Part 1: Inequality in What? Income Measures and Wage Measures

James J. Heckman
University of Chicago

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Inequality in What? Alternative Measures of Inequality and Social Mobility

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Some Graphs that Capture the Attention of the Profession

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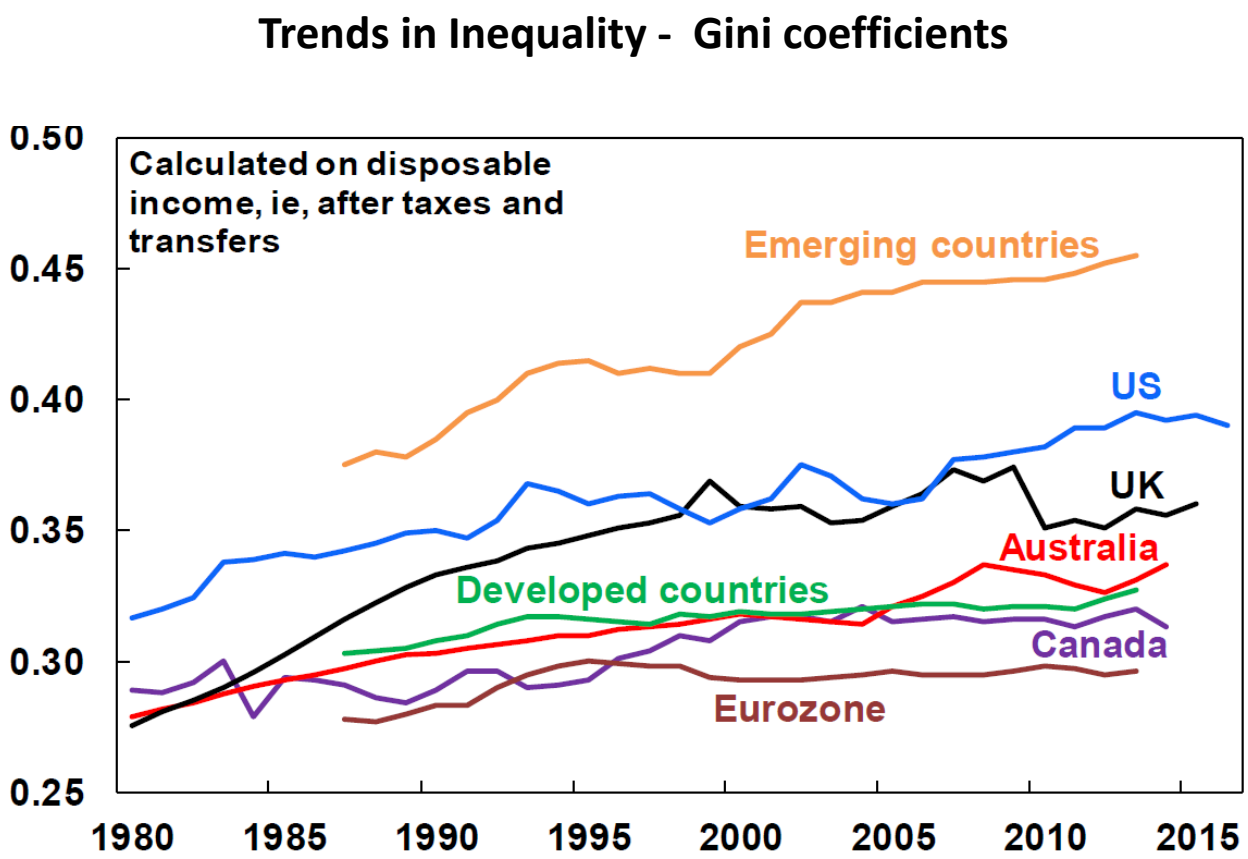
Figure 1: Cross-National Trends in Inequality – Gini coefficients



Source: OECD, Standardised World Income Inequality Database, AMP Capital

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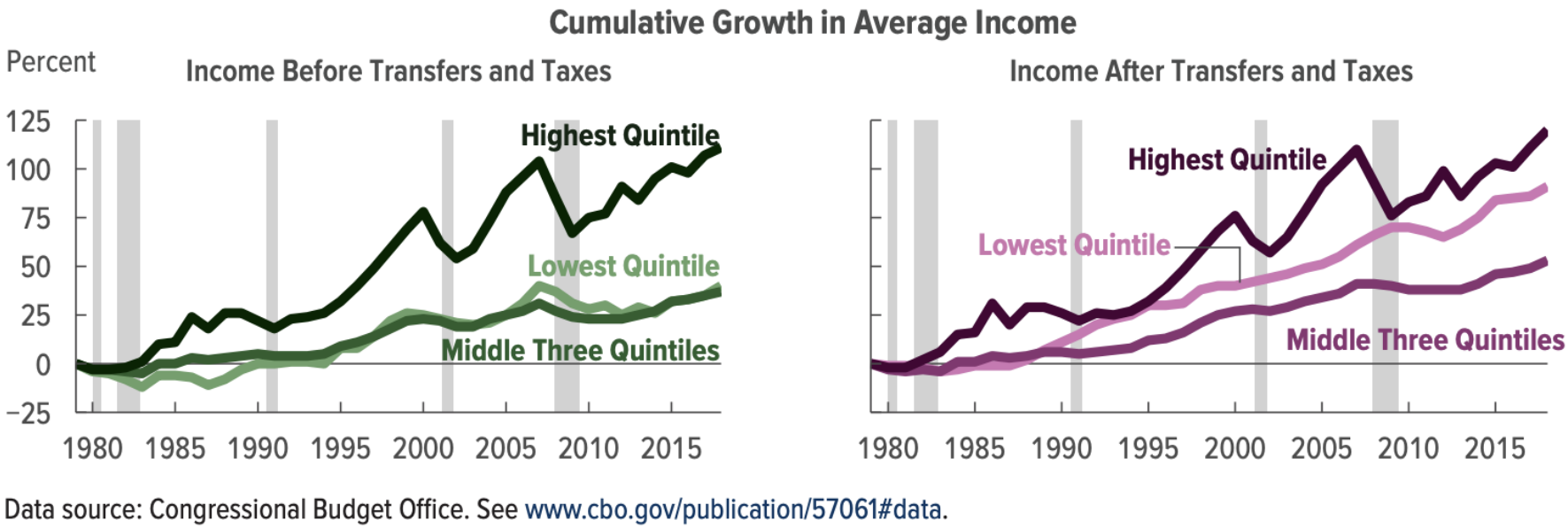
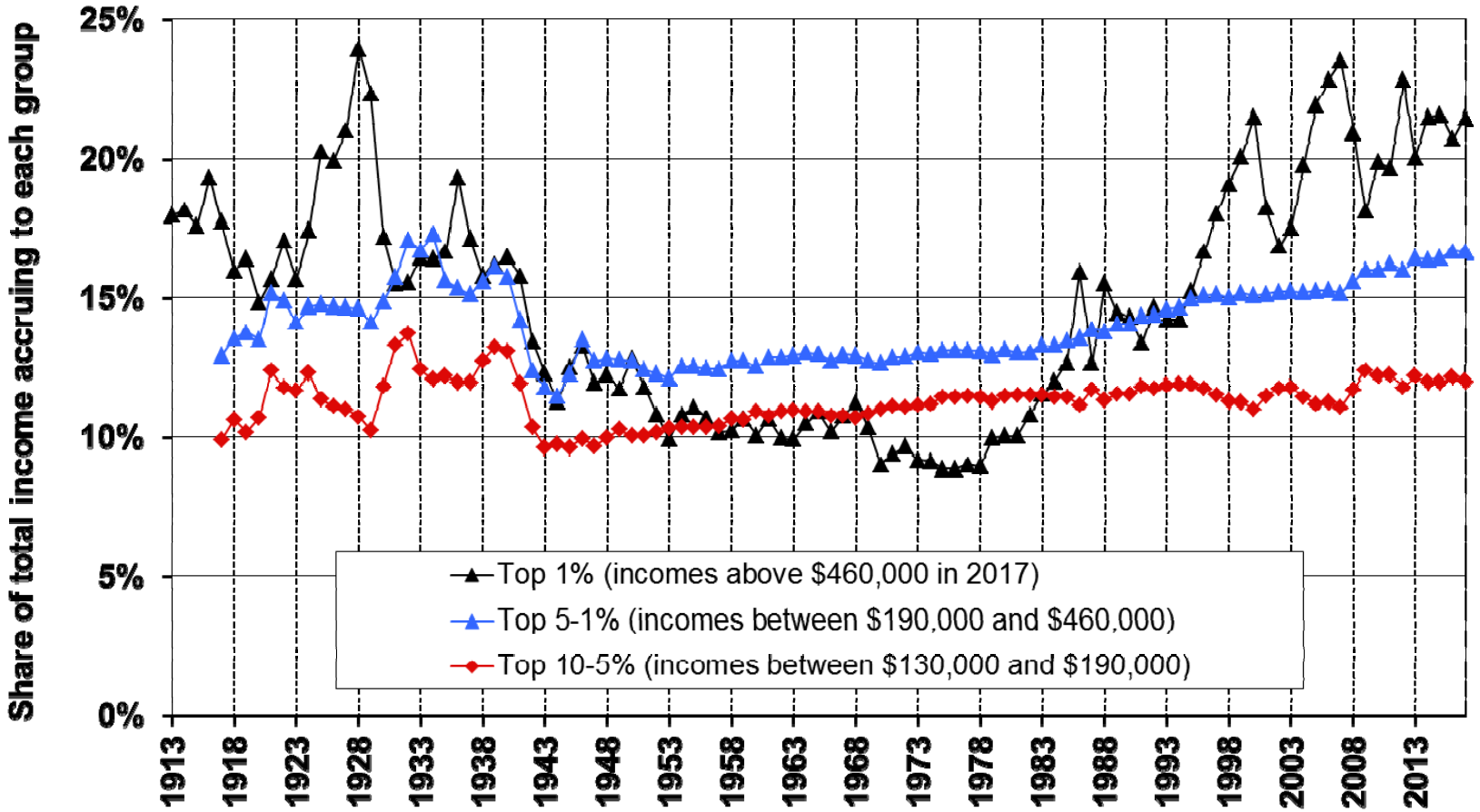
Figure 2: Cumulative Growth in Average Income, by Income Group, 1979 to 2020: U.S.



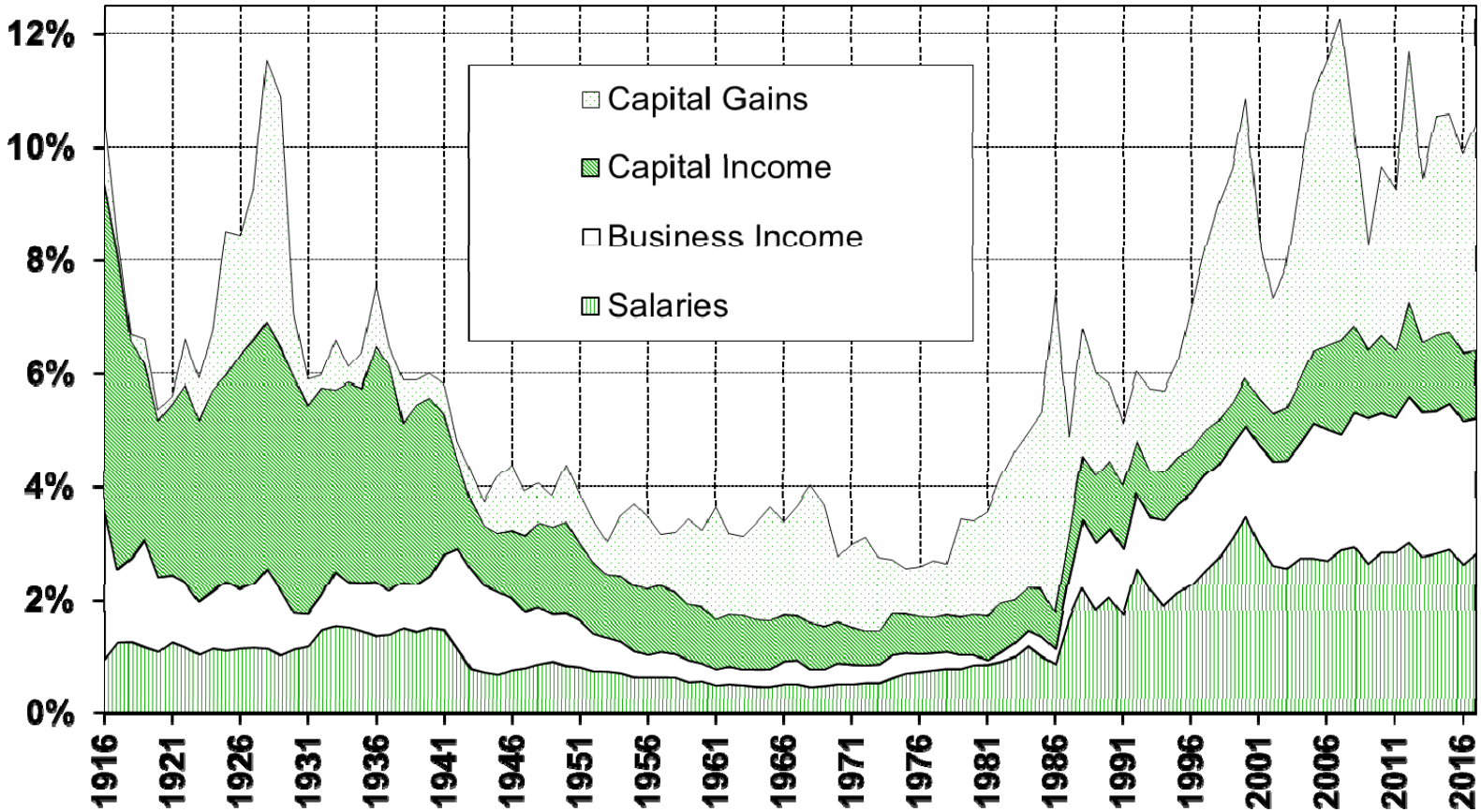
Data source: Congressional Budget Office. See www.cbo.gov/publication/57061#data.

Figure 3: Decomposing Top 10% into 3 Groups, 1913-2017: U.S.



Source: Piketty and Saez, 2003 updated to 2017. Series based on pre-tax cash market income including realized capital gains and excluding government transfers.

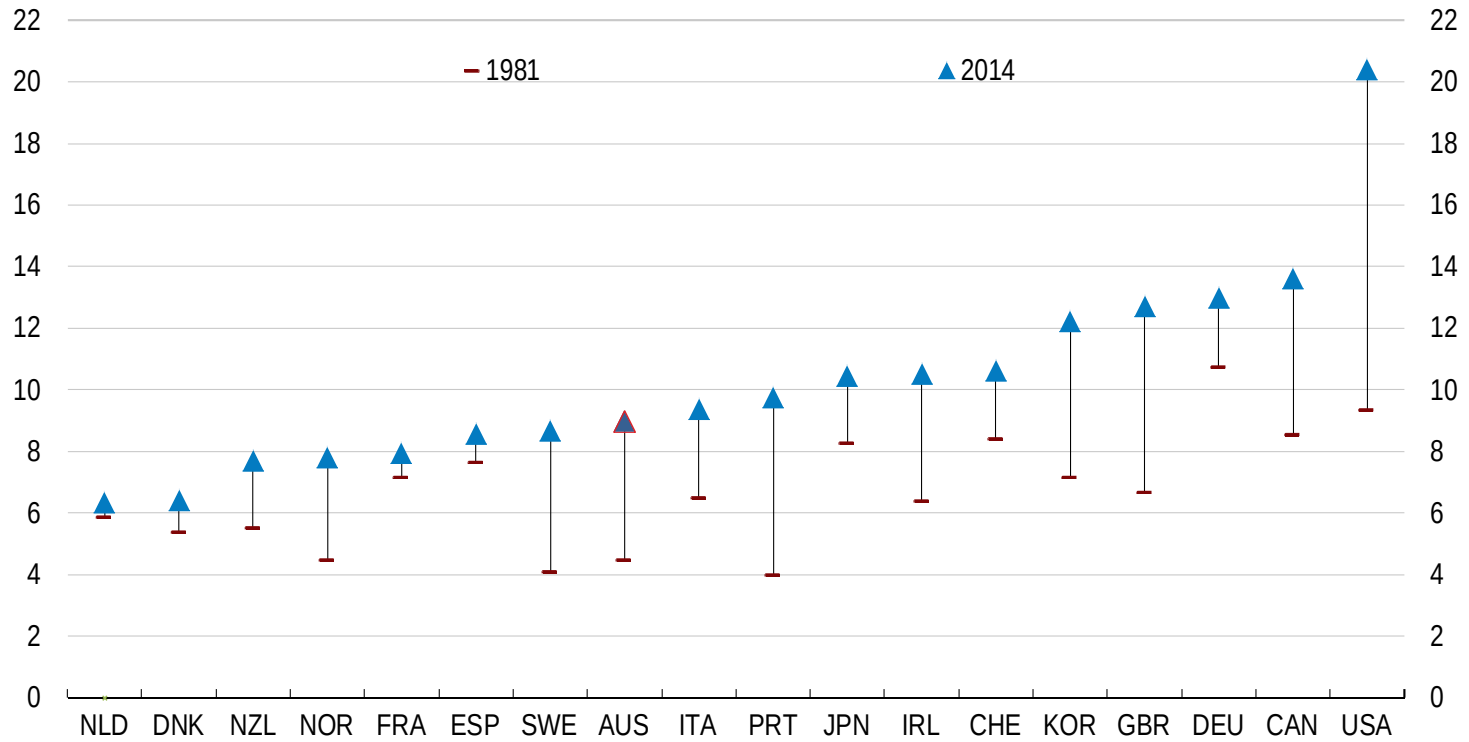
Figure 4: U.S. Top 0.1% Pre-Tax Income Share and Composition



Source: Piketty and Saez, 2003 updated to 2017. Series based on pre-tax cash market income including or excluding realized capital gains, and always excluding government transfers.
Note: The Figure displays the top 0.1% income share and its composition. Top 0.1% defined by market income including realized capital gains.

Piketty and Saez

Figure 5: Shares of top 1% incomes in total pre-tax income, 1980 – 2014 (or closest available period)



Source: OECD Economic Survey: Australia 2017.

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Sources of Inequality

I. Taxes and Transfers?
II. Skills? Skill Premia? (Technology? Lagging Supply? Or both?)
III. Genetics?
V. Macroeconomic Factors?
V. Family Structure?
VI Tax Reporting and Tax Income Units

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What Income is Being Measured? (What Components Drive the Time Series?)

Capital? (Piketty and Coauthors)
Wages and Skills? (A Lot of Labor Economics)

What Policies Indicated?

