates with estimates from SOI only

**Table 5:** Fiscal income, tax units, for comparison years 1946, 1955, 1962

| series | Bottom 90% | | Bottom 50% | | Middle 40% | | Top 10% | | Top 1% | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Year* | Goldsmith-OBE harmonized | SOI only | OBE | SOI | OBE | SOI | OBE | SOI | OBE | SOI |
| *1946* | 63% | 63% | 21% | 18% | 42% | 45% | 37% | 37% | 15% | 14% |
| *1955* | 65% | 65% | 22% | 17% | 44% | 48% | 35% | 35% | 12% | 12% |
| *1962* | 67% | 66% | 21% | 15% | 45% | 51% | 33% | 34% | 9% | 10% |

**Table 6:** Fiscal income, equal-split adults, for comparison years 1946, 1955, 1962

| series | Bottom 90% | | Bottom 50% | | Middle 40% | | Top 10% | | Top 1% | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Year* | Goldsmith-OBE harmonized | SOI only | OBE | SOI | OBE | SOI | OBE | SOI | OBE | SOI |
| *1946* | 61% | 62% | 19% | 17% | 42% | 45% | 39% | 38% | 16% | 16% |
| *1955* | 66% | 67% | 20% | 20% | 46% | 47% | 34% | 33% | 12% | 12% |
| *1962* | 68% | 68% | 20% | 19% | 48% | 49% | 32% | 32% | 9% | 10% |

