Who Pays No Tax?
The Declining Fraction Paying Income Taxes and Increasing Tax Progressivity

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Using federal individual income tax data, this paper presents the first long-run estimates of the fraction paying no income tax. Between 1985 and 2015, the fraction of working age adults paying no tax increased from 20 to 36 percent. A decomposition shows that almost all of this increase resulted from changes in tax policy, especially from more generous tax credits. Increasing tax progressivity over the last three decades also resulted from more generous tax credits. The substantial federal tax changes enacted in 2017 are forecasted to temporarily increase both the fraction paying no tax and individual income tax progressivity. (*JEL* H22, H24, H31)

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I. INTRODUCTION

The fraction of Americans paying no tax serves as a simple measure of tax progressivity that came to prominence during the 2012 presidential election. Three years prior, Williams (2009) estimated that 47 percent of tax units paid no federal individual income tax (hereafter, *tax*).[1] This paper places this estimate in historical context by providing consistent estimates of the fraction paying no tax since the beginning of the federal individual income tax, extending over a full century. This reveals that the fraction paying no tax increased dramatically since 1985. Also, a decomposition shows that almost all of this increase is explained by changes in tax policy, in particular, from increasingly generous tax credits.

The increase in the fraction paying no tax since 1985 was mirrored by a similar increase in the fraction receiving refundable credits, that is, with sufficient tax credits to have a negative tax liability. In part, this was due to expansion of the Earned Income Tax Credit (EITC) and the creation and expansion of the child tax credit. Besides highlighting the increasing impact of tax credits, considering the last three decades shows that real income changes around the tax-exempt threshold have had different effects over time. Between 1985 and 2000, increases in the fraction paying no tax due to tax policy were partially *offset* by rising incomes among filers with little tax liability. Since the 2000 business cycle peak, increases in the fraction paying no tax due to tax policy were *amplified* by stagnant incomes in a similar part of the distribution.

This paper also connects trends in the fraction paying no tax with a distribution-wide measure of tax progressivity. Since 1985, I estimate that the fraction paying no tax and tax progressivity, as measured by the Kakwani index, have had a correlation of 0.95. This suggests that the fraction paying no tax has served as an effective proxy for overall tax progressivity.

[1] Tax units are the conventional unit of observation in tax return data and combine individuals filing a tax return together or who would file together in the case of non-filers.

Forecasts of these measures can also provide insight into the expected impacts of the 2017 Tax Cuts and Jobs Act (TCJA). This reform made a number of changes that will tend to increase the fraction paying no tax: dramatically expanded standard deductions, child credits doubled to $2,000, and lower tax rates—but their effect will be partially offset by the elimination of personal deductions. This paper presents an analysis of these changes on the forecasted fraction paying no tax and tax progressivity. The TCJA is expected to increase the 2018 fraction of working age adults paying no tax by three percentage points and to increase the Kakwani index of progressivity for the income tax by over ten percent. After 2025, however, the TCJA is forecasted to decrease the fraction paying no tax and tax progressivity due to a permanent change in indexing and the expiration of other individual income tax changes.

A. Previous Literature

A number of studies responded to the 47 percent estimate by emphasizing that the 2009 fraction paying no tax was unusually large due to the temporary making work pay credit and recession-related unemployment (Marr and Huang, 2012; Heim, Lurie, and Pearce, 2014; Fullerton and Rao, 2016). Another common point was that the fraction paying no tax falls significantly when including payroll taxes.[2] These studies also emphasized that the fraction paying no tax falls when considering tax burdens over multiple years, as compared to annual tax burdens. While multi-year measures indeed show lower fractions paying no tax, I find that increases in these fractions were similar for annual and multi-year measures. This means that

[2] Including payroll taxes generally implies that anyone with positive earnings during the year paid taxes. Compared to the estimates in this paper, which only consider federal individual income taxes, including payroll taxes should show little long-run trend in the fraction paying no tax and results in about a quarter to a third fewer individuals paying no tax (Heim, Lurie, and Pearce, 2014).

while controlling for short-term income mobility with multi-year measures lowers the level, it does not explain the upward trend in the fraction paying no tax.[3]

Heim, Lurie, and Pearce (2017) addressed this question by studying the increase in the fraction paying no tax between 2001 and 2013. They found that almost half of the increase was due to changes in tax policy and the majority was from changes in population characteristics. Between 2008 and 2010, almost all of the increases in the fraction paying no tax and the fraction receiving refundable credits were explained by recession-related tax changes.