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Income Measurements

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Measures of income are sensitive

- To measure income one has to make choices on
  - **Measure:** Central tendency (Median); Inequality (Share held by top 1%, share by quintile, Gini)
  - **Type of income:** Labor earnings (wages, salary; hourly, weekly, annual); market earnings; whether and how to include government transfers; employer-provided benefits; pre- or post-tax
  - **Source:** Survey (CPS-ORG, CPS-March, CPS-ASEC, Census); IRS; Social Security
  - **Methodology:** Unit of measurement (tax unit vs individual vs size-adjusted HH); missing income; inflation index
- These choices can be consequential for the resulting story on what income distributions look like and how they have evolved over time
  - Measurements of median income are not sensitive to data source, but are sensitive to type of income and methodology
  - Measurements of inequality are sensitive to data source, type of income, and methodology

Sensitivity of median income

TABLE 1

Median Income Growth, 1979–2014

Study	Change in median (%)	Price deflater	Income concept	Adjust for size	Unit of analysis, 2014
Piketty and Saez (2003)	-8	CPI-U-RS	Gross income as reported on tax forms without government transfers	No	165 million tax filers[a]
CPS	7	CPI-U-RS	Pretax, postcash transfers and no employer benefits	No	123 million households
Rose (2016)	30	PCE	Pretax, postcash transfers and no employer benefits	Yes	186 million independent adults
Piketty, Saez, and Zucman (2018)	33	National income deflater	All national income including homeownership and government services	No	234 million adults age 20 and older
Burkhauser, Larrimore, and Simon (2011)[b]	37	CPI-U-RS	Posttax, posttransfer income with health benefits	Yes	117 million households
CBO (2018)	51	PCE	Posttax and post- and noncash transfers and employer benefits	Yes	310 million people

Sources: Table 2C13 in Piketty, Saez, and Zucman's (2018) "Appendix II: Detailed distributional series"; table 2D13 in Piketty and Saez (2003); Supplemental Data Spreadsheet #4 in CBO (2018); Rose (2016); and Burkhauser, Larrimore, and Simon (2011).
Notes: Piketty and Saez (2003) has been updated to 2014 and includes capital gains.
[a] Some low-income people do not file tax returns. Piketty and Saez (2003) created tax records by giving them an imputed amount of income.
[b] This study compares 2007 with 1979; the 2007 median income is very close to the 2014 median.

Figure 6: Rose (2018)

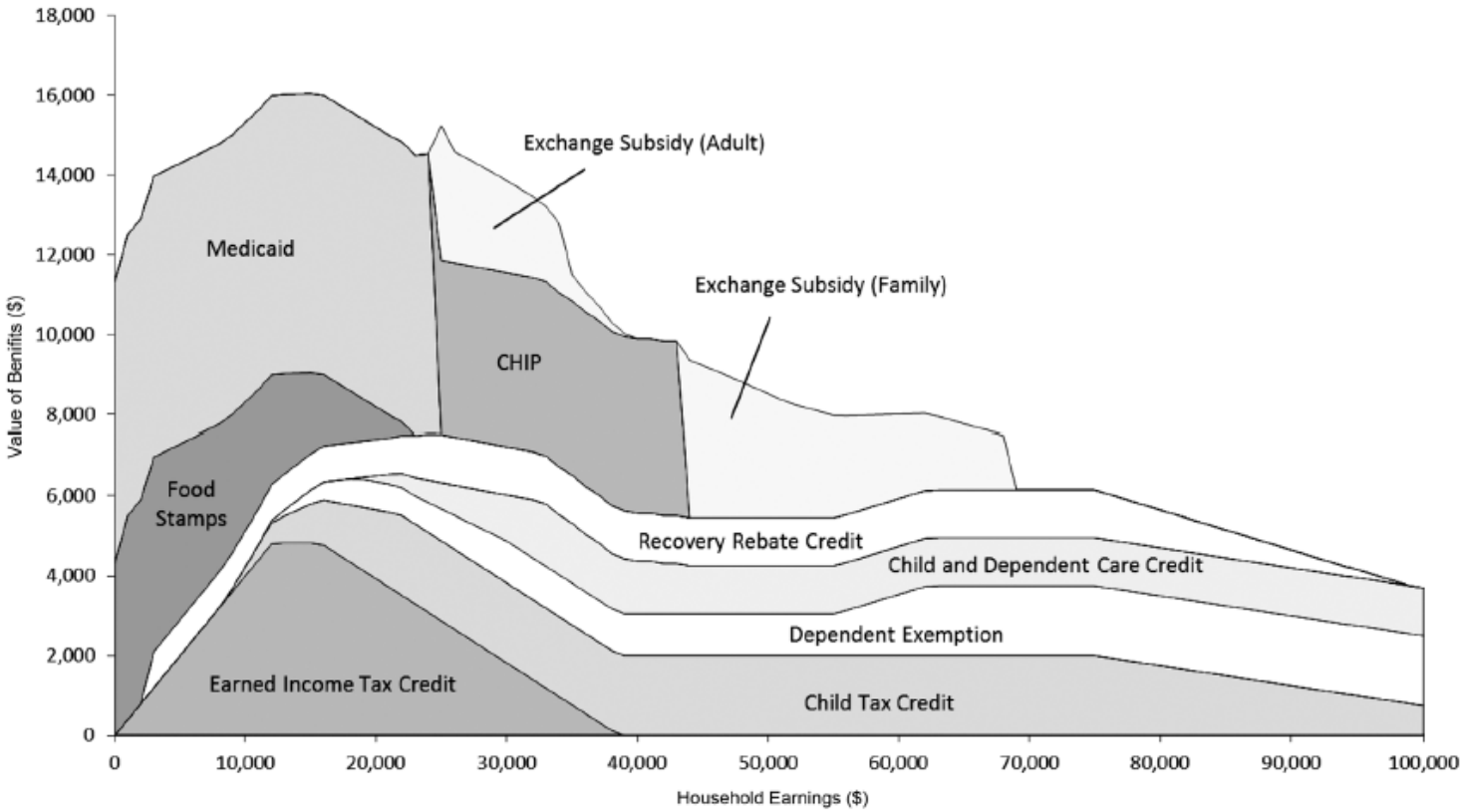
Reconciling studies of median income growth

- Studies measuring median income differ in estimates, but they also differences in data sources and methodology
- For example, consider the following two studies (same authors!)
- Piketty & Saez (2003)
  - Exclude government transfers and employer health care contributions
  - Unit of analysis is the tax unit, estimate incomes for non-filers
    - Tax-filing units have grown faster than population growth because fewer adults are marrying and more people are filing as single adults (from 44% in 1979 to 56% in 2014)
- Piketty, Saez & Zucman (2018)
  - 41 percentage point difference from Piketty & Saez (2003)
    - 14 percentage points attributed to adjusting for taxation and including all components of national income (employer benefits, government transfers and services)
    - 7 percentage points attributed to using the national income price deflator that is closer to the PCE than the CPI-U-RS
    - 20 percentage points attributed to changing the unit analysis from tax unit to all Americans age 20 and older as the unit of observation

Some sense of the size of transfers

Figure 1

Universally Available Tax and Transfer Benefits
(Single Parent with Two Children in Colorado, 2008)

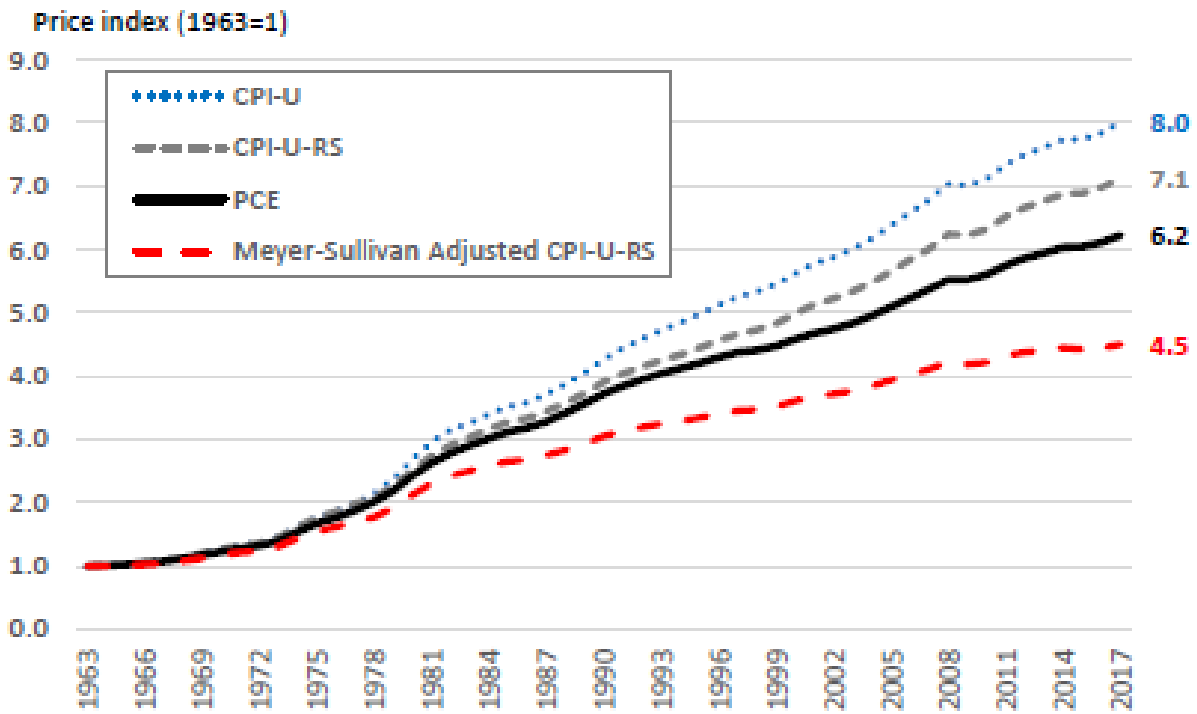


Notes: Value of tax and value transfer benefits for a single parent with two children living in Colorado. Tax and transfer rules are for 2008 with hypothetical exchange plans in 2014 added in. Health value estimates are based on Medicaid spending and insurance premiums as reported by the Kaiser Family Foundation. Coverage varies by source: Medicaid and CHIP benefits are more comprehensive and have less cost-sharing than those in the exchange. Medicaid and CHIP also pay providers for services at lower rates than private insurers.

Figure 7: Maag et al. (2012)

The choice of price index is consequential

Figure 1. Price index based on various inflation measures, 1963 to 2017



Sources: Bureau of Labor Statistics, Bureau of Economic Analysis; Authors' calculations.
Note: CPI denotes Consumer Price Index. CPI-U-RS denotes CPI Research Series. PCE denotes Personal Consumption Expenditure price index. As described in Meyer and Sullivan (2012b, 2018), the Meyer-Sullivan adjusted CPI-U-RS is calculated by subtracting 0.8 percentage points from the growth rate in the CPI-U-RS for each year from 1978 through 2017, and subtracting 1.1 percentage points from the growth rate in the CPI-U-RS for each year from 1963 through 1977.

Figure 8: Burkhauser et al. 2019.

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Adjusting for economies of scale

Number of household members [a]	Household income [b]	Household income per person [b]/[a]	Equivalence scale [b]/sqrt([a])
1	100,000	$ 100,000	$ 100,000
2	100,000	$ 50,000	$ 70,711
3	100,000	$ 33,333	$ 57,735
4	100,000	$ 25,000	$ 50,000
5	100,000	$ 20,000	$ 44,721
6	100,000	$ 16,667	$ 40,825

Number of household members [a]	Household income [b]	Household income per person [b]/[a]	Equivalence scale [b]/sqrt([a])
1	57,735	$ 57,735	$ 57,735
2	81,650	$ 40,825	$ 57,735
3	100,000	$ 33,333	$ 57,735
4	115,470	$ 28,868	$ 57,735
5	129,099	$ 25,820	$ 57,735
6	141,421	$ 23,570	$ 57,735

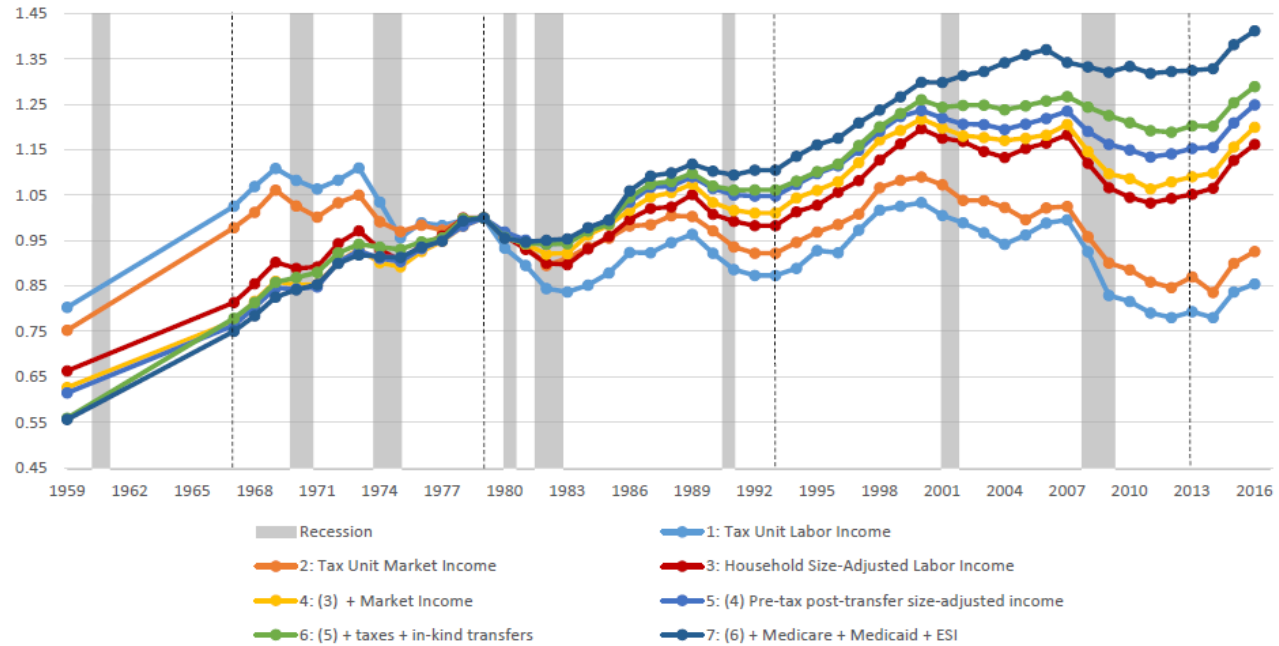
- There are economies of scale when multiple people share a household
  - Ex. The rent on a two-bedroom apartment is generally less than twice the rent of a one-bedroom apartment
- To calculate per-person income from household income, the equivalence scale divides by the square root of the number of household members

Isolating changes in methodology for measuring median income

- Elwell et al. (2019) study the evolution of median income from 1959 to 2016
- Highlight the sensitivity of measurements to the income type and methodology
  - Document decline in market income of the middle class since 1969 (orange series in the next slide)
  - But show the decline more than offset by taxes and transfers
- In the next slide, read off incremental changes in the following order
  - Light blue is the labor income at the tax unit
  - Red switches to household size-adjusted unit
  - Yellow switches to market income
  - Dark blue adds transfers, taxes, in-kind transfers, Medicare, Medicaid and employer-sponsored health insurance (ESI)
- We will return to this chart and outline the different methodologies shortly

Whether median income has increased or decreased over time depends on income-type and methodology

Figure 1. Alternative Measures of Median Income Normalized to 1979 Levels (1959-2016)



Sources: Authors' calculations using the ASEC-CPS, NHEA, White House Budget Historical Tables, Statistical Abstracts of the U.S., Census Bureau population estimates, USDA SNAP Data Tables and Child Nutrition Tables, BLS CPI for Medical Care in U.S. City Average, CMS Medicare Enrollment Data, MACPAC Medicaid Enrollment Data, Kramer (1988), Collinson et al. (2016), Hoynes et al. (2016). Taxes calculated using NBER TaxSim.

Notes: Median income trends normalized to one in 1979 with NBER recession dates in gray. In keeping with previous work (Armour et al., 2014; Burkhauser et al., 2012b; Larrimore et al., 2015), "Series 1: Tax Unit Labor Income" measures the size-unadjusted labor income of tax units. Series 2 adds market income. In series 3-7 we adjust for persons in the household using the square-root of household size. Vertical dashed lines signify breaks in the data due to start of our use of ASEC-CPS data with our new imputations in 1967; start of standard ASEC-CPS data in 1979; and assumption that all changes in income between 1992 and 1993 and between 2013 and 2014 were due to the change in CPS survey methods with prior years adjusted accordingly.

- Median income as a share of 1979 median income level

Elwell et al. (2019) - Data

- Use public use ASEC-CPS data for income years 1967-2016
  - Better flexibility in specification of income and income-sharing unit than tax data
  - Adjusts for differences in household size/composition using the equivalence scale
  - Does not fully capture the highest incomes, which tax-based data do, but unlikely to affect the results on median income
- Since many Great Society programs began before 1967 (ex. Medicare and Medicaid), extend data back to earlier peak of 1959 using Decennial Census
  - Extend back to peak to separate trends in income growth from business cycle variation
  - ASEC-CPS and Census values are similar in overlapping years (1969, 1979, and 1989)

Data continued

- Account for two breaks in ASEC-CPS methodology
  - 1992-1993: Improvement in survey questions
    - Adjust by assuming decrease in median income in this period is caused by methodology, adjust median income in preceding years by the same percentage
  - 2013: Improvement in methods. ASEC-CPS split population and used past years' methods for one and a new method for the other
    - Adjust median income in preceding years by the ratio based on the new and the old methods

Sensitivity of methodology for median income

- Present time-series measurements of median income under different methodologies
- Calculate labor earnings and market earnings with and without size-adjustments, and pre- and post-taxes and transfers
- The next few slides give precise descriptions of the additional assumptions under each measurement methodology

Definitions of measurement methodologies

- **Labor earnings of the median tax unit**: Wages and salaries, self-employment income, and farm income at the unadjusted tax unit
  - Tax units are not defined in the ASEC-CPS or Decennial Census
  - Assume married couples, divorced or widowed individuals, and single individuals over the age of 20 are all considered their own tax unit
- **Market income of the median tax unit** Gross income from wages and salaries, farm income, self-employment and business income, retirement income from pensions, dividends, interest, rent, and alimony at the unadjusted tax unit

Definitions of measurement methodologies

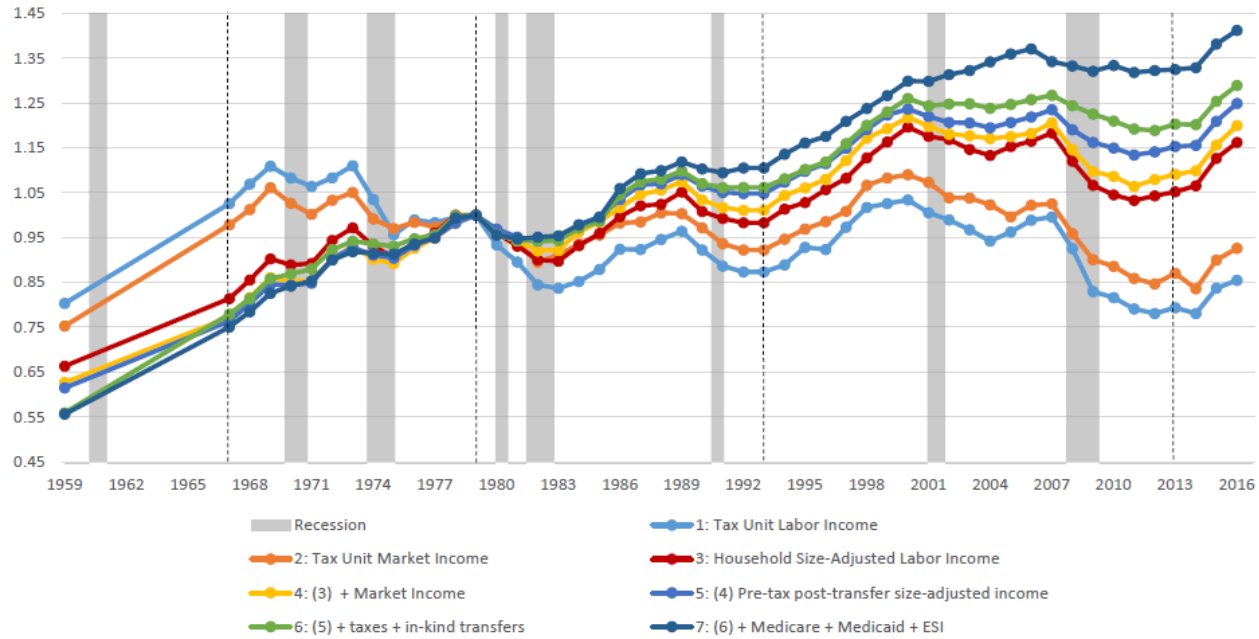
- **Household size-adjusted labor earnings of the median person** Expands the sharing unit to the household and makes the unit of analysis the person. Adjust by the square root of the number of people in the household and assume equal sharing across household members
- **Household size-adjusted market income of persons** Adjust market income of the median tax unit to be at the household unit and makes the unit of analysis the person
- **Household size-adjusted pre-tax post-transfer income of persons**
  - Adds government cash transfers (Aid to Families with Dependent Children and its successor, Temporary Assistance for Needy Families and social insurance programs such as Social Security and Workers' Compensation).
  - Excludes transfers directly tied to the tax system (ex. EITC) and in-kind government transfers such as food and housing assistance and the market value of Medicare/Medicaid.