**Appendix 5: Match of new wage income estimates to Piketty-Saez (2003) benchmark series**

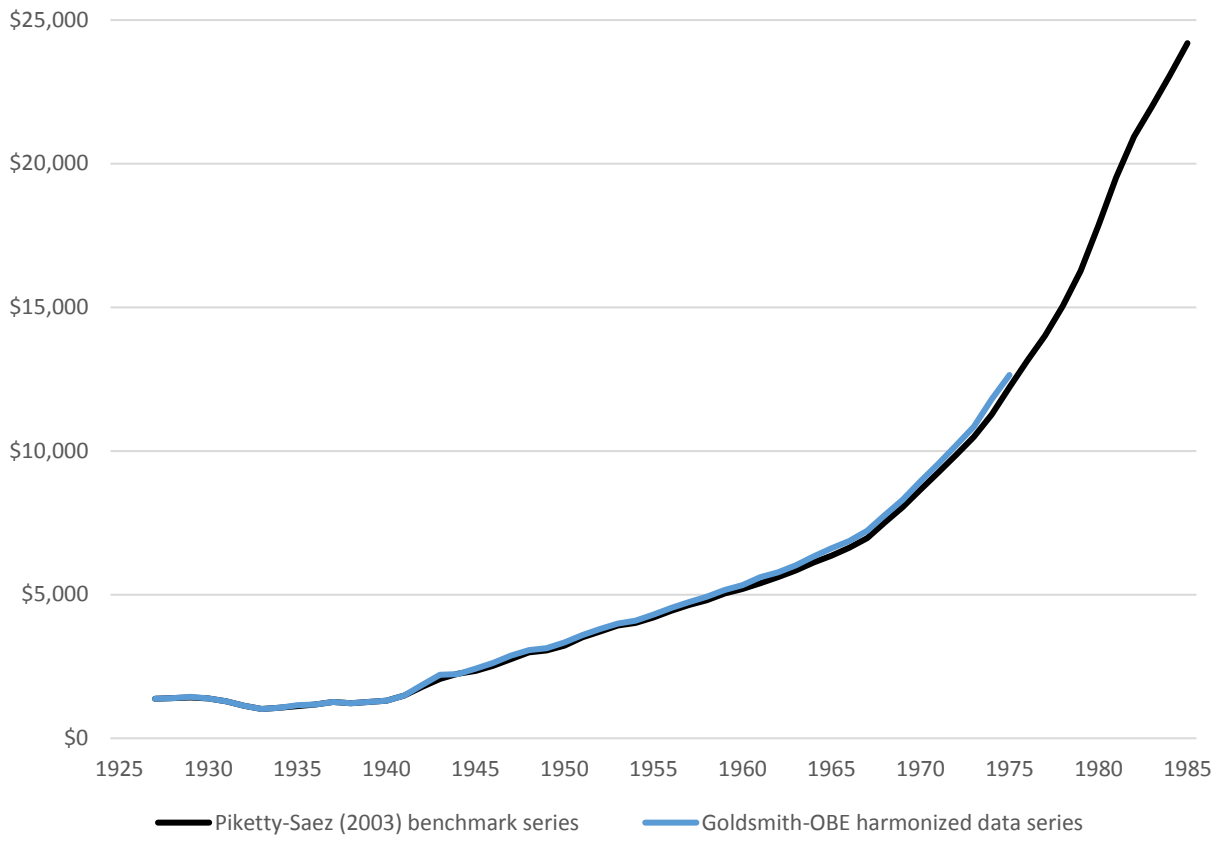


**Figure 36:** Overall average fiscal wage income (current $US), tax units, 1927-2011: Goldsmith-OBE harmonized data series, compared to Piketty-Saez (2003) benchmark series.

The match on overall income is not quite perfect, as our smoothing function needs to make some adjustments to accommodate the observed distribution and impute non-filers into the lefthand side of the distribution, but it comes very close. All dollar figures are in current terms from the era.

## Appendix 6: Example g-percentile table

**Table 7:** Fiscal income inequality, 1950, equal-split adults[23]

| cumulative population density | threshold level (current $US) | share of income above threshold | average income above threshold | bracket average income | Pareto coefficient *b(p)* |
|---|---|---|---|---|---|
| 0% | - | 100% | 1,879 | 14 | - |
| 1% | 27 | 100% | 1,898 | 41 | 69.6 |
| 2% | 55 | 100% | 1,917 | 68 | 35.0 |
| 3% | 82 | 100% | 1,936 | 95 | 23.6 |
| 4% | 108 | 100% | 1,955 | 121 | 18.1 |
| 5% | 133 | 100% | 1,974 | 145 | 14.8 |
| 6% | 156 | 100% | 1,994 | 166 | 12.8 |
| 7% | 176 | 100% | 2,013 | 185 | 11.4 |
| 8% | 193 | 100% | 2,033 | 200 | 10.5 |
| 9% | 206 | 99% | 2,053 | 211 | 10.0 |
| 10% | 216 | 99% | 2,074 | 219 | 9.6 |
| 11% | 222 | 99% | 2,095 | 225 | 9.4 |
| 12% | 227 | 99% | 2,116 | 230 | 9.3 |
| 13% | 234 | 99% | 2,138 | 239 | 9.1 |
| 14% | 245 | 99% | 2,160 | 253 | 8.8 |
| 15% | 263 | 99% | 2,182 | 275 | 8.3 |
| 16% | 290 | 99% | 2,205 | 306 | 7.6 |
| 17% | 325 | 98% | 2,228 | 345 | 6.9 |
| 18% | 367 | 98% | 2,251 | 390 | 6.1 |
| 19% | 415 | 98% | 2,274 | 439 | 5.5 |