Another recent study of the fraction paying no tax is Fullerton and Rao (2016), which used survey-based data at the household level. This approach carries with it a number of issues. First, survey-based data are subject to multiple levels of error: survey response error, income reporting error, and tax burden calculation errors (due to incomplete take-up of some deductions and credits). Second, multiple tax unit households can present problems for calculating correct tax burdens, as household incomes and dependents need to be allocated across more than one tax return.[4] Third, Fullerton and Rao (2016) pooled data over four decades, which obscures trends over time. I address these limitations by using administrative tax data, estimating tax burdens at the tax unit level, and showing trends over the last hundred years. This provides accurate and consistent measures of the fraction paying no federal individual income tax.

II. DATA AND APPROACH

A. Cross-section Data

[3] A similar increase in the fraction paying no tax for annual and multi-year measures is consistent with stable levels of short-term income mobility, as has been estimated by Dahl, DeLeire, and Schwabish (2011) and Celik et al (2012).

[4] For example, how children will be claimed on tax returns may conflict with reporting in survey data. Jones and O'Hara (2016) and Splinter, Larrimore, and Mortenson (2017) find that some households with multiple tax units appear to reassign dependents to lower tax liabilities.

Annual numbers of taxpayers are estimated from IRS Statistics of Income tax return samples, which are representative of the population of tax returns. Confidential files, referred to as the individual and sole proprietorship (INSOLE) files, are used since 1979. These data include taxpayer identification numbers (TINs, usually Social Security Numbers), allowing for merges with Social Security data that include years of birth. To convert from filing tax units to adults, weights are doubled for married filing jointly returns. For Figure 1 only, public use files are used from 1960 to 1978—except for missing years in 1961, 1963, and 1965, which are interpolated—and IRS Statistics of Income individual annual data books (publication 1304) before 1960.

The total number of tax units comes from Census-based estimates of Piketty and Saez (2003 and updates), which sums the number of married couples and unmarried individuals at least 20 years old. As the underlying tax data only includes individuals filing tax returns, these Census-based totals are necessary in order to impute the number of non-filing tax units (all of which are assumed to pay no tax, as discussed below). The number of non-filing tax units is calculated as the total number of tax units less the number of tax returns with resident filers at least 20 years old, where the number of married filing separate returns is halved to fit the Census-based tax unit definition. Based on estimates of Census and tax data, I set the non-filing tax unit marriage rate at 40 percent and the fraction of non-filing tax units that are 20 to 64 years old (i.e., *working age*) at 55 percent.[5] These assumptions allow a conversion of the unit of observation from tax units to working age adults.

[5] For example, in 2000 the Census Bureau's Statistical Abstract reports 59.6 million married men. The IRS reports 50.3 million returns filing jointly and 2.5 million married filing separately (representing 1.2 million marriages). This leaves 8.1 million married couples not filing, and dividing by the estimated 18.6 million non-filer tax units gives a 43 percent non-filer marriage rate. For working age adults, I assume that only 20 percent of non-filing adults are married because elderly non-filers have a higher marriage rate. The assumption that 55 percent of non-filing tax units are working age yields an estimate of 110.7 million working age tax units, similar to Statistical Abstract based estimates of 110.1 million.

B. Panel Data

A panel of tax returns is used to compare annual and multi-year fractions paying no tax in Figure 3 only; for all other analysis, cross-section data is used. The Continuous Work History Sample (CWHS) is a randomly sampled panel, including tax returns since 1979 with primary TINs with specific four digit endings, so tax units continually cycle into the panel when they start filing taxes and out of the panel upon death.[6] The number of sampled TIN endings fluctuated over the sample, generally increasing over time. Only those endings sampled in all years of each multi-year period are included.

The CWHS panel only includes tax returns, therefore some observations will be missing in years when not filing. While studies using the CWHS tend to exclude observations that are not in the sample every year of a multi-year period, this would provide downwardly biased estimates of the fraction paying no tax. To account for periodically missing observations, all primaries filing returns at least once during each five-year sample are kept in the sample. All those filing at least three times are kept in each eleven-year sample.[7] This results in annual fractions of non-filers and adults not paying tax in the multi-year samples that are similar to the cross-section (compare the fraction filing in Table 1, Panel B with Panels C and D). Note that multi-year panels are centered—for example, the 2012 five-year panel includes 2010 to 2014.