Definitions of measurements continued

- **Household size-adjusted post-tax post-transfer plus in-kind transfer income of persons**
  - Uses NBER's TaxSim 9.3 to estimate Federal and State taxes and liabilities, including Social Security and Medicare payroll taxes
  - Captures the market value of some in-kind transfers: The value of SNAP, housing subsidies, school lunches
- **Household size-adjusted post-tax post-transfer plus in-kind transfer income (including Medicare, Medicaid, and ESI) of persons**
  - Include the market value of Medicare, Medicaid, and ESI based on the Census Bureau's imputed value of health insurance (full market value rather than just its fungible value)

Whether median income has increased or decreased over time depends on income-type and methodology

Figure 1. Alternative Measures of Median Income Normalized to 1979 Levels (1959-2016)



Sources: Authors' calculations using the ASEC-CPS, NHEA, White House Budget Historical Tables, Statistical Abstracts of the U.S., Census Bureau population estimates, USDA SNAP Data Tables and Child Nutrition Tables, BLS CPI for Medical Care in U.S. City Average, CMS Medicare Enrollment Data, MACPAC Medicaid Enrollment Data, Kramer (1988), Collinson et al. (2016), Hoynes et al. (2016). Taxes calculated using NBER TaxSim.

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- Median income as a share of 1979 median income level

Sensitivity by quintile

Table 1. Income Growth for 1959-2016 and 1959-2007 using Alternative Measures of Income by Quintiles

					Household Size-Adjusted Post-Transfer		
	Labor Income of Tax Units (1)	Market Income of Tax Units (2)	Household Size-Adjusted Labor Income of Persons (3)	Household Size-Adjusted Market Income of Persons (4)	Pre-Tax Income of Persons (5)	Post-Tax Income + In-Kind Income of Persons (6)	Post-Tax Income + In-Kind Income + Medicare + Medicaid + ESI of Persons (7)
Panel A:							
Median	6.4%	23.0%	75.1%	91.3%	103.1%	130.4%	153.7%
Q1	-52.7%	-75.5%	-61.3%	18.0%	109.0%	183.8%	262.0%
Q2	-4.7%	20.7%	35.5%	63.3%	88.5%	119.7%	157.6%
Q3	8.6%	24.3%	75.7%	91.9%	103.8%	130.4%	154.5%
Q4	41.6%	54.0%	103.4%	116.2%	120.4%	145.1%	162.2%
Q5	110.6%	121.2%	149.8%	160.4%	157.2%	164.7%	175.7%
Top 5%	146.7%	155.0%	190.6%	193.4%	184.9%	179.3%	186.8%
Panel B:							
Median	24.0%	36.2%	78.2%	92.4%	100.8%	126.4%	141.2%
Q1	-75.7%	-20.4%	-30.9%	34.9%	108.9%	188.1%	246.8%
Q2	21.0%	47.9%	45.7%	68.2%	85.3%	116.5%	144.9%
Q3	28.5%	37.1%	78.0%	93.4%	101.0%	126.7%	141.9%
Q4	56.4%	63.7%	99.5%	113.5%	115.4%	140.0%	149.1%
Q5	108.5%	119.2%	135.5%	148.0%	144.0%	154.0%	155.7%
Top 5%	134.5%	142.2%	168.6%	173.9%	164.9%	165.4%	163.5%

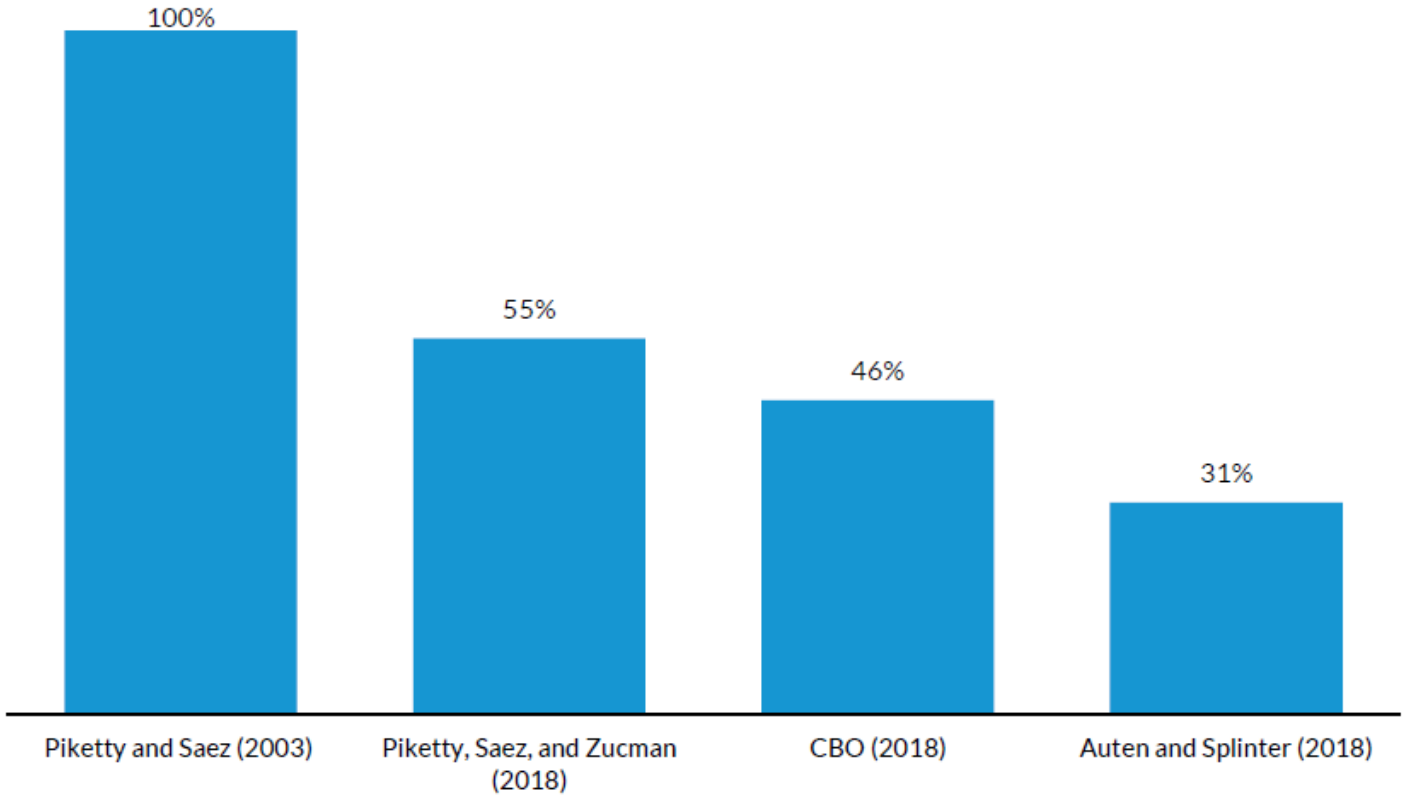
Sources: Authors' calculations using ASEC-CPS, NHEA, White House Budget Historical Tables, Statistical Abstracts of the U.S., Census Bureau population estimates, USDA SNAP Data Tables and Child Nutrition Tables, BLS CPI for Medical Care in U.S. City Average, CMS Medicare Enrollment Data, MACPAC Medicaid Enrollment Data, Kramer (1988), Collinson et al. (2016), Hoynes et al. (2016). Taxes calculated using NBER TaxSim.
Notes: Panel A: 1959-2016, Panel B: 1959-2007.

- Panel B restricts period to 1959-2007 to compare peaks
- Adjusting for taxes and cash/in-kind transfers, all five income quintiles experienced gains of more than 100%

Measurements of inequality are sensitive as well

FIGURE 1

The Top 10 Percent's Share of Economic Growth, 1979–2014



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Notes: Figure shows top 10 percent of income distribution. Piketty and Saez is updated with capital gains. Piketty, Saez, and Zucman and Auten and Splinter report posttax income, and CBO reports posttax and posttransfer income.

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Sensitivity of inequality - Top 1%

TABLE 2

Changes in Top 1 Percent's Income Share, 1979–2014

Study	1979 (percent)	2014 (percent)	Percentage-point change
Piketty and Saez (2003), pretax and updated with capital gains	10.0	22.0	11.9
Piketty, Saez, and Zucman (2018), posttax	9.1	15.7	6.6
Auten and Splinter (2018), posttax	8.2	8.8	0.7
CBO (2018), posttax	7.4	13.3	5.9

Sources: Piketty and Saez (2003); Piketty, Saez, and Zucman (2018); Auten and Splinter (2018); and CBO (2018).

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The sensitivity of measures of inequality

- Measuring inequality presents further challenges, in particular, which data source to use
  - Public-use CPS/Census data does not measure income at the top well
  - IRS data at the tax-unit level, tax laws and incentive to report income change over time
- CPS and IRS studies have told different stories
  - Public-use March CPS studies show HH income inequality increased substantially in the 1970s/80s and continued at a slower pace in the 1990s
    - Gottschalk and Danziger 2005, Daly and Valetta 2006, and Burkhauser, Feng and Jenkins 2009
  - IRS studies find higher inequality and growth
    - Piketty and Saez (2003, 2008) find the share of total income held by the very richest groups grew during the 1990s and rapidly through the beginning of the 21st century
- **Burkhauser et al. (2012) reconcile existing studies by showing how measurements change with income type and methodology vs data source**

Burkhauser et al. (2012)

- Use internal CPS data that measures top incomes better than public use CPS files
- Match influential tax-data study Piketty & Saez (2003) for most results
- Show that previous studies that used IRS and CPS data differed not only in data source but in their measurement methodology
- In the next slide, we review the methodological differences between earlier studies that Burkhauser et al. (2012) overcome in consilience exercise

Differences between CPS and IRS tax return studies

- Three methodological differences
  1. Inequality measurement
     - CPS research often uses indices like the Gini coefficient or Theil index that use data on all incomes or p90/p10 that ignore incomes at the very top
     - IRS research focuses on the top of the distribution, the share of the income held by the richest percent
  2. Income measurement
     - CPS use pre-tax, post-transfer income excluding capital gains
     - Piketty & Saez (2003) include any income reported on IRS personal income tax returns before deductions, include capital gains. Including stock options, exclude most transfer income
  3. Income receiving unit
     - CPS report at individual level. Aggregate income to the HH and deflate using an equivalence scale to account for differences in economies of scale. Attribute size-adjusted HH income to each individual within HH
     - Piketty and Saez (2003) aggregate to tax unit, do not adjust, examine the distribution among tax units

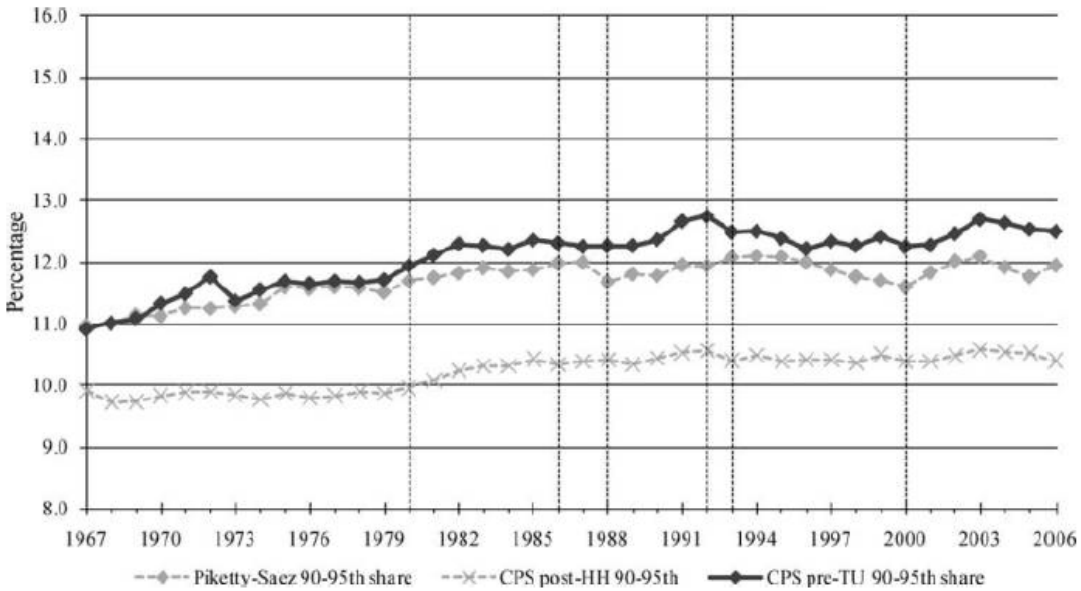
Definitions of measurements

- Burkhauser et al. (2012) present results using the following methodologies for consilience with existing literature
  - **CPS-Post-HH:** Traditional CPS - size-adjusted pre-tax post-cash transfer HH income excluding capital gains at the individual level
  - **CPS-Pre-TU:** Piketty-Saez-type - non-size-adjusted pre-tax pre-transfer tax unit income amongst potential tax units. Excluding capital gains because don't have data in CPS
- Compare these measurements to Piketty-Saez's measurements that used tax data
- Comparing CPS-Post-HH and CPS-Pre-TU informative about sensitivity of measures to definitions
- Comparing CPS-Pre-TU and Piketty-Saez informative about sensitivity to of measures to differences in data source

Times series data on inequality - 90 to 95

RECENT TRENDS IN TOP INCOME SHARES IN THE UNITED STATES

FIGURE 1.—ESTIMATES FROM CPS AND IRS TAX RETURN DATA OF THE SHARE OF TOTAL INCOME HELD BY UNITS WITH INCOMES BETWEEN THE 90TH AND 95TH PERCENTILES, 1967–2006



Vertical lines delineate time periods displayed in table 1 and discussed in the main text.

Source: The Piketty-Saez series is taken from Piketty and Saez (2003, 2008). It refers to the distribution of pretax, pretransfer income among tax units. The CPS-based series were derived by the authors from CPS internal data. The CPS-Pre-TU series was derived using the Piketty-Saez definition; the CPS-Post-HH series refers to the distribution of size-adjusted pretax, posttransfer household income among individuals. See main text for further details.

Figure 9: Burkhauser et al. 2012.

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Times series data on inequality - 95 to 99

FIGURE 2.—ESTIMATES FROM CPS AND IRS TAX RETURN DATA OF THE SHARE OF TOTAL INCOME HELD BY UNITS WITH INCOMES BETWEEN THE 95TH AND 99TH PERCENTILES, 1967–2006

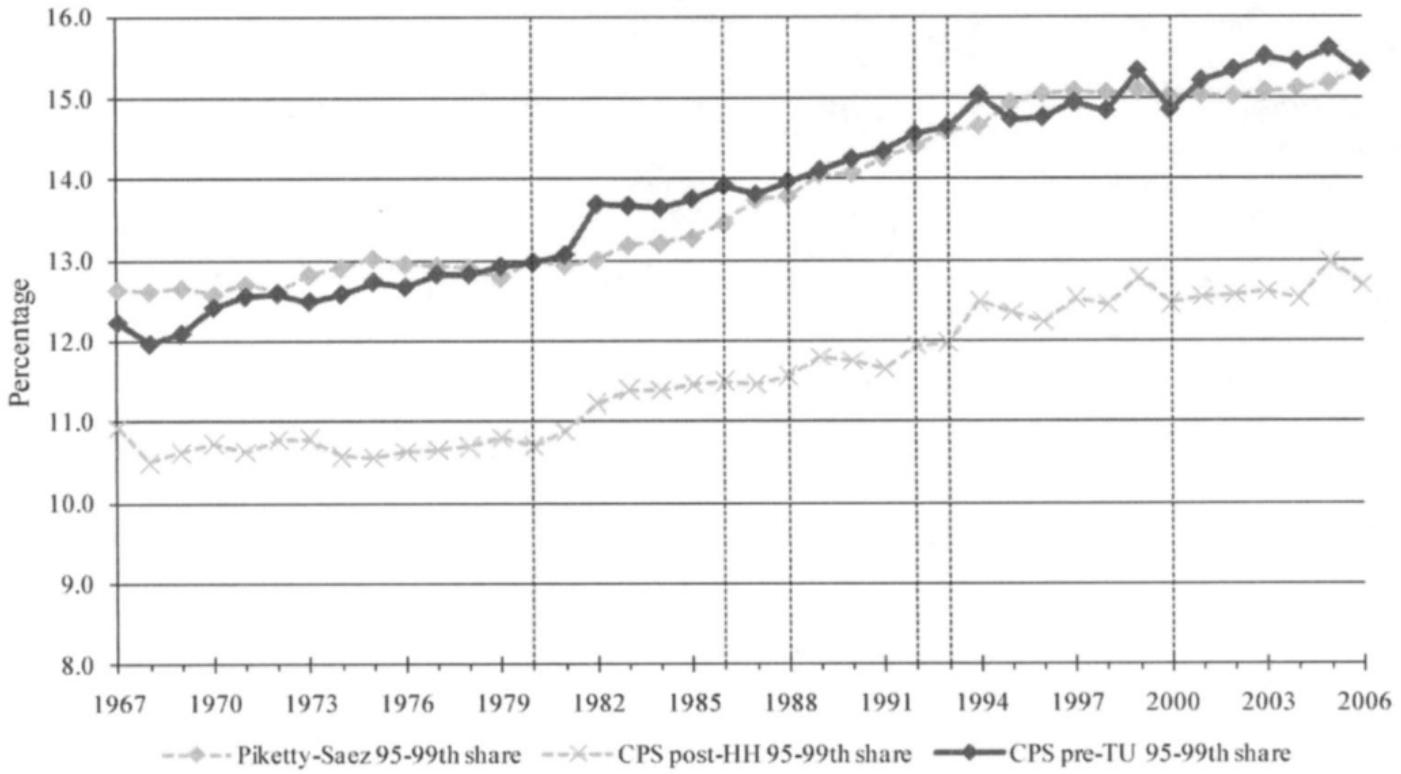

Figure 10: Burkhauser et al. 2012.