| 20% | 464 | 98% | 2,297 | 487 | 5.0 |
| 21% | 509 | 98% | 2,319 | 530 | 4.6 |
| 22% | 549 | 97% | 2,342 | 570 | 4.3 |
| 23% | 590 | 97% | 2,365 | 611 | 4.0 |
| 24% | 632 | 97% | 2,389 | 651 | 3.8 |
| 25% | 670 | 96% | 2,412 | 690 | 3.6 |
| 26% | 710 | 96% | 2,435 | 731 | 3.4 |
| 27% | 752 | 96% | 2,458 | 773 | 3.3 |
| 28% | 792 | 95% | 2,482 | 812 | 3.1 |
| 29% | 833 | 95% | 2,505 | 854 | 3.0 |
| 30% | 874 | 94% | 2,529 | 893 | 2.9 |
| 31% | 912 | 94% | 2,552 | 930 | 2.8 |
| 32% | 948 | 93% | 2,576 | 966 | 2.7 |
| 33% | 985 | 93% | 2,600 | 1,003 | 2.6 |
| 34% | 1,021 | 92% | 2,625 | 1,038 | 2.6 |
| 35% | 1,056 | 92% | 2,649 | 1,073 | 2.5 |
| 36% | 1,091 | 91% | 2,674 | 1,108 | 2.5 |
| 37% | 1,126 | 90% | 2,698 | 1,142 | 2.4 |
| 38% | 1,158 | 90% | 2,724 | 1,173 | 2.4 |
| 39% | 1,189 | 89% | 2,749 | 1,205 | 2.3 |
| 40% | 1,221 | 89% | 2,775 | 1,237 | 2.3 |
| 41% | 1,253 | 88% | 2,801 | 1,268 | 2.2 |
| 42% | 1,282 | 87% | 2,827 | 1,297 | 2.2 |
| 43% | 1,312 | 87% | 2,854 | 1,327 | 2.2 |
| 44% | 1,342 | 86% | 2,881 | 1,357 | 2.1 |
| 45% | 1,372 | 85% | 2,909 | 1,387 | 2.1 |
| 46% | 1,401 | 84% | 2,937 | 1,415 | 2.1 |
| 47% | 1,429 | 84% | 2,966 | 1,442 | 2.1 |
| 48% | 1,456 | 83% | 2,995 | 1,470 | 2.1 |
| 49% | 1,485 | 82% | 3,025 | 1,498 | 2.0 |
| 50% | 1,512 | 81% | 3,056 | 1,525 | 2.0 |
| 51% | 1,538 | 81% | 3,087 | 1,551 | 2.0 |
| 52% | 1,563 | 80% | 3,119 | 1,576 | 2.0 |
| 53% | 1,589 | 79% | 3,152 | 1,602 | 2.0 |
| 54% | 1,615 | 78% | 3,185 | 1,628 | 2.0 |
| 55% | 1,642 | 77% | 3,220 | 1,656 | 2.0 |
| 56% | 1,670 | 76% | 3,256 | 1,684 | 1.9 |
| 57% | 1,699 | 75% | 3,292 | 1,714 | 1.9 |
| 58% | 1,729 | 74% | 3,330 | 1,744 | 1.9 |
| 59% | 1,758 | 74% | 3,368 | 1,772 | 1.9 |
| 60% | 1,786 | 73% | 3,408 | 1,800 | 1.9 |