Times series data on inequality - 1%

FIGURE 3.—ESTIMATES FROM CPS AND IRS TAX RETURN DATA OF THE SHARE OF TOTAL INCOME HELD BY THE TOP 1%, 1967–2006

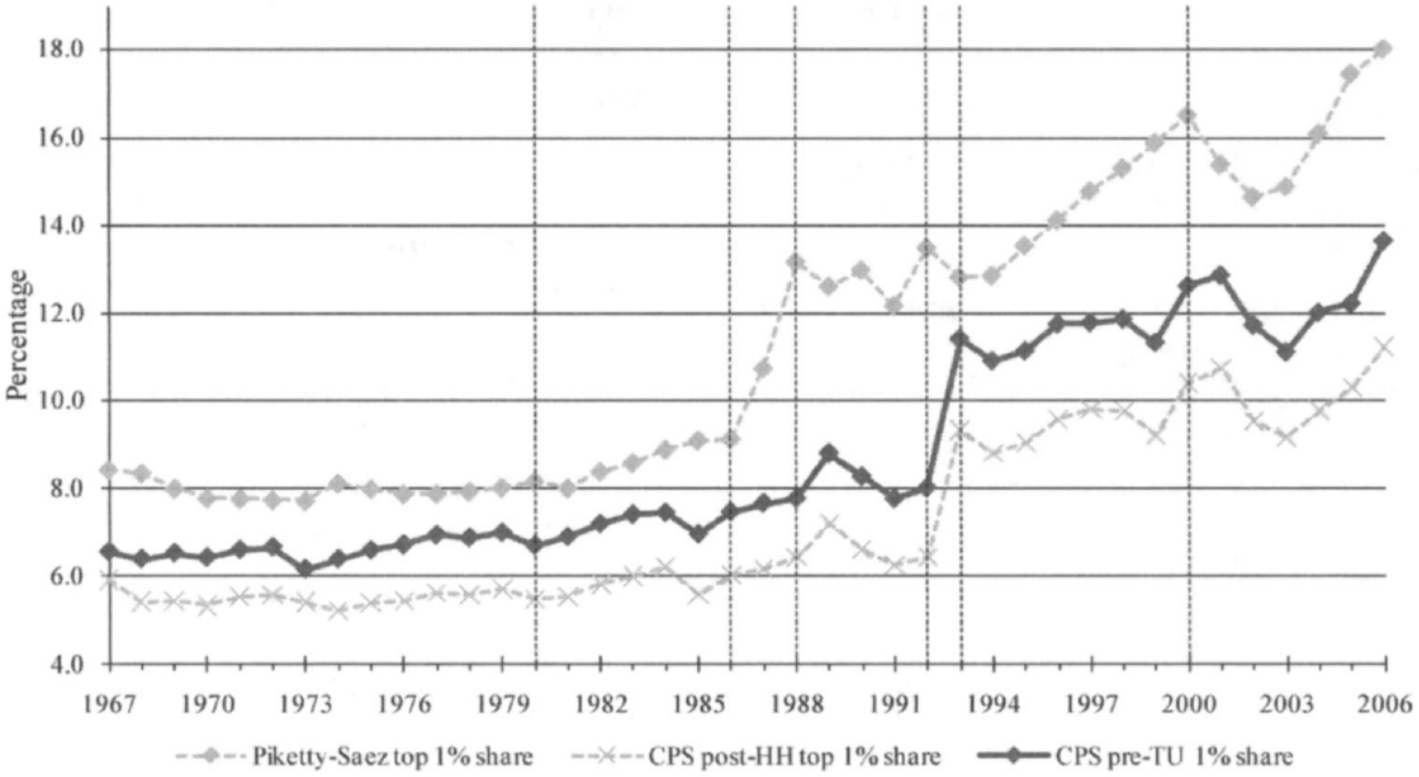

Figure 11: Burkhauser et al. 2012.

Inequality under different measurements

TABLE 2.—AVERAGE ANNUAL PERCENTAGE CHANGE IN INCOME INEQUALITY USING THREE INEQUALITY MEASURES, BY SUBPERIOD BETWEEN 1967 AND 2006, ADJUSTING FOR MEASUREMENT CHANGES IN 1992–1993 IN THE CPS DATA

	CPS Post-HH			CPS Pre-TU		
Subperiod	Gini	Share of Top 1%	Share of Top 10%	Gini	Share of Top 1%	Share of Top 10%
1967–1980	0.1	−0.5	−0.2	0.4	0.2	0.5
1980–1986	1.2	1.7	1.1	0.7	1.9	1.1
1986–1988	0.6	3.2	0.9	−0.1	2.0	0.5
1988–1992	0.4	0.0	0.5	0.9	0.8	1.0
1992–1993[a]	−0.8	−4.9	−0.8	−0.8	−4.9	−0.8
1993–2000	0.2	1.6	0.7	0.0	1.5	0.4
2000–2006	0.6	1.3	0.5	0.5	1.4	0.7
1967–2006[b]	0.4	0.6	0.4	0.4	1.0	0.7

For sources, see figure 1.

[a]Following the procedure in figure 4, the CPS series is adjusted upward prior to 1993 to reflect the systematic undercounting of income from top-income households prior to the 1993 CPS redesign. The change between 1992 and 1993 is reported as the corresponding change observed by Piketty and Saez (2003) using IRS records. Since the Gini coefficient cannot be calculated in the IRS data, the 1992–1993 change assumed for the Gini coefficient matches that in the IRS tax return data for the top 10% income share. From other years, this appears to be the closest approximation available in the IRS data.

[b]Following the procedure in figure 4, the CPS series is adjusted upward prior to 1993 to reflect the systematic undercounting of income from top-income households prior to the 1993 CPS redesign, thus suppressing the 1992–1993 blip and replacing it with the corresponding change observed by Piketty and Saez (2003) using IRS records.

Figure 12: Burkhauser et al. 2012.

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CPS vs. IRS for the top 1%

- In 90 v 95 and 95 v 99 we see that measurements using CPS and IRS data are very similar
- In top 1% large differences remain with three divergences
  - Prior to 1986, the trends were similar across methodologies
  - Afterwards there are three divergence
    - 1986 to 1988: Tax Reform Act of 1986 improved ability to capture income at the top
    - 1992 to 1993: Redesign of CPS, allowing respondents to enter higher income values
    - 1993 to 2000: Reynolds (2016) posits two explanations. 1) Changes in tax rules requiring executive stock options to be reported as taxable income 2) Greater increase in the use of tax-deferred savings accounts by the rich outside of the 1%
- **Major differences in measurements of income inequality stemming from data source are confined to top 1%**

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Times series data on inequality - 1%

TABLE 1.—AVERAGE ANNUAL PERCENTAGE CHANGE IN INCOME SHARE OF THE TOP 1%, BY SUBPERIOD BETWEEN 1967 AND 2006

	March CPS		IRS Tax Return Data
Subperiod	Size-Adjusted Pretax, Posttransfer Household Income among Individuals (CPU-Post-HH)	Pretax, Pretransfer Tax Unit Income among Tax Units (CPU-Pre-TU)	Pretax Pretransfer Tax Unit Income among Tax Units (Piketty-Saez)
1967–1980	−0.5	0.2	−0.2
1980–1986	1.7	1.9	1.9
1986–1988	3.2	2.0	22.1
1988–1992	0.0	0.8	0.6
1992–1993	45.0	42.5	−4.9
1993–2000	1.6	1.5	4.1
2000–2006	1.3	1.4	1.5

See figure 1 for sources.

Figure 13: Burkhauser et al. 2012.

Larrimore (2014): Changing household structures

- To better understand why different methodologies return different measurements, we turn to Larrimore (2014) which looks at the contribution of changing household structures to measurements of inequality
- Literature before him suggested the following factors drove inequality growth
  - Increases in male and female labor earnings inequality
  - Shifts in male and female employment rates
  - Increases in correlation between earnings of household members
  - Decline in households headed by married couples
- Larrimore (2014) uses a shift-share analysis of March CPS data

Larrimore (2014) decompositon methodology

1. Start with 1980 public use March CPS
   - Correct for Census topcoding using cell-mean data
   - Look at pre-tax, post-transfer cash income of households from labor and non-labor income sources, excluding capital gains, adjusted by equivalence scale (dividing by the square root of the households size)
2. Decompose changes in household income inequality into component sources by adding each factor sequentially
   - Changes in population characteristics (ex. martial and employment status of HH head)
   - Changes in distribution of source-level incomes (Changes to male/female head earnings, non-head earnings, non-labor earnings)
   - Correlations on incomes across income sources
3. Compare resulting income inequality trends to that which would have occurred had the specified factor remained unchanged

Decomposition: Changes in population characteristics

- The first set of factors address changes in categorical characteristics such as the marital and employment status of the household heads
- Within-group income distributions are held constant, and the relative size of each group is changed
  - For example, how does an increase in full-time workers change the overall income distribution, holding the income distribution of full-time, part-time, and non-workers constant
- Do so by reweighting observations from the base year, t, such that the fraction of the population in each group matches that in future years t'
  - Increasing the weight of individuals with characteristics more prevalent in year t' so that the impact of changing the prevalence of characteristics is estimated without altering the income distributions within a group

Decomposition: Changes in distribution of source-level income

- The second set of factors address changes in the income distributions within each group, for example, an increase in labor earnings inequality of males
- The effects are analyzed using a rank-preserving income exchange
  - Within a household, each individual i that is part of population group k at time t has an income Y_{ik}^t that is the sum of streams of income from members of the household (income sources)

$$Y_{ik}^t = f_{1ik}^t + f_{2ik}^t + ... + f_{Nik}^t$$

  - Each individual's income from the source f in year t is replaced with the income of the individual at the same percentile rank of the source f's income distribution in year t

$$Y_{ik}^{t'}(p_{1ik}) = f_{1ik}^{t'} + f_{2ik}^t + ... + f_{Nik}^t$$

  - p_{1ik} is the percentile for each source
  - Captures changes in the source-level income distribution of source f within each population group while preserving conditional earnings rank of each individual from source f and rank-correlation across sources

Correlations in incomes

- We have done rank-preserving income exchanges for sources f_1 and f_2 separately

$$\hat{Y}_{ik}^{t'}(p_{1ik}, p_{2ik}) = f_{1ik}^{t'}(p_{1ik}) + f_{2k}^{t'}(p_{2k}) + f_{3ik}^{t} + ... + f_{Nik}^{t}$$

- To change the correlation between sources of income (ex. increase in assortive mating) let $g_1 = f_1 + f_2$. Combine sources prior to the rank-preserving income exchange rather than after. Then, calling each individual's percentile rank in the g_1 distribution q_{fik}

$$\hat{Y}_{ik}^{t'}(q_{1ik}) = g_{1ik}^{t'}(q_{1ik}) + f_{3ik}^{t} + ... + f_{Nik}^{t}$$

- Comparing results when only their seperate income distributions change with that when their joint distribution changes isolates the impact of changing the correlation

Decomposition results

- Consider income inequality trends across peak years of business cycles
- Row (1) of Table 1 shows the average annual percentage change in Gini coefficients for each business cycle since 1979
  - Large increase in inequality (0.97% per year) in the 1980s business cycle
- Row (2) shows declining marriage rates account for $\approx 0.09\%$ per year of inequality growth over the three business cycles
- Row (3) shows decline in work among males had a small impact
  - Decline concentrated among part-time workers, see Table 2
- **Row (4) shows shifts in the male earnings distribution conditional on employment and martial status are extremely important in the 1980s and 1990s business cycles**
  - 1980s, when inequality increased most rapidly, accounted for income inequality growth of 0.65% per year, representing over 2/3 of the net increase
  - In the 2000s, accounted for 0.35% average annual percentage point **reduction** in income inequality
  - Table 2 shows that male earnings inequality rose in the 1980s and 1990s and fell during the 2000s

Decomposition results

	1979–89	1989–00	2000–07	1979–07
(1) Actual Gini average annual percentage change	0.97	0.08	0.10	0.40
Average annual percentage change accounted for by:				
(2) Marriage rates	0.13	0.05	0.10	0.09
(3) Male head employment	0.03	–0.02	0.05	0.02
(4) Male head earnings distribution	0.65	0.36	–0.35	0.29
(5) Female head employment	–0.15	–0.16	0.08	–0.10
(6) Female head earnings distribution	0.09	0.01	0.17	0.08
(7) Spouses' earnings correlation	0.14	0.02	–0.05	0.04
(8) Non-head labor earnings distribution	–0.01	–0.10	–0.02	–0.05
(9) Non-head labor earnings correlation	0.03	–0.03	–0.02	0.00
(10) Private non-labor income distribution	–0.09	0.04	0.08	0.00
(11) Private non-labor income correlation	0.08	–0.01	–0.01	0.02
(12) Public transfers distribution	0.01	–0.06	0.02	–0.02
(13) Public transfers correlation	0.06	–0.01	0.03	0.02

Figure 14: Larrimore (2014)

Decomposition results

TABLE 2

PERCENTAGE OF MALE AND FEMALE HOUSEHOLD HEADS AND SPOUSES WORKING FULL-TIME, PART-TIME, AND NOT WORKING

Year	Percent Working Full-Time	Gini for Full-Time Earnings	Percent Working Part-Time	Gini for Part-Time Earnings	Percent Not Working
Panel A: Employment status and Gini coefficient for earnings by employment status for male household heads and male spouses of household heads					
1979	63.4	0.307	19.4	0.465	17.2
1989	62.4	0.348	17.8	0.530	19.9
2000	64.6	0.409	14.2	0.558	21.2
2007	62.8	0.391	14.6	0.569	22.6
Panel B: Employment status and Gini coefficient for earnings by employment status for of female household heads and female spouses of household heads					
1979	27.0	0.269	29.6	0.500	43.4
1989	33.9	0.309	27.0	0.517	39.1
2000	40.4	0.340	23.8	0.524	35.8
2007	41.0	0.355	21.8	0.527	37.2

Source: Author's calculations using March CPS data.

Figure 15: Larrimore (2014)

Decomposition results

- Row (5) shows increases in female employment slowed household income inequality growth over the 1980s and 1990s, and decreases in female employment in the 2000s increased income inequality
  - Contribution to growth in inequality in the 2000s explains why net income inequality grew despite male earnings inequality decreasing
- Row (6) shows changes to the earnings distribution of female households heads, conditional on martial status and whether they work full or part time, partially offset household income inequality declines stemming from the increase in female employment until 2000
- Row (7) shows the increase in spouses' labor earnings correlation since the 1970s accounted for 0.14 percent-per-year increase in income inequality during the 1980s business cycle. Fell in importance in 1990s and accounted for inequality declines in the 2000s
  - Correlation changes can come from shifts in the correlation of earnings among duel-earner couples or from changes in where in the income distribution women are entering the labor market and met are leaving
  - Shifts in where entry and exists from the labor market drive these results

Percentage Changes in Wives' Employment Rate

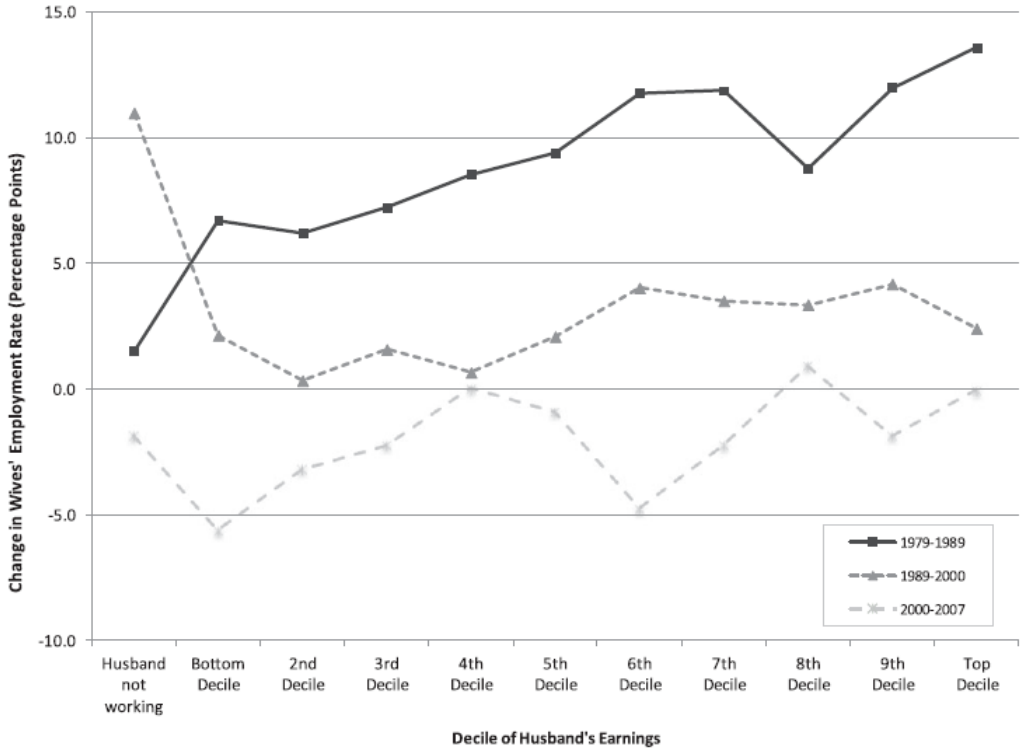

Figure 1. Percentage Change in Wives' Employment Rate by Decile of Husbands' Earnings Among Working-Age (22–62 Years) Couples

- Positive correlation btwn husband's earnings and wife's employment
- By 1990s, the wives of high earning men no longer entering the labor market at a faster pace than those married to lower earning men

Decomposition results

- Rows (8-9) look at the impact of changes to non-head labor earnings
- Rows (10-11) look at private non-labor income such as interest and dividends, notice that capital gains are not captured in the CPS and not included in these calculations
- Rows (12-13) In the 1980s there was a reduction in the amount of public transfers and reduction in the amount of concentration among the lowest income individuals. Transfers became less effective at reducing inequality. In the 1990s transfers increased and became more correlated with low incomes, contributing to the the slowdown in income inequality

Taking stock of where we are

- Elwell et al. (2019) and Burkhauser et al. (2012) show the sensitivity of measurements of income distributions to methodology
- The sensitivity suggests that a multitude of factors should be considered when thinking about income distributions
  - Skills and prices
  - Family structure and demography
  - Transfers and social insurance
- Larrimore (2014) shows the importance of these factors directly

Auten & Splinter (2019): A challenge to Saez & Piketty

- Burkhauser et al. (2012) reconcile studies using different data sources
- Show that measurements using CPS data can closely match measurements from IRS data reported in Piketty-Saez (2003) except for the top 1%
- Auten & Splinter (2019) challenge the methodology of Piketty & Saez (2003) and later updates and make step-by-step correction

Auten & Splinter (2019): A challenge to Saez & Piketty

- Show that top income share estimates based only on individual tax returns are biased by tax-base changes, major social changes, and missing income sources
- Addressing these issues requires numerous assumptions, especially for broadening income beyond that reported on tax returns
- Show the effects of adjusting for technical tax issues and the sensitivity to alternative assumptions for distributing missing income
- **Find that there has been little change since the early 1960s in after-tax top income shares after accounting for government transfers**

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Challenges to working with tax data

- Tax data better represents top income groups than survey data but presents challenges
- Tax legislation has changed over time so that the rules and incentives for reporting income has changed
- Tax units as the unit of analysis can bias results: declining marriage rates, changing household structures, returns filed by dependents
- Important sources of income are excluded: government transfers, non-taxable employer-provided benefits
  - Share of missing income has increased over time. Market income on tax returns accounts for only about 60% of national income in recent years
- Technical issues on differences between what is reported on tax returns and what economists regard as current-year economic income

Piketty & Saez (2003)

- Piketty & Saez (2003) estimated that the top 1% share more than doubled from 9 to 20% between 1962 and 2015
- Two broad criticisms
  - Study the top 1% of tax units
    - This introduced a bias as marriage rates have declined disproportionately among poorer Americans
    - Marriage rates among tax filers declined from 67 to 39% of tax units between 1960-2015, but for top 1%: 90 to 85%
    - $\Longrightarrow$ increase in number of tax units
    - $\Longrightarrow$ increase in number of tax units in top 1% which are disproportionately married
  - About 40% of the increase occurred around the Tax Reform of 1986
    - Created incentives for firms to operate as pass-through where owners register profits as income rather than sheltering inside corporations
    - Since incentives did not exist before, top-incomes likely understated before the reform
    - Money inside corporations show up as retained earnings and are declared as capital gains when shares in the business change hands
    - Capital gains are volatile: reflect chosen timing of seller, and movement in the stock market

Piketty, Saez & Zucman (2018) update

- Piketty, Saez & Zucman (2018) address two criticisms in updated paper
  - Rank over individuals instead of tax unit
  - Replace capital gains with retained earnings
- But still find leap in the share of pre-tax income of the top 1% from about 12% in the early 1980s to 20% in 2014
- This is because they expand sources of income sources
  - Try and allocate every dollar of GDP
  - But 2/5 of GDP does not show up on individuals' tax records (untaxed by government or illegally omitted)
    - Measurements are sensitive to how you allocate this income