[23] Similar tables are available for all years 1917-75, for fiscal and wage income, by tax units and equal-split adults

| cumulative population density | threshold level (current $US) | share of income above threshold | average income above threshold | bracket average income | Pareto coefficient *b(p)* |
|---|---|---|---|---|---|
| 61% | 1,813 | 72% | 3,450 | 1,827 | 1.9 |
| 62% | 1,840 | 71% | 3,492 | 1,854 | 1.9 |
| 63% | 1,868 | 70% | 3,537 | 1,883 | 1.9 |
| 64% | 1,898 | 69% | 3,582 | 1,913 | 1.9 |
| 65% | 1,929 | 68% | 3,630 | 1,945 | 1.9 |
| 66% | 1,961 | 67% | 3,680 | 1,978 | 1.9 |
| 67% | 1,994 | 66% | 3,731 | 2,010 | 1.9 |
| 68% | 2,026 | 64% | 3,785 | 2,042 | 1.9 |
| 69% | 2,058 | 63% | 3,841 | 2,074 | 1.9 |
| 70% | 2,090 | 62% | 3,900 | 2,107 | 1.9 |
| 71% | 2,124 | 61% | 3,962 | 2,142 | 1.9 |
| 72% | 2,160 | 60% | 4,027 | 2,178 | 1.9 |
| 73% | 2,197 | 59% | 4,096 | 2,216 | 1.9 |
| 74% | 2,235 | 58% | 4,168 | 2,255 | 1.9 |
| 75% | 2,274 | 56% | 4,244 | 2,294 | 1.9 |
| 76% | 2,314 | 55% | 4,326 | 2,334 | 1.9 |
| 77% | 2,355 | 54% | 4,412 | 2,376 | 1.9 |
| 78% | 2,398 | 53% | 4,505 | 2,421 | 1.9 |
| 79% | 2,445 | 51% | 4,604 | 2,469 | 1.9 |
| 80% | 2,493 | 50% | 4,711 | 2,518 | 1.9 |
| 81% | 2,544 | 49% | 4,826 | 2,570 | 1.9 |
| 82% | 2,596 | 47% | 4,951 | 2,623 | 1.9 |
| 83% | 2,651 | 46% | 5,088 | 2,680 | 1.9 |
| 84% | 2,709 | 45% | 5,239 | 2,741 | 1.9 |
| 85% | 2,773 | 43% | 5,405 | 2,809 | 1.9 |
| 86% | 2,847 | 42% | 5,591 | 2,886 | 2.0 |
| 87% | 2,926 | 40% | 5,799 | 2,969 | 2.0 |
| 88% | 3,013 | 39% | 6,035 | 3,061 | 2.0 |
| 89% | 3,112 | 37% | 6,305 | 3,167 | 2.0 |
| 90% | 3,224 | 35% | 6,619 | 3,284 | 2.1 |
| 91% | 3,346 | 33% | 6,990 | 3,413 | 2.1 |
| 92% | 3,483 | 32% | 7,437 | 3,566 | 2.1 |
| 93% | 3,656 | 30% | 7,990 | 3,757 | 2.2 |
| 94% | 3,863 | 28% | 8,695 | 3,987 | 2.3 |
| 95% | 4,130 | 26% | 9,637 | 4,310 | 2.3 |
| 96% | 4,508 | 23% | 10,968 | 4,792 | 2.4 |
| 97% | 5,127 | 21% | 13,027 | 5,661 | 2.5 |
| 98% | 6,357 | 18% | 16,710 | 7,716 | 2.6 |
| 99% | 9,739 | 14% | 25,705 | 10,062 | 2.6 |
| 99.1% | 10,401 | 13% | 27,444 | 10,786 | 2.6 |
| 99.2% | 11,196 | 13% | 29,526 | 11,660 | 2.6 |
| 99.3% | 12,153 | 12% | 32,078 | 12,708 | 2.6 |
| 99.4% | 13,303 | 11% | 35,306 | 14,001 | 2.7 |
| 99.5% | 14,763 | 11% | 39,568 | 15,690 | 2.7 |
| 99.6% | 16,720 | 10% | 45,537 | 18,035 | 2.7 |
| 99.7% | 19,551 | 9% | 54,704 | 21,662 | 2.8 |
| 99.8% | 24,232 | 8% | 71,225 | 28,572 | 2.9 |
| 99.9% | 34,801 | 6% | 113,879 | 35,805 | 3.3 |
| 99.91% | 36,871 | 6% | 122,554 | 38,085 | 3.3 |
| 99.92% | 39,384 | 6% | 133,112 | 40,883 | 3.4 |
| 99.93% | 42,501 | 5% | 146,288 | 44,414 | 3.4 |
| 99.94% | 46,510 | 5% | 163,267 | 49,061 | 3.5 |
| 99.95% | 51,888 | 5% | 186,108 | 55,445 | 3.6 |
| 99.96% | 59,506 | 5% | 218,774 | 64,960 | 3.7 |
| 99.97% | 71,415 | 4% | 270,045 | 81,076 | 3.8 |
| 99.98% | 93,344 | 4% | 364,530 | 116,327 | 3.9 |
| 99.99% | 150,915 | 3% | 612,732 | 156,608 | 4.1 |
| 99.991% | 162,665 | 3% | 663,412 | 169,572 | 4.1 |
| 99.992% | 176,976 | 3% | 725,142 | 185,558 | 4.1 |
| 99.993% | 194,843 | 3% | 802,226 | 205,838 | 4.1 |
| 99.994% | 217,878 | 3% | 901,624 | 232,550 | 4.1 |
| 99.995% | 248,884 | 3% | 1,035,438 | 269,604 | 4.2 |
| 99.996% | 293,235 | 3% | 1,226,897 | 325,098 | 4.2 |
| 99.997% | 362,847 | 2% | 1,527,496 | 419,350 | 4.2 |
| 99.998% | 491,105 | 2% | 2,081,569 | 625,557 | 4.2 |
| 99.999% | 827,919 | 2% | 3,537,582 | 3,537,582 | 4.3 |