PSZ (2018) From taxable to total income

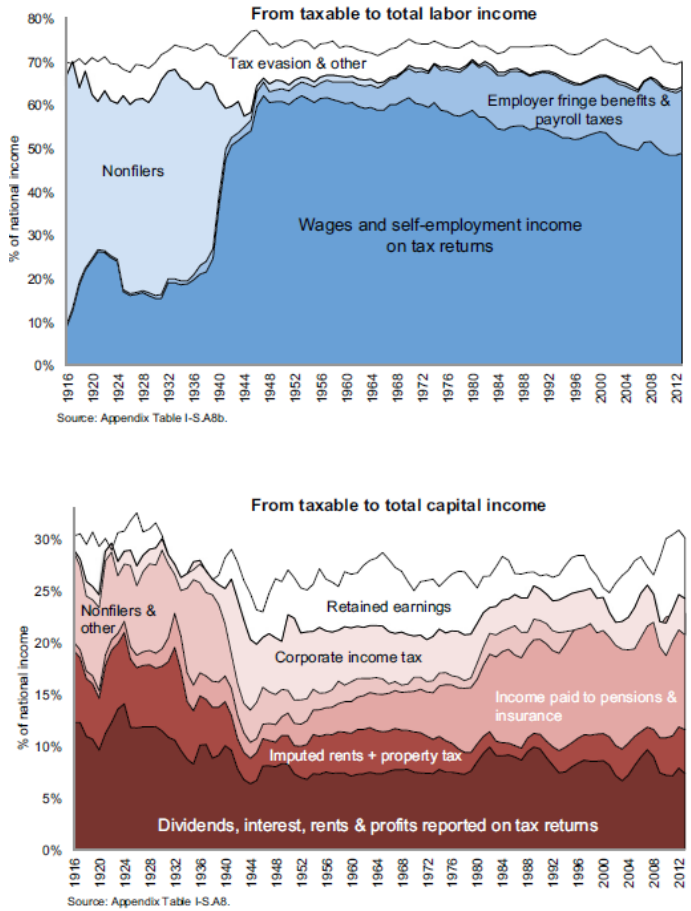
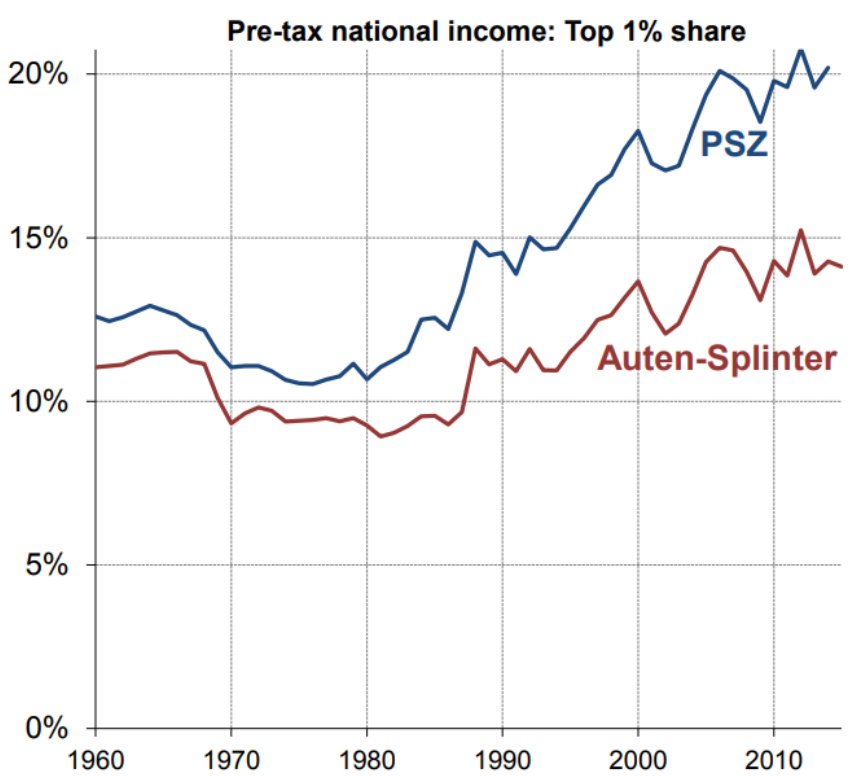


FIGURE I

From Taxable Income to National Income (1916–2014)

Figure 16: PSZ

Auten & Splinter (2019) have further criticisms



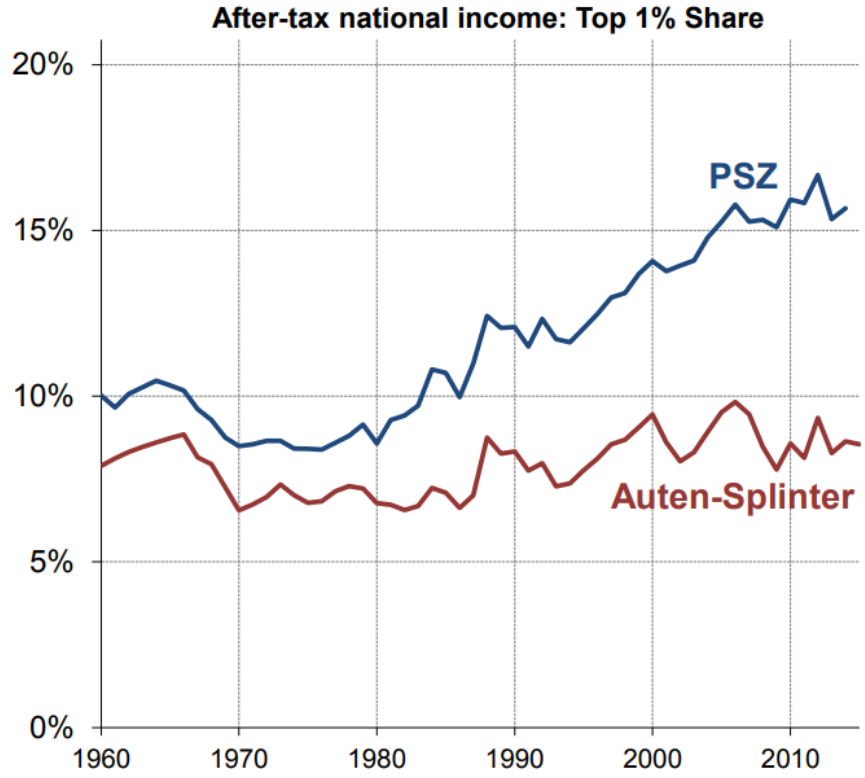


Figure 1: Top 1% shares of national income

Notes: Adjustments used to estimate Auten-Splinter pre-tax and after-tax income are listed in Tables 1and 2 and described in detail in the online appendix.
Sources: Authors' calculations, and Piketty, Saez, and Zucman (2018, PSZ in figure).

Figure 17: Auten & Splinter (2019)

Comparison of results to PSZ

- 1962 to 1979, two calculations are similar (Figure 1 and Table 3)
  - During these decades most of the income excluded from tax returns was from retained earnings and the two allocation approaches have similar distributional effects
- 1979 to 2014, very different estimates.
  - PSZ: Increase in pre-tax/after-tax income share was 9 pp/6.5 pp
  - AS: 4.8/1.4pp
- Table 4 breaks down differences.

Accounting for differences

- In 2014, AS pre-tax income share is 14.3%, 5.9 pp below PSZ estimate
  - 40% of the difference in allocating underreported income
  - 20% from the treatment of retirement income
  - 10% differences in non-retirement pre-tax corporate income including corporate tax differences
  - 10% from other taxes being allocated by our measure of disposable income less savings versus PSZ factor income less savings (which ignores effects from transfers, retirement income and taxes)
  - 10% net effects of our corrections to tax return–based income
  - 10% other differences
- Most from PSZ distributing underreported (passthrough) business income in proportion to positive reported business income
- PSZ truncates business income at zero thereby ignoring the share of underreported business income found on tax returns with losses and overstates amounts found on returns that do report large profits
- It also ignores evidence that the ratio of underreported income tends to decline at higher levels of reported income

Accounting for differences

- PSZ distributes about 50% of underreported business income to the top 1% in 2014
- However, audit data suggest that only about 15% should go to the final top 1% after re-ranking
- PSZ explain that they allocate more underreported income to the top of the distribution because of lower-quality audits of complex partnerships
- However, PSZ effectively removes underreported income found lower in the distribution and transfers that income to the top

Accounting for differences

- Differences in allocating private retirement income explain about 1 pp of the difference in pre-tax top 1% shares
- AS 2014 retirement income is about half from taxable distributions and half from inside buildup (dividend + interest income of retirement accounts), which AS allocate by account ownership
- Overall, the top 1% receives about 6 percent
- PSZ online data suggest they allocate more than twice this share
- One factor in the high PSZ share is they use taxable and non-taxable IRA distributions and pension income reported on tax returns to allocate inside buildup
- While some pension and IRA income can be non-taxable, most of the nontaxable amounts on tax returns reflect rollovers and the basis portion of Roth conversions
- Since these amounts reflect asset values rather than income, they should not be mixed with income flows to allocate retirement income

Accounting for differences

- In 2014, the PSZ rollover-inclusive approach results in a top 1% share of pension wealth of 14%—much higher than the Devlin-Foltz, Henriques, and Sabelhaus (2016) estimate of about 8% using the Survey of Consumer Finance, which is better suited for estimating the distribution of pension wealth
- For after-tax income, the PSZ estimate of the top 1% share in 2014 is much higher than AS (15.7% vs 8.6 percent), but most of this difference is explained by pre-tax differences
- After accounting for pre-tax differences, only 1.1 pp remains
- The largest after-tax effect is 1.3 pp due to PSZ allocating all government consumption by after-tax income and none per capita
- This assumption ignores the redistributive and public goods aspects of government consumption, which are captured by our half per capita allocation

Accounting for differences

- Another half a pp is due to allocation of government deficits
- These effects, which lower our top share estimates relative to PSZ, are partially offset by differences in the distribution of corporate and other taxes (essentially undoing pre-tax differences)
- Imputed rent is allocated by reported property taxes in both studies
- PSZ fixed the share of property taxes allocated to non-itemizers at 25% in all years, despite non-itemizers accounting for nearly 50% in 1962
- AS imputed rent approach allocates more imputed rent to the bottom of the distribution in the 1960s

Auten & Splinter (2019)

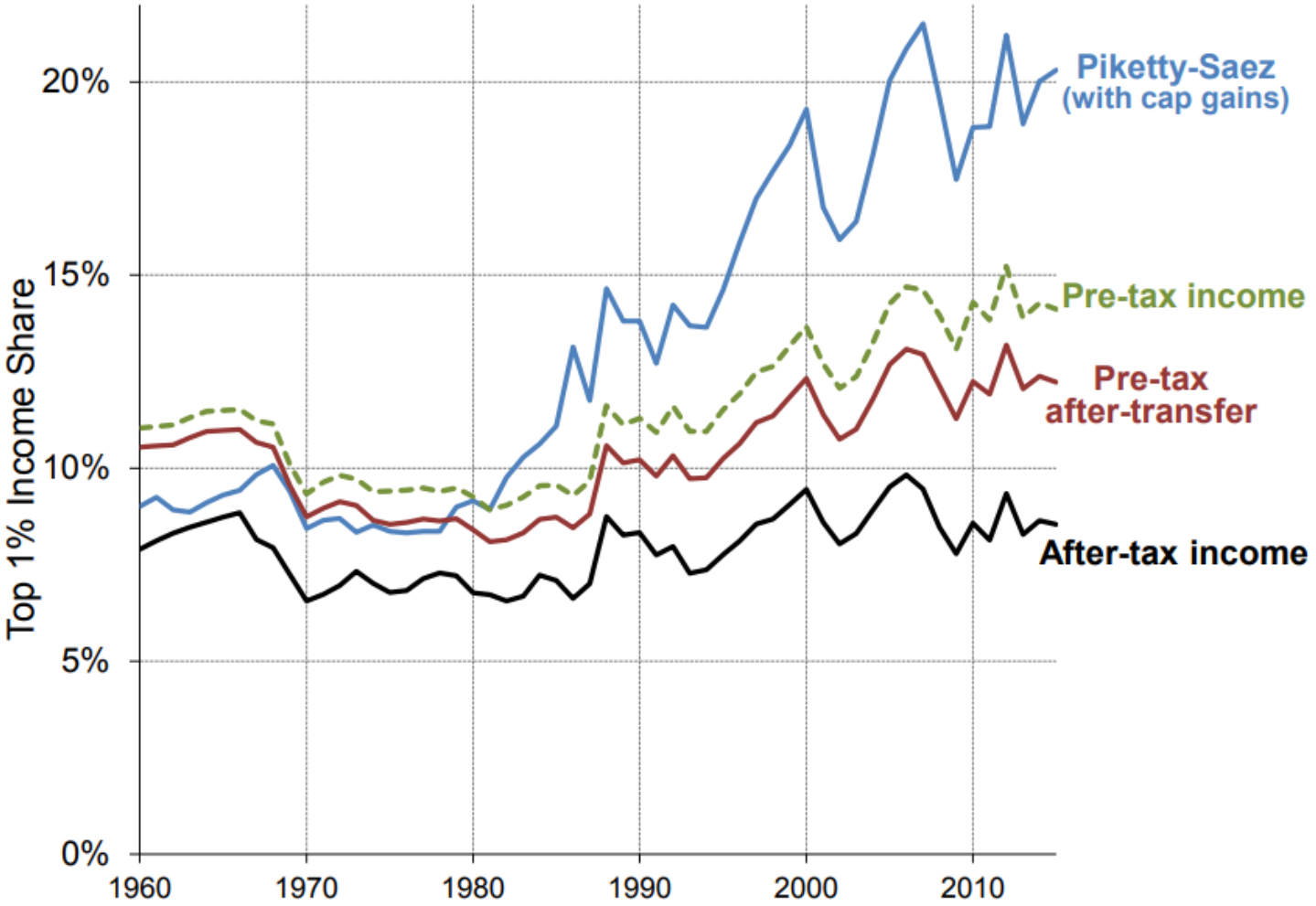


Figure 3: Comparison of top 1% income shares

Notes: Piketty and Saez series includes capital gains (thresholds set without capital gains). Adjustments used to estimate pre-tax, pre-tax/after-transfer, and after-tax income are listed in Tables 1 and 2 and described in detail in the online appendix.
Sources: Authors' calculations and Piketty and Saez (2003 and updates).

Auten & Splinter (2019)

Table 3: Comparison of top 1% income shares and changes

	1962	1979	2014	1962–1979 Change	1979–2014 Change	1962–2014 Change
Piketty-Saez-Zucman						
Pre-tax	12.6	11.2	20.2	-1.4	9.0	7.6
After-tax	10.1	9.1	15.7	-0.9	6.5	5.6
Auten-Splinter						
Pre-tax	11.1	9.5	14.3	-1.6	4.8	3.2
Pre-tax/after-transfer	10.6	8.7	12.4	-1.9	3.7	1.8
After-tax	8.3	7.2	8.6	-1.1	1.4	0.3

Notes: Adjustments used to estimate various definitions of income are listed in Tables 1 and 2 and described in detail in the online appendix.
Sources: Authors' calculations and Piketty, Saez, and Zucman (2018).

Figure 19: Auten & Splinter (2019)

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Auten & Splinter (2019)

Table 4: Decomposition of top one percent income shares by approaches

Auten-Splinter approach	PSZ approach	Percentage point level difference			Percentage point difference in changes	
		1962	1979	2014	1979–2014	1962–2014
Pre-tax income						
Underreported income by IRS audit data	Underreported income by reported income	0.4	1.0	2.2	1.2	1.8
Include distributed & other retirement income	Retirement alloc. partly includes rollovers	0.5	0.1	1.3	1.2	0.9
Other taxes by disposable income less savings	Other taxes by factor income less savings	0.3	0.2	0.7	0.5	0.4
Non-retirement pre-tax corporate income	PSZ non-retirement pre-tax corp. income	0.5	0.2	0.7	0.5	0.1
Various corrections to tax income definition	Use uncorrected tax return market income	-0.1	-0.1	0.4	0.6	0.5
Imputed rent by property tax deductions	Imputed rent by housing wealth estimates	0.4	0.2	0.3	0.1	-0.1
Limit returns to non-dependent U.S. residents	No adjustment	-0.2	0.2	0.2	*	0.4
Groups by individuals/size-adjusted incomes	Groups by adults/equal-split married inc	*	0.1	0.2	0.1	0.2
Non-profits/govt. income half per capita	Non-profits/govt. income all by income	*	*	0.1	0.1	*
Inflation correction	No correction	*	-0.5	-0.1	0.5	*
Social insurance benefits/deficit excluded	Social insur. ben./def. incl., taxes deducted	*	*	-0.1	-0.1	-0.1
Pre-tax differences (PSZ less AS) & totals		**1.5**	**1.7**	**5.9**	**4.3**	**4.5**
After-tax income						
Govt. consumption allocated half per capita	Govt. consumption all by after-tax income	0.8	0.8	1.3	0.5	0.5
Non-SS deficits by federal income taxes	Half by government transfers, half taxes	-0.3	0.0	0.5	0.6	0.8
Estate tax by prior decade decedent income	Estate tax by wealth distribution	-0.3	-0.2	*	0.2	0.3
Government transfers as described in text	PSZ transfers distribution	*	*	*	*	*
Corporate taxes by wages/corp. ownership	Corporate taxes by capital ownership	-0.2	-0.3	-0.3	*	-0.1
Other taxes by disposable inc. less savings	Other taxes by factor income less savings	*	*	-0.3	-0.3	-0.3
After-tax differences (PSZ less AS) & totals		**0.3**	**0.3**	**1.1**	**0.8**	**0.8**

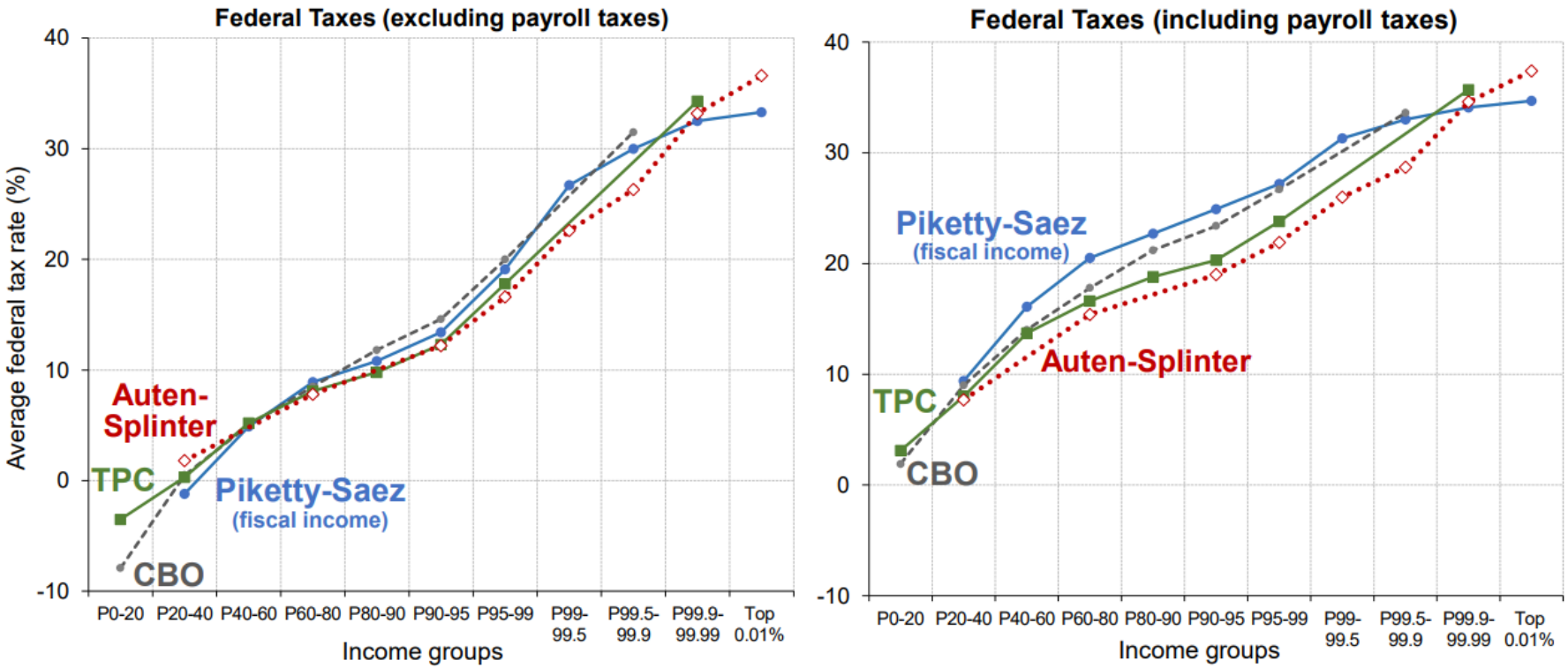
Notes: Auten-Splinter approach is described in text and in detail in the online appendix. Percentage point differences are from changing each assumption independently (as opposed to stacking changes) and therefore may not sum to the PSZ less AS difference. Results shown are the average changes in top one percent income shares of going from AS to PSZ and PSZ to AS assumptions (see online data for details). Note also that the total after-tax difference is after netting out the pre-tax differences. * denotes changes between -0.05 and 0.05.

Sensitivity of measurements of taxes to measurements of income

- Most studies of U.S. taxes have measured them to be progressive
  - Piketty and Saez (2007), Auten and Splinter (2019), The Urban-Brookings Tax Policy Center, the Joint Committee on Taxation, the U.S. Treasury, and the Congressional Budget Office
- But Saez and Zucman (2019) argue that average tax rates are nearly equal over the income distribution
- Average tax rates result from dividing total taxes of an income group by their income
- Splinter (2019) show that PSZ measurements are a result of how they measure income
  - Three differences in how incomes are estimated stand out: the allocation of underreported income, the allocation of retirement income, and the definition of income

Splinter (2019)

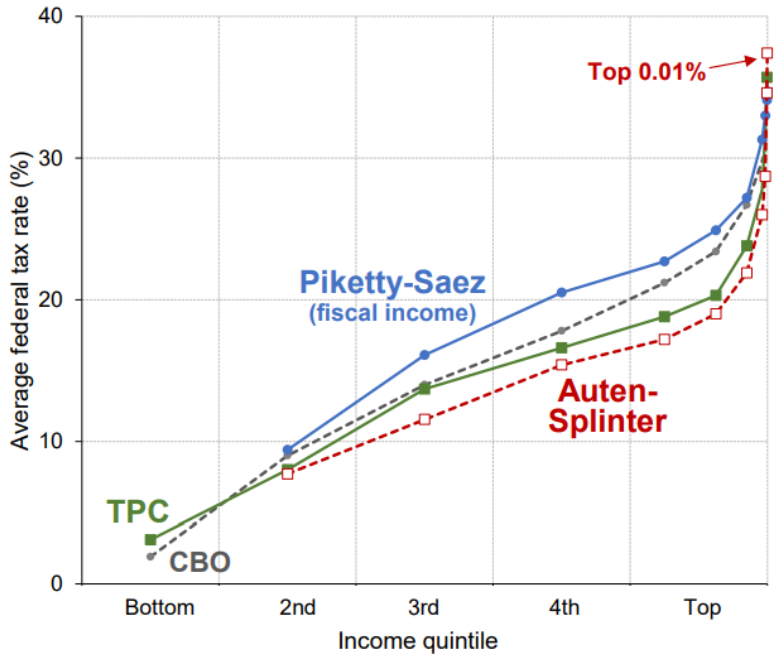
Figure 1: Average federal tax rates



Notes: Average tax rates are taxes divided by income, defined by Piketty-Saez as fiscal income and payroll and corporate taxes; Auten-Splinter as pre-tax/after-transfer national income; TPC as expanded cash income; and CBO as market income plus social insurance benefits. Income include realized capital gains, although Auten-Splinter instead include corporate retained earnings. Auten-Splinter and TPC include income accrued in retirement accounts. Auten-Splinter taxes include non-federal corporate and estate taxes. P0–20 is the bottom quintile, P20–40 the second quintile, etc. Auten-Splinter bottom 50% rate is placed in P20–40 bin and P50–90 in P60–80 bin, CBO top 1% in P99.5–99.9 bin, and TPC top 0.1% in P99.9–99.99 bin. Piketty-Saez rates are for 2004, but otherwise for 2014. *Sources*: Piketty and Saez (2007), TPC, CBO, and AS.

Splinter (2019)

Figure 2: Average federal tax rates



Notes: See Figure 1. *Sources*: Piketty and Saez (2007), TPC, CBO, and AS.

Figure 22: Uses an equal-spacing approach that shows how average tax rates spike for a small share at the top of the distribution.

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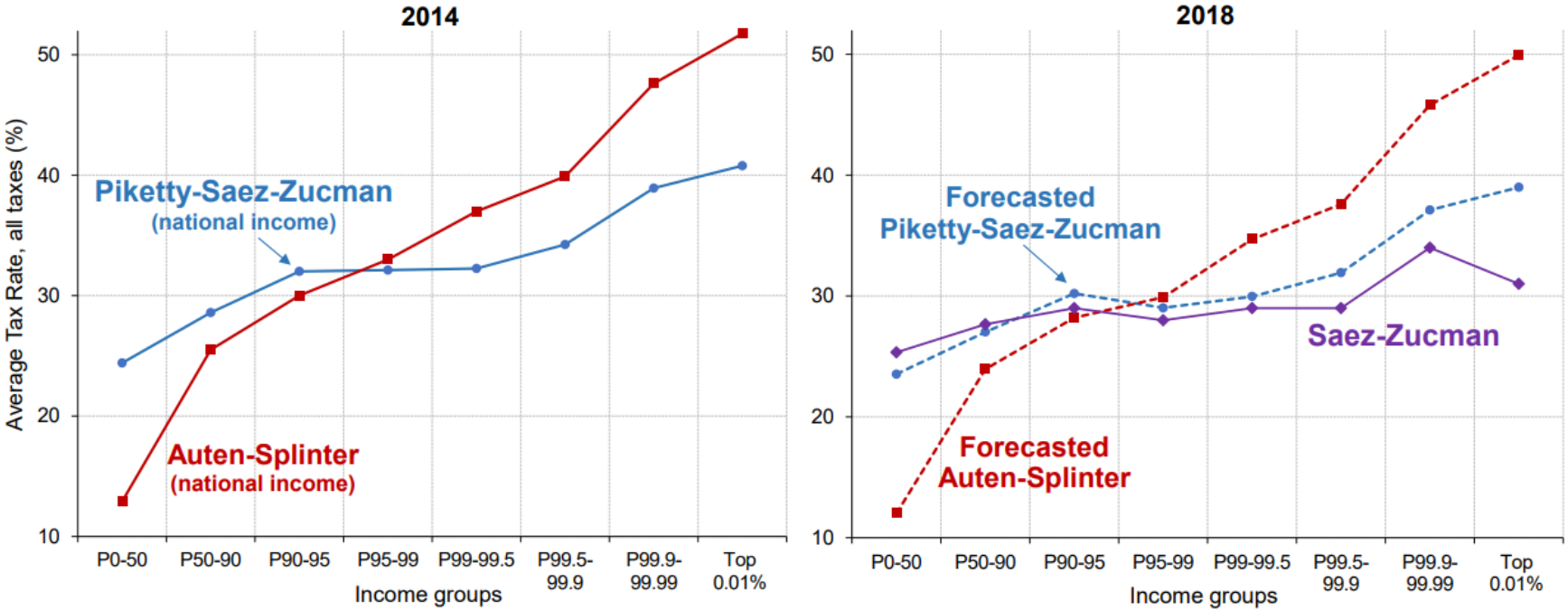
Splinter (2019)

Figure 3: Average tax rates



Notes: Average tax rates are all taxes divided by income. Both PSZ and Auten-Splinter exclude the refundable portion of tax credits, which are categorized as transfers in the national accounts—adding them would lower bottom 50 percent tax rates up to 3 percentage points. Forecasted rates apply Tax Policy Center (2017) estimated changes to 2014 rates. To match the 2014 PSZ groups, the Saez-Zucman bottom groups are averaged for the P0–50 bin, P99–99.9 values are applied to separate groups, and the top 400 rate is excluded.
Sources: PSZ, AS, Saez and Zucman (2019), and author's calculations.

Figure 23: Considers average tax rates for all taxes, including state and local income, property, and sales taxes

Accounting for differences

- Three main differences: allocation of underreported income, the allocation of retirement income, and the definition of income
- **Underreported income:** First, wage and business income in national income data exceed amounts reported on tax returns by over a trillion dollars
  - Both PSZ and AS include these untaxed underreported amounts
  - PSZ allocate underreported income using an ad hoc assumption that such income is proportional to reported source-specific income $\Longrightarrow$ over-allocate underreported income to the top
  - AS rely on IRS audit studies that show that the ratio of underreported income to reported income declines for higher levels of reported income

Accounting for differences, continued

- **Untaxed income:** Second, the PSZ allocation of untaxed retirement income reduces average tax rates for the top of the distribution
  - PSZ count non-taxable rollovers as a part of retirement savings
  - AS allege that rollovers represent assets shifting between accounts rather than a current-year income flow
  - This results in an over-allocation of non-taxable retirement income to the top of the distribution and depresses the estimated tax rate

Accounting for differences, continued

- **Definition of income:** Third, differences in the income definition have significant effects on lower-income tax rates
  - A broad definition of pre-tax income should be used to calculate average tax rates, but PSZ exclude non-social insurance transfers and deduct most payroll taxes, decreasing income and thereby increasing the PSZ low-income tax rate to 24%
  - Using a more consistent approach, AS include all government transfers and all payroll taxes in the income measure, which decreases the AS low-income tax rate to 13%. These tax rates approximate the bottom 50% rates in Figure 3
- See appendix for further details

The sensitivity of assessing the "war on poverty" to income measurements

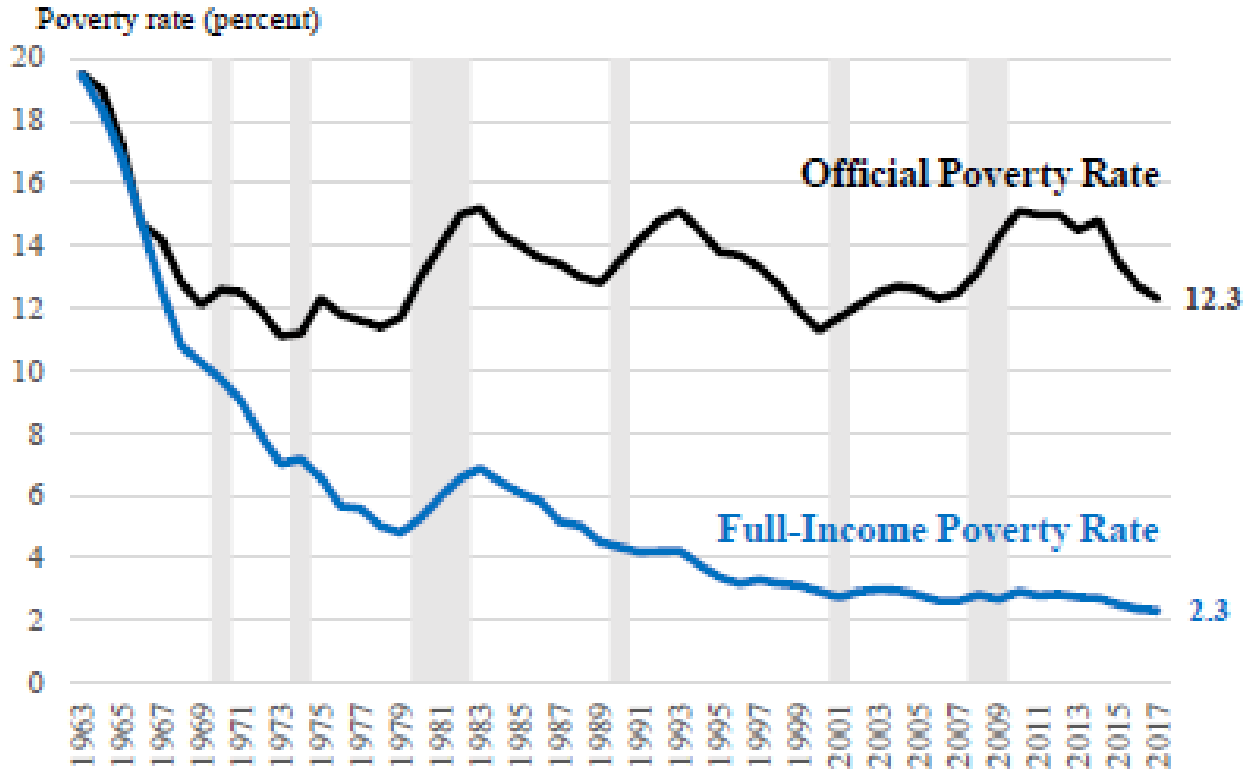
- 1964 President Lyndon B. Johnson declares "war on poverty"
- Legislation expanded and created federal programs assisting low-income individuals
  - Food Stamp Act of 1964 - Expanded and made permanent
  - Social Security Act - Created Medicaid and Medicare
  - EITC, CTC - tax code provisions targeting families with children and low to moderate earnings

Burkhauser, Larrimore, Elwell (2019) on poverty

- Study the share of people under the poverty line
- The Official Poverty Rate does not make adjustments for in-kind transfers, taxes
- Propose the "Full-Income Poverty Rate" to include cash income, taxes, and major in-kind transfers and update poverty thresholds for inflation annually
- The share in poverty decreases from 12.3% to 2.3% in 2017 when incorporating adjustments

Times series data on poverty

Figure 2. Official Poverty Rate and Full-Income Poverty Rate, 1963 to 2017



Source: IPUMS and NBER CPS data; Advisory Commission on Intergovernmental Relations (1968); BEA; BLS; Census Bureau; CMS; Collinson et al. (2016); Flood et al. (2018); Hoynes et al. (2016); Kramer (1988); MACPAC; NBER TaxSim; NHEA; OMB; USDA; Authors' calculations.
Note: Shading denotes NBER-based recession periods.

Figure 24: Burkhauser et al. 2019.

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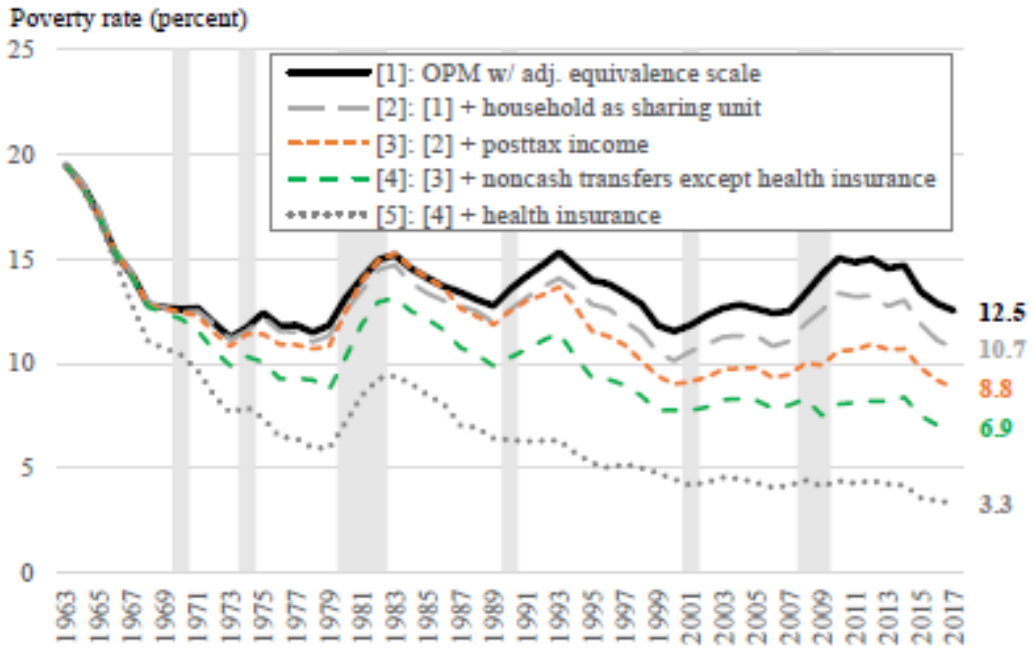
Times series data on poverty

Figure 4. Crosswalk of income components from the Official Poverty Rate with adjusted equivalence scale to the Full-Income Poverty Rate, 1963 to 2017



Source: IPUMS and NBER CPS data; Advisory Commission on Intergovernmental Relations (1968); BEA; BLS; Census Bureau; CMS; Collinson et al. (2016); Flood et al. (2018); Hoynes et al. (2016); Kramer (1988); MACPAC; NBER TaxSim; NHEA; OMB; USDA; Authors' calculations.
Note: Shading denotes NBER-based recession periods.

Figure 25: Burkhauser et al. 2019.

TABLE 1. *Income Mobility 1979 to 1988: Fraction of households in each 1979 income category that had moved to the other income categories by 1988 (U.S. Treasury Data)*

	Lowest 20% (1988)	Fourth 20%	Middle 20%	Second 20%	Top 2-20%	Top 1%
Bottom 20% (1979)	14.2	20.7	25.0	25.3	14.4	0.3
Fourth 20%	10.9	29.0	29.6	19.5	10.8	0.3
Middle 20%	5.7	14	33	32.3	14.6	0.4
Second 20%	3.1	9.3	14.8	37.5	34.8	0.6
Top 2-20%	1.1	4.4	9.4	20.3	59.4	5.3
Top 1%	2.2	0.4	3.8	7.7	38.6	47.3

Source: Horwitz, (2015)

TABLE 2. *Income Mobility 1975 to 1991: Fraction of households in each 1975 income category that had moved to the other income categories by 1991 (PSID-UM Data)*

	Lowest 20% (1991)	Fourth 20%	Middle 20%	Second 20%	Top 20%
Lowest 20% (1975)	5.1	14.6	21.0	30.3	29.0
Fourth 20%	4.2	23.5	20.3	25.2	26.8
Middle 20%	3.3	19.3	28.3	30.1	19.0
Second 20%	1.9	9.3	18.8	32.6	37.4
Top 20%	0.9	2.8	10.2	23.6	62.5

Source: Horwitz, (2015)

TABLE 3. *Income mobility 1996 to 2005: Fraction of households in each 1996 income category that had moved to the other income categories by 2005 (U.S. Department of Treasury)*

	Lowest 20% (2005)	Second 20%	Middle 20%	Fourth 20%	Top 20%
Lowest 20% (1996)	42.4	28.6	13.9	9.9	5.3
Second 20%	17.0	33.3	26.7	15.1	7.9
Middle 20%	7.1	17.5	33.3	29.6	12.5
Fourth 20%	4.1	7.3	18.3	40.2	30.2
Upper 20%	2.6	3.2	7.1	17.8	69.4

Source: Horwitz, (2015)

Is Income the Proper Measure of Economic Welfare? Trends in Consumption and Poverty

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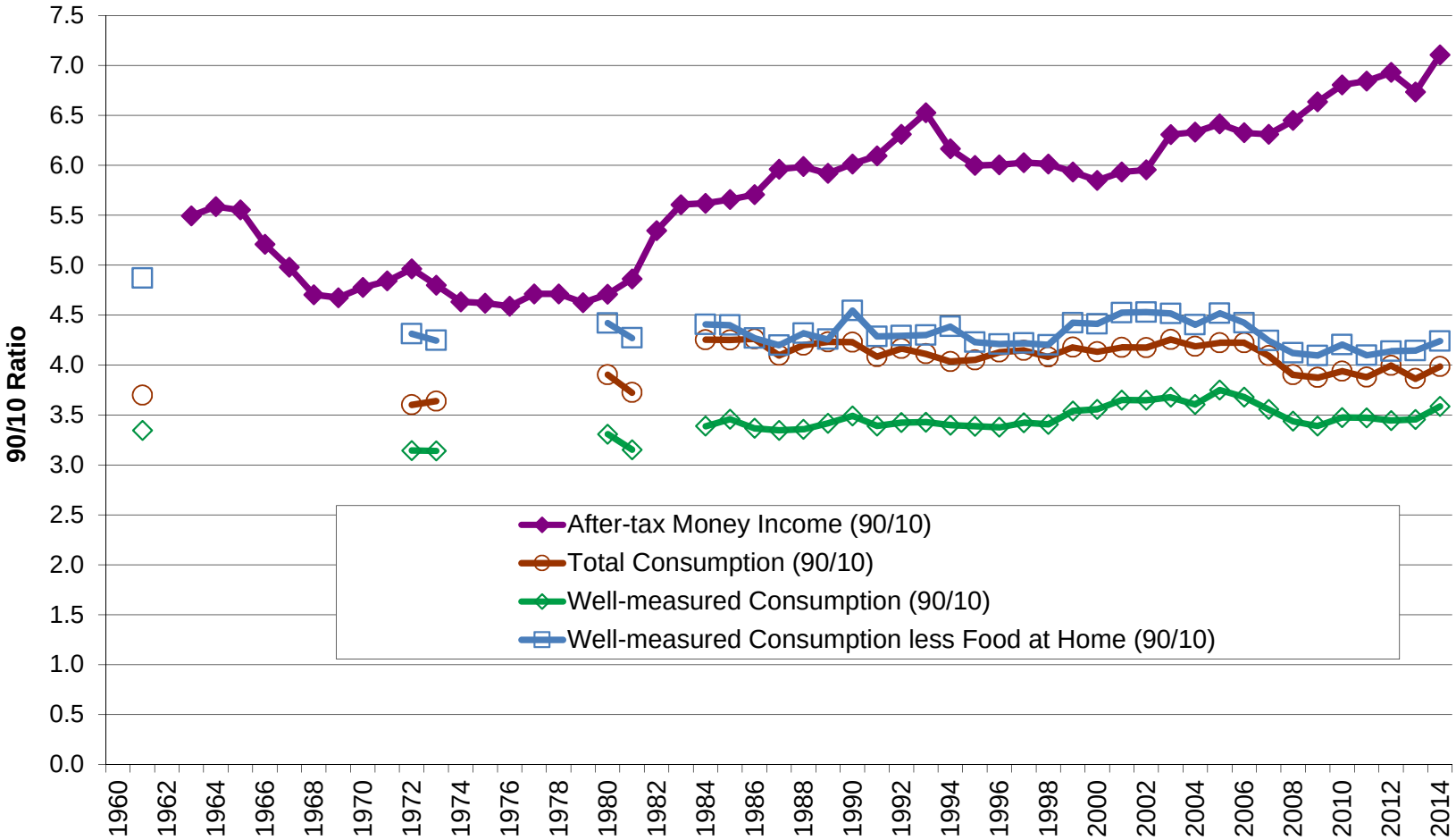
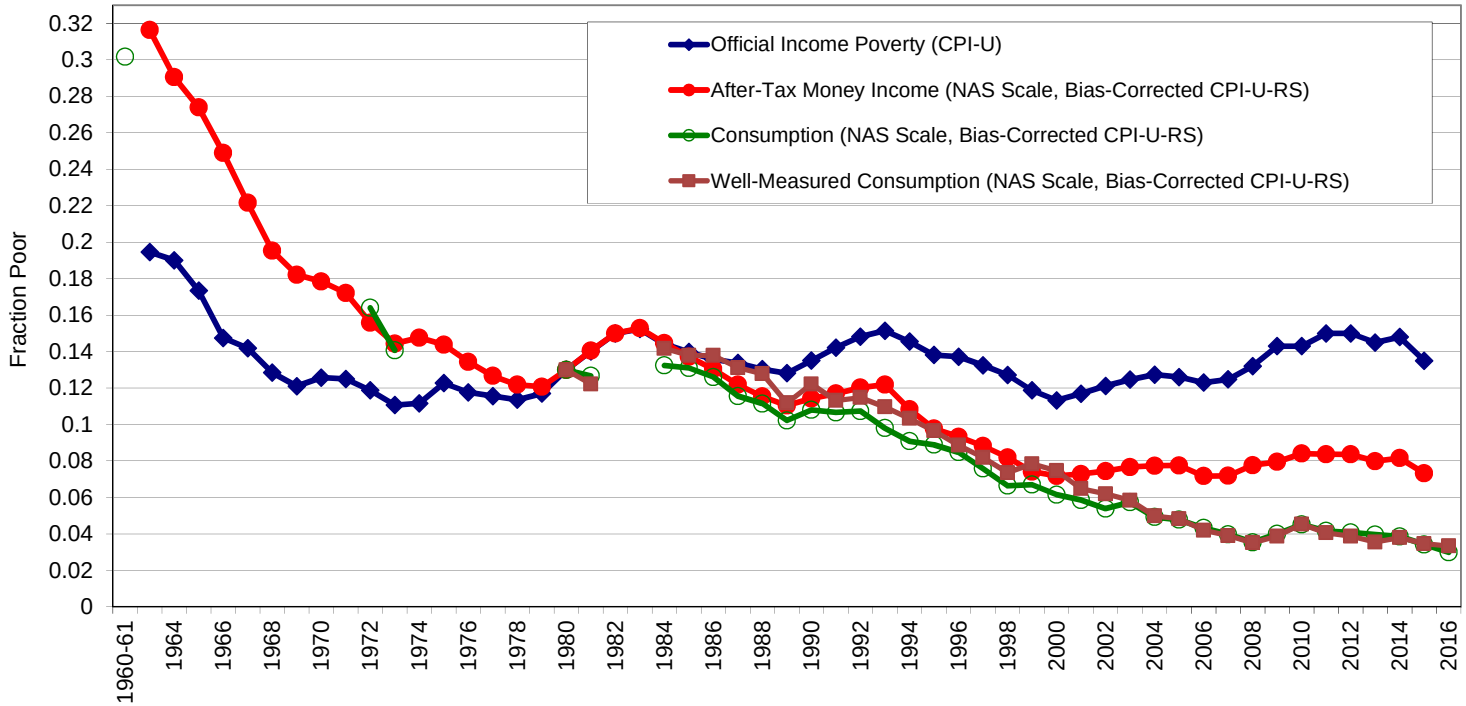
Figure 26: Consumption Inequality 1961-2014



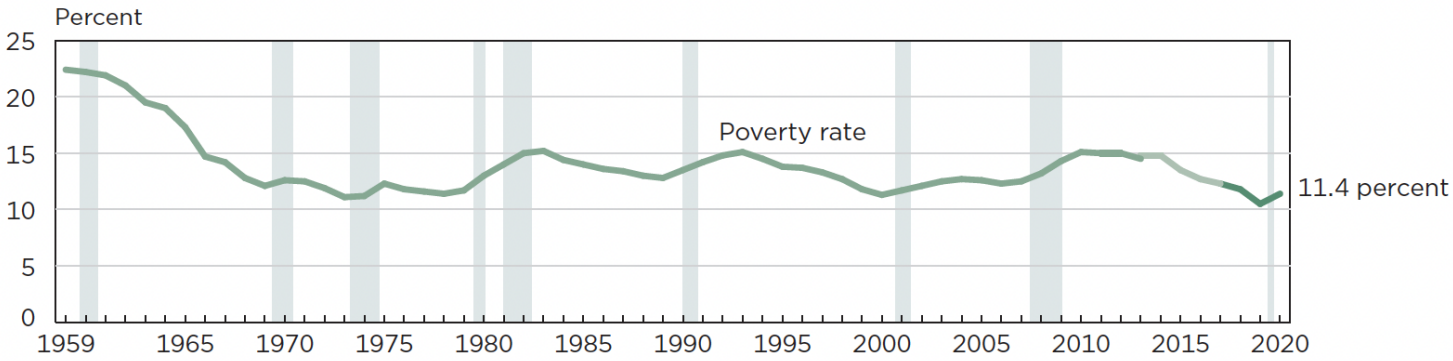
Note: Consumption data are from the CE and income data are from the CPS. Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. See text for more details.
Source: Meyer and Sullivan (2017).

Figure 27: Consumption and Income Poverty Rates, 1960-2016, Thresholds Anchored in 1980



Sources: Meyer and Sullivan (2016).
Note: Official Income Poverty follows the U.S. Census definition of income poverty using official thresholds. For measures other than the official one, the threshold in 1980 is equal to the value that yields a poverty rate equal to the official poverty rate in 1980 (13.0 percent). The thresholds in 1980 are then adjusted over time using the Bias-Corrected CPI-U-RS, which subtracts 1.1 percentage points from the CPI-U-RS each year from 1960-1977 and 0.8 percentage points from the CPI-U-RS each year from 1978-2016. Poverty status is determined at the family level and then person weighted. After-Tax Money Income includes taxes and credits (calculated using TAXSIM). Consumption data are from the CE and income data are from the CPS-ASEC/ADF. CE data are not available for the years 1962-1971, 1974-1979 and 1982-1983.

Figure 28: Should You Believe This Chart? Official Poverty Rate for the United States 1959 to 2020



Notes: The data for 2017 and beyond reflect the implementation of an updated processing system. The data for 2013 and beyond reflect the implementation of the redesigned income questions. Refer to Table B-4 for historical footnotes. The data points are placed at the midpoints of the respective years. Information on recessions is available in Appendix A. Information on confidentiality protection, sampling error, nonsampling error, and definitions is available at <https://www2.census.gov/programs-surveys/cps/techdocs/cpsmar21.pdf>.

Source: U.S. Census Bureau, Current Population Survey, 1960 to 2021 Annual Social and Economic Supplements (CPS ASEC).

TABLE 4. *Retail prices and the time cost of household appliances: 1959, 1973, and 2013*

	Retail Price 1959	Hours of Work @ $2.09	Retail Price 1973	Hours of Work @ $3.95	Retail Price 2013	Hours of Work @ 19.30
Household Appliances						
Washing Machine	$210	100.5	$285	72.2	$450	23.3
Clothes Dryer (gas)	$170	81.3	$185	46.8	$450	23.3
Dishwasher	$190	90.9	$310	78.5	$400	20.7
Refrigerator	$350	167.5	$370	93.7	$432	22.4
Freezer	$320	153.1	$240	60.8	$330	17.1
Stove (gas)	$190	90.9	$290	73.4	$550	28.5
Coffee Pot	$23	11	$37	9.4	$70	3.6
Blender	$22	10.5	$40	10.1	$40	2.1
Toaster	$14	6.7	$25	6.3	$37	1.9
Vacuum Cleaner	$95	45.5	$90	22.8	$130	6.7
Color TV	$267	127.8	$400	101.3	$400	20.7
TOTALS	$1,851	885.6	$2,272	575.2	$3,289	170.4

Source: Horwitz, (2015)

TABLE 5. *Percentage of households with various consumer items, 1984 to 2005*

% Households with:	Poor 1984	Poor 1994	Poor 2003	Poor 2005	All 1971	All 2005
Washing machine	58.2	71.7	67.0	68.7	**71.3**	**84.0**
Clothes dryer	35.6	50.2	58.5	61.2	**44.5**	**81.2**
Dishwasher	13.6	19.6	33.9	36.7	**18.8**	**64.0**
Refrigerator	95.8	97.9	98.2	98.5	**83.3**	**99.3**
Freezer	29.2	28.6	25.4	25.1	**32.2**	**36.6**
Stove	95.2	97.7	97.1	97.0	**87.0**	**98.8**
Microwave	12.5	60.0	88.7	91.2	**1.0**	**96.4**
Color TV	70.3	92.5	96.8	97.4	**43.3**	**98.9**
VCR	3.4	59.7	75.4	83.6	**0.0**	**92.2**
Personal computer	2.9	7.4	36.0	42.4	**0.0**	**67.1**
Telephone	71.0	76.7	87.3	79.8	**93.0**	**90.6**
Air conditioner	42.5	49.6	77.7	78.8	**31.8**	**85.7**
Cellular Telephone			34.7	48.3	**0.0**	**71.3**
One or more cars	64.1	71.8	72.8 (2001)		**79.5**	

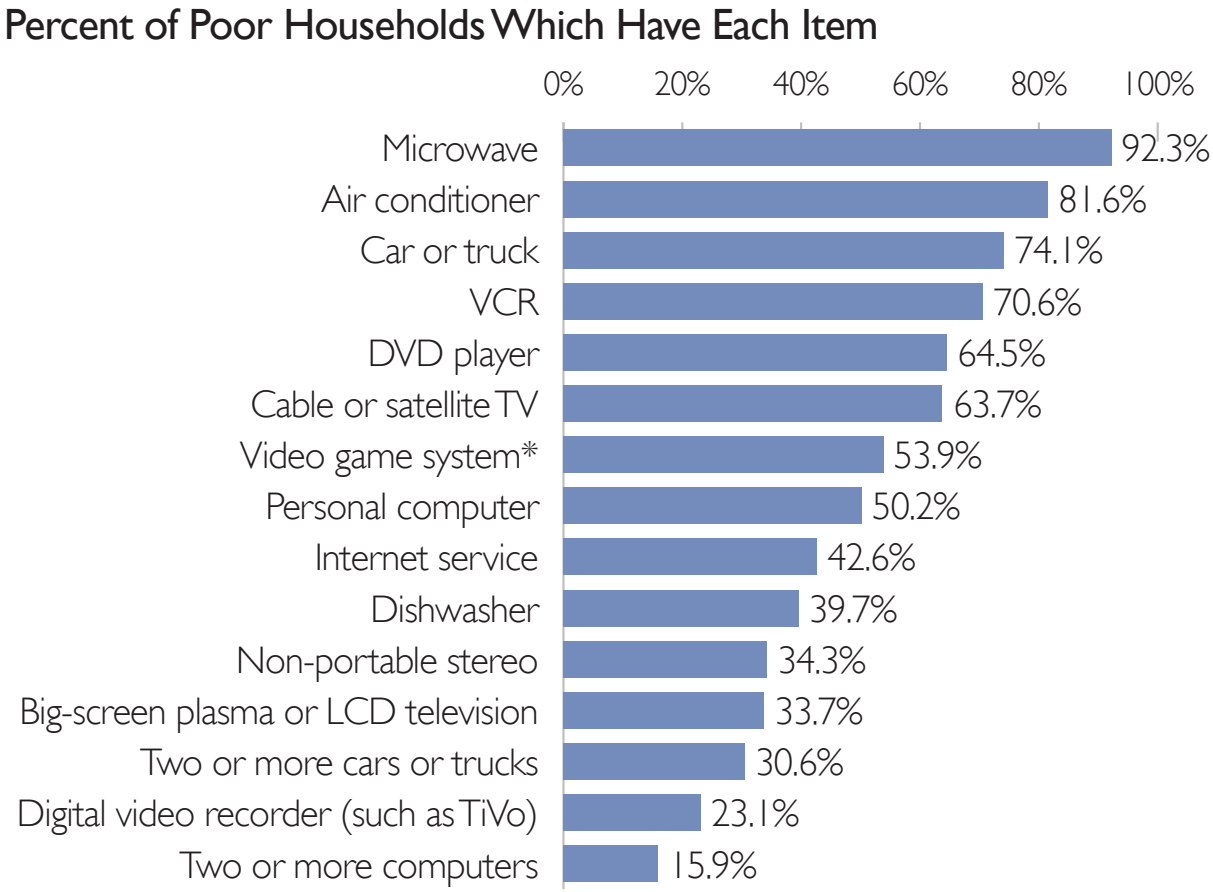
Source: Horwitz, (2015)

TABLE 6. *Percentages of poor and rich households with various consumer items 2003 and 2005*

% Households with:	Poor 2003	Rich 2003	2003 gap	Poor 2005	Rich 2005	2005 gap	*Gap change*
Washing machine	67.0	94.8	**27.8**	68.7	95.2	**26.5**	*-1.3*
Clothes dryer	58.5	93.6	**35.1**	61.2	94.3	**33.1**	*-2.0*
Dishwasher	33.9	86.1	**52.2**	36.7	88.4	**51.7**	*-0.5*
Refrigerator	98.2	99.6	**1.4**	98.5	99.8	**1.3**	*-0.1*
Freezer	25.4	44	**18.6**	25.1	43.7	**18.6**	*0.0*
Stove	97.1	99.6	**2.5**	97.0	99.7	**2.7**	*0.2*
Microwave	88.7	98.6	**9.9**	91.2	98.8	**7.6**	*-2.3*
Color TV	96.8	99.5	**2.7**	97.4	99.5	**2.1**	*-0.6*
VCR	75.4	97.7	**22.3**	83.6	98.5	**14.9**	*-7.4*
Personal computer	36.0	87.9	**51.9**	42.4	92.7	**50.3**	*-1.6*
Telephone	87.3	98.6	**11.3**	79.8	97.1	**17.3**	*6.0*
Air conditioner	77.7	90.3	**12.6**	78.8	89.1	**10.3**	*-2.3*
Cellular Telephone	34.7	88.6	**53.9**	48.3	92.4	**44.1**	*-9.8*

Source: Horwitz, (2015)

Table 1: Amenities in Poor Households



* Among poor families with children in 2005.

Source: Rector and Sheffield (2011). U.S. Department of Energy, Residential Energy Consumption Survey, 2009, at `http://www.eia.doe.gov/emeu/recs/` (June 22, 2011), and U.S. Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey for the United States: 2009, at `http://www.census.gov/prod/2011pubs/h150-09.pdf` (September 8, 2011).

Concluding thoughts

- Studying income distributions is complex
- Controversy surrounds even the most basic measurements
- The sensitivity of measurements to income types, data source, and methodology highlight the importance of studying a multitude of factors and their interactions in determining income distributions

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APPENDIX

Road map of AS methodology

1. Replicate PS fiscal income excluding capital gains
   - Filers: Adjusted gross income + statutory adjustments - taxable Social Security and unemployment benefits and Schedule D capital gains
   - Non-filers: 20% of average income of filers
2. Correct fiscal income calculation
   - Correct for sample, adjust for tax reform, add tax-exempt interest, additions and corrections to income components, bases income groups on the number of individuals rather than tax units
3. Estimate pre-tax and after-tax income measures that target national income

Correct fiscal income

1. Correct sample
   - Want to be consistent with Census counts of filing/non-filing tax units
   - Limit returns to residents over the age of 20 that are not claimed as dependents on other tax returns
   - Income of dependent filers is allocated among tax returns with dependent children
   - Correct for married couples filing seperate returns
2. Impose post-TRA86 loss limits
   - Apply limitations on deducations of losses for rent and other business income to years before the reform
   - This makes a large fraction of losses non-deductible, increasing the incomes of those taking advantage of tax shelters

Methodology continued

3. Add tax-exempt interest
4. Correct income definition
   - Add back excluded dividends before 1987, tax-exempt combat pay, and net operating loss carryovers from prior years (reflect prior-year losses)
   - Capital gains distributions listed separately from Schedule D and ordinary gains from the sale of business property are subtracted
   - Subtract gambling losses, taxable state/local income tax refunds and IRA contributions to parallel treatment of excluded employee contributions to other defined contribution accounts(ex. 401(k))
   - These corrections provide a consistent exclusion of capital gains and retirement contributions
   - Estimate non-filer income using the SOI Databank (contains every person with a taxpayer identification number
     - Fiscal income of non-filers is estimated using Forms W-2 (wages), 1099-R (pensions), 1099-DIV (dividends), and 1099-MISC(miscellaneous income)
     - Sum income from these sources and divide by the number of non-filer tax units for average non-filer income

Methodology continued

5. Set groups by number of individuals and rank by size-adjusted income
   - Define income groups based on all individuals instead of tax units and rank using size-adjusted incomes to control for falling marriage rates
   - Use size-adjusted income to rank tax-units and determine income groups
     - Use equivalence scale of dividing tax unit income by the square-root of the number of individuals in unit
     - Note that income shares are calculated using total tax unit incomes (unadjusted), such that they sum to national income
   - Changing from tax units to individuals ranked by size-adjusted incomes decreases top 1% income shares by 0.8 pp in the 1960s and 1.9 pp in recent years.

Methodology continued

6. Pre-tax income expansions: Include sources not captured on individual tax returns
   - Fiduciary retained income
   - Corporate retained earnings
   - Corporate taxes
   - Business property taxes
   - Inflationary component of business interest deductions and other inflation adjustments
   - Underreported income
   - Imputed rental income on housing (including property taxes)
   - Employer portion of payroll taxes
   - Employer-provided insurance costs
   - Retirement account income
   - Other sources of national income, primarily sales taxes

- Table 1 and Figure 2 show the impact of these adjustments on top 1%
- The effects of adding retained earnings and corporate taxes decrease over time as the share of business conducted by C corporations and corporate tax rates decrease
- The effects of payroll taxes and insurance increase over time

AS methodology for pre-tax/after-transfer income

- Government cash and non-cash transfers are added to pre-tax income
  - Social Security and unemployment benefits reported on tax returns
  - NIPA Social Security and unemployment benefits not reported on tax returns are allocated to the bottom half of the distribution
  - NIPA value of other cash transfers is allocated to the bottom half of the distribution
    - Includes federal supplemental security income and the refundable portion of tax credits (generally, earned income and additional child tax credits), as well as cash transfers from state and local governments
  - Value of Medicare benefits less premiums is allocated proportionally to filers and non-filers age 65 and older, except for high-wage filers likely receiving insurance through their employers
  - Finally, NIPA value of remaining non-cash transfers, such as Medicaid and food stamps, is allocated to the bottom half of the distribution
  - As shown in Table 2, the inclusion of transfers decreases top 1% income shares with a growing effect over time: 0.5 percentage points in 1960, 0.8 in 1979, and 1.9 in 2015
    - Other studies have found similar reductions (Bricker et al. (2016b); Congressional Office (2016))

Methodology for after-tax income

- Taxes are subtracted from pre-tax/after-transfer income
  - Additional adjustments for federal individual income tax liabilities
    - Foreign tax credits, which reflect foreign withholding taxes paid, are added back to federal income taxes
    - The Additional Medicare Tax and Net Investment Income Tax, which began in 2013, are included in federal income taxes
    - Self-employment taxes and other payroll taxes are considered separately in connection with SS and UI benefits
  - The estate tax encourages planning over many years prior to actual payment of the tax. Therefore, AS assume that estate and gift taxes are borne by decedents over the decade before estate taxes are filed
    - Using population tax data, estimate the fraction of estate tax paid by decedents by income group in each of these years
    - This approach accounts for year-to-year income variability among high-wealth individuals
    - Approach reflects the complex relationships among income dynamics, wealth, and estate tax planning.

Methodology for after-tax income continued

- Taxes (continued)
  - State/local income and residential real estate taxes are based on deducted amounts
    - Most tax returns at the top itemize deductions
  - Sales and other taxes are allocated by disposable income (after-tax income at the stage above after subtracting payroll taxes) less savings
- Include government deficits/surpluses and government consumption to match national income
  - Government deficits/surpluses are allocated by federal payroll and income taxes paid because almost all deficits are at the federal level
  - Government consumption includes spending valued at cost of military expenditures, education spending, and other non-transfer gov spending
  - Allocate government consumption half per capita and half by after-tax income to account for the mixture of types of government spending
    - Ex. Police and military spending may be considered to have a large public good component, while higher-income individuals may derive more benefits from government spending for public universities
    - Provide estimates excluding government consumption in the online data and present alternative allocations in the sensitivity analysis

Results - Moving from Fiscal Income to National Income

- In 1960,
  - Sample and income corrections and excluding capital gains reduce the top 1% income share of fiscal income from 9.0 to 7.9 percent
  - Income expansions to reach national income increase this share to 11.0%
  - Most important factor is addition of pre-tax C corporation income in place of realized capital gains, reflects the sheltering of income inside corporations to avoid high individual income tax rates
- In 2015,
  - The fiscal income share is 20.3%, pre-tax income share is 14.1%
  - The most important factors are controlling for the decrease in the marriage rate of lower-income tax units (1.9 pp), replacing realized capital gains with pre-tax C corporation income (1.1 pp), including employer-provided insurance (0.8 pp), including underreported income (0.8 pp), and including the employer share of payroll taxes (0.5 pp)

Results continued

- Measure of pre-tax/after-transfer income includes government transfers, the largest of which is Social Security benefits. Relative to pre-tax national income, this measure avoids the problem of treating a large share of older retired individuals as having almost no income
- In 1960, the top 1% income share is 10.5%, only slightly lower than the pre-tax national income share because transfers were relatively small. In 2015, the top share is reduced by two pp from 14.1 to 12.2% due to the growth of transfers (see Table 2)
- These differences are consistent with the increase in earned income inequality being offset by increasing amounts of transfers
- After-tax income top 1% shares fluctuate with the business cycle, but have remained relatively unchanged over the last five decades. The estimated increase in the top 1% after-tax income share between 1962 and 2015 is small compared to PS: 0.2 vs. 11.4 pp

Auten & Splinter (2019)

Table 1: Effects of adjustments on top 1% market and pre-tax income shares

	Top 1% income shares					Top 1% share changes				
Adjustments	**1960**	**1979**	**1985**	**1989**	**2015**	**1960**	**1979**	**1985**	**1989**	**2015**
Piketty-Saez fiscal income (with CGs)	9.0	9.0	11.1	13.8	20.3	----	----	----	----	----
Piketty-Saez fiscal income (no CGs)	8.3	8.1	9.2	12.8	18.6	-0.7	-0.9	-1.9	-1.0	-1.7
Adjustments to PS fiscal income & income groups										
Correct sample	8.3	8.0	9.2	12.6	18.2	*	-0.1	-0.1	-0.3	-0.4
Impose post-TRA86 loss limits	8.4	8.2	9.7	----	----	*	0.2	0.5	----	----
Add tax-exempt interest	8.7	8.6	10.1	12.9	18.3	0.3	0.3	0.4	0.3	0.2
Correct income definition	8.7	8.5	9.9	12.7	17.8	0.0	*	-0.1	-0.2	-0.5
Set groups by #indivs/sz-adj. inc.	7.9	7.6	9.2	11.7	16.0	-0.8	-0.9	-0.7	-1.0	-1.9
Corrected fiscal income & total chg.	**7.9**	**7.6**	**9.2**	**11.7**	**16.0**	**-1.1**	**-1.4**	**-1.9**	**-2.1**	**-4.4**
Expansions to PS fiscal income										
Fiduciary retained income	8.1	7.9	9.5	12.0	16.1	0.2	0.3	0.3	0.3	0.2
C-corp retained earnings	10.4	9.7	10.5	12.4	16.8	2.4	1.8	1.0	0.4	0.6
C-corp taxes	11.8	10.1	10.6	12.5	17.0	1.4	0.4	0.1	0.1	0.2
Business property tax	12.4	10.3	10.7	12.6	17.2	0.6	0.2	0.2	0.2	0.3
Inflation correction for interest	12.5	10.8	11.1	13.1	17.2	0.1	0.6	0.3	0.4	*
Underreported income	12.5	11.0	11.2	13.0	16.4	*	0.2	0.1	-0.1	-0.8
Imputed rent	12.2	10.9	11.1	12.8	16.1	-0.2	-0.1	-0.1	-0.1	-0.4
Employer payroll tax	12.0	10.4	10.6	12.3	15.5	-0.2	-0.4	-0.5	-0.5	-0.5
Employer insurance	11.8	10.1	10.3	11.8	14.8	-0.1	-0.3	-0.4	-0.5	-0.8
Retirement account income	12.0	10.3	10.5	12.1	15.1	0.1	0.2	0.3	0.3	0.3
Indirect taxes, non-profits, etc.	11.0	9.5	9.6	11.1	14.1	-0.9	-0.8	-1.0	-0.9	-1.0
Pre-tax income & total changes	**11.0**	**9.5**	**9.6**	**11.1**	**14.1**	**2.0**	**0.5**	**-1.5**	**-2.7**	**-6.2**

Notes: Total changes are relative to the Piketty and Saez series with capital gains (thresholds set without capital gains). See the online appendix for detailed description of adjustments. * denotes changes between -0.05 and 0.05 percentage points.

Sources: Authors' calculations and Piketty and Saez (2003 and updates).

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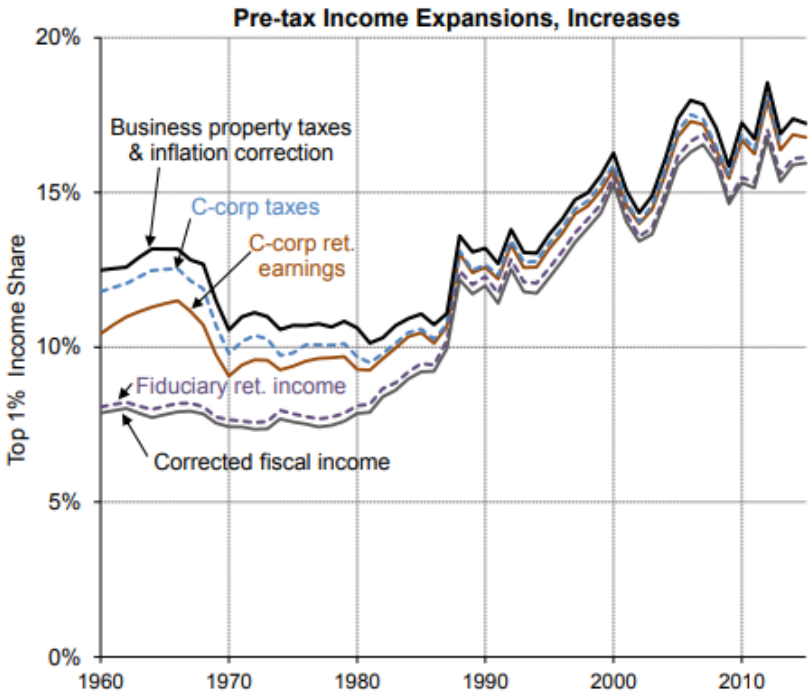

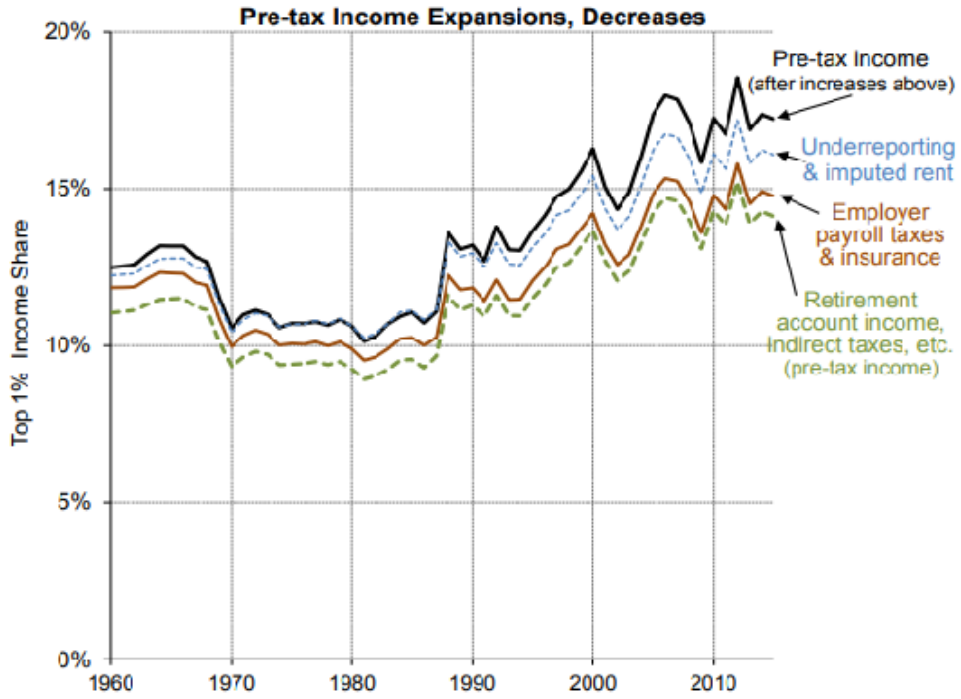

Figure 2: Top 1% income shares: Pre-tax income expansions
Notes: See text and Table 1 for description of adjustments.
Sources: Authors' calculations.

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Table 2: Effects of transfers, taxes, and government spending on top 1% income shares

	Top 1% income shares					Top 1% share changes				
Adjustments	**1960**	**1979**	**1985**	**1989**	**2015**	**1960**	**1979**	**1985**	**1989**	**2015**
Pre-tax income	11.0	9.5	9.6	11.1	14.1	----	----	----	----	----
Pre-tax/after-transfer Income, Add transfers										
Social Security benefits	10.8	9.1	9.2	10.7	13.4	-0.2	-0.4	-0.4	-0.4	-0.7
Unemployment benefits	10.7	9.1	9.1	10.7	13.4	-0.1	*	*	*	*
Other cash transfers	10.6	8.9	9.0	10.5	13.2	-0.2	-0.1	-0.1	-0.1	-0.2
Medicare	----	8.8	8.9	10.3	12.8	----	-0.1	-0.1	-0.2	-0.4
Other non-cash transfers	10.5	8.7	8.7	10.1	12.2	*	-0.2	-0.2	-0.2	-0.5
Pre-tax/after-transfer income & total changes	**10.5**	**8.7**	**8.7**	**10.1**	**12.2**	**-0.5**	**-0.8**	**-0.8**	**-1.0**	**-1.9**
After-tax Income, Remove taxes										
Federal indiv. income & estate tax	9.6	7.7	7.6	8.8	10.1	-0.9	-1.0	-1.2	-1.3	-2.2
State/Local indiv. income tax	9.5	7.6	7.4	8.5	9.6	-0.1	-0.1	-0.2	-0.3	-0.5
Corporate income tax	8.3	7.3	7.3	8.4	9.4	-1.2	-0.4	-0.1	-0.1	-0.2
Property tax	7.7	7.1	7.1	8.3	9.1	-0.6	-0.1	-0.1	-0.1	-0.3
Payroll tax	8.0	7.6	7.6	8.8	9.5	0.3	0.4	0.5	0.6	0.4
Sales and other taxes	8.3	7.8	7.8	9.0	9.6	0.3	0.2	0.2	0.1	0.1
After-tax Income, Add rest of government sector										
Government deficit/surplus	9.0	8.1	7.7	9.2	9.0	0.8	0.3	0.0	0.2	-0.6
Government consumption	7.9	7.2	7.1	8.3	8.5	-1.1	-0.9	-0.7	-1.0	-0.4
After-tax income & total changes	**7.9**	**7.2**	**7.1**	**8.3**	**8.5**	**-3.1**	**-2.3**	**-2.5**	**-2.9**	**-5.6**

Notes: Total changes are relative to pre-tax income. Tax totals are based on NIPA amounts. Fuel and utility taxes are not included. See the online appendix for detailed description of adjustments. * denotes changes between -0.05 and 0.05 percentage points.
Source: Authors' calculations.

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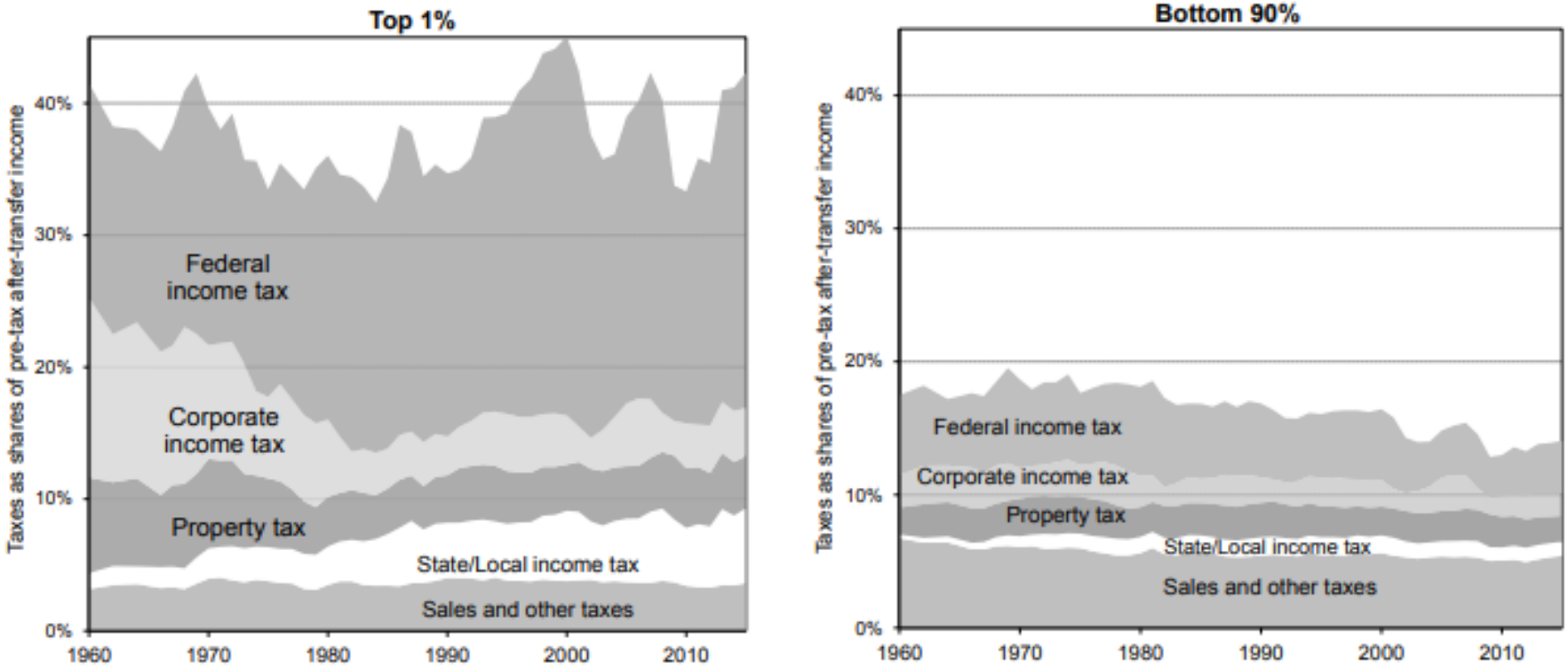

Figure 4: Taxes as shares of pre-tax income

Notes: Payroll taxes are examined in Figure 5 in connection with transfer payments. Refundable tax credits are included in government transfers and excluded from income taxes.
Sources: Authors' calculations.

Figure 29: Auten & Splinter (2019)

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How Much of Business Income is Due to Human Capital? Return to Skills Invested in the Individual

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Capitalists in the Twenty-first Century

by Matthew Smith, Danny Yagan, Owen M. Zidar, and Eric Zwick

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