C. Defining Taxes

The federal individual income tax burden of filers is total tax liability reported on actual tax returns (after the non-refundable portion of tax credits and including other taxes) less included self-employment taxes, payroll taxes reported on tax returns, and refundable tax

[6] For more description of the CWHS, see Dowd and Horowitz (2011a, 2011b).
[7] Due to marriage and divorce, including all individuals sampled in the CWHS over eleven-year periods would result in an excess estimated fraction of those paying no tax.

credits.[8] I assume that non-filers pay zero income tax, even though some may have tax withheld from their wages. Estimates of non-filers by Heim, Lurie, and Pearce (2017) suggest that withheld taxes in excess of calculated tax liabilities may decrease the fraction paying no tax by a couple percentage points but do not affect the trend.[9] Also, the fraction paying no tax may differ from the fraction that should pay no tax, as some income is not reported to the IRS and over-claiming expenses by businesses could decrease some tax burdens.

D. Decomposition Approach

A shift-share decomposition is used to estimate the causes for the recent increase in the fraction paying no tax among changes in tax policy, demographics, and the income distribution.[10] The effect of tax policy is divided into three steps that transform 2015 tax burdens into 1985 counterfactual tax burdens. First, the EITC is replaced with 1985 EITC values, where credit values and various thresholds are indexed with the CPI-U, and the refundable and non-refundable portions of the child tax credit are removed, as this credit began in the 1990s. Second, some prominent new tax credits are removed: the net premium tax credit, the health care tax credit, and education credits. Third, personal exemptions and standard deductions are replaced

[8] For example, on the 2015 Form 1040 the tax burden is total tax (line 63) less self-employment and payroll taxes (lines 57, 58 and 60a) and refundable credits (lines 66a, 67, 68, 69, and 73 box c). Note that this includes the 0.9% additional Medicare and 3.8% net investment income surtaxes and excludes some credits related to other taxes, such as the credit for federal tax on fuels, and the 2001 and 2008 tax rebates, as they were one-time payments and not fundamental parts of the individual income tax system.

[9] This is likely an over-estimate due to millions of information returns that cannot be linked to the tax returns with which they were filed, incorrectly attributing the taxes withheld on these information returns to non-filers. This occurs because of "ITIN/SSN mismatches," which is when taxpayers use Individual Taxpayer Identification Numbers (ITINs) to file tax returns, but attach information returns with SSNs, as ITINs are invalid for work purposes and so cannot be used on Form W-2. Auten and Splinter (2017) discuss this issue and estimate that since 2006 at least a third of unlinked W-2 wages are reported on tax returns with only ITIN filers.

[10] In an analysis of the 2011 level paying no tax, rather than the change over time, Johnson et al (2011) estimated that about half is from personal exemptions and the standard deduction, and half from tax credits and various exclusions.

with indexed 1985 values, and the bottom 1985 tax rate of 11 percent tax rate is applied to any resulting increase in taxable income.[11]

To estimate the effects of changes in demographics and the income distribution, I follow a reweighting approach similar to Larrimore (2014) and Heim, Lurie, and Pearce (2017). This means sequentially adjusting 2015 observational weights to match 1985 weights for age groups, filing types, the number of children claimed, and income groups.[12] For example, the weights of age 20 to 24 filers are multiplied by the share of age 20 to 24 filers in 1985 and divided by their share in 2015. This leaves the within age group fraction paying no tax unchanged, while adjusting weights to control for their falling share of the population.

The filing groups include single, head of household (unmarried filers claiming dependents), and married (including married filing separately). Age groups are 20 to 24, 25 to 34, 35 to 44, 45 to 54, and 55 to 64 years old. These are the same filing and age groups shown in Figures 4 and 5, as discussed in the next section. Number of children groups are for none, one, two, and three or more dependents claimed, which can also include disabled adults and elderly parents. Income groups in 1985 are set by filing status as five adjusted gross income ranges, equally divided by income between zero and an upper bound: $20,000 for single filers, $35,000 for head of household, and $40,000 for married filers.[13] Non-filers are reweighted such that their share of the adult population equals that in 1985. As in other papers holding tax policy constant over time, such as Dowd (2005), changes to population demographics and the income distribution are considered unaffected by changes in tax policy. For the 1985–2000 and 2000–

[11] As changes in personal exemptions and standard deductions limit the amount of child and dependent care credit reported on Form 1040, its value is replaced with the unlimited amount on Form 2441.
[12] As in Heim, Lurie, and Pearce (2017), reweighting starts with only age group cells. Then for filing types, reweighting is by each age × filing type cell. For the number of children, reweighting is by each age × filing type × number of children cell. For income groups, reweighting is by each age × filing type × number of children × income group cell.
[13] These 1985 income groups are set such that the top group for each filing status has very few adults paying no tax and are inflation adjusted for 2015. The bottom group includes those with negative incomes and the top group includes those with incomes over the upper bound.

2015 subperiods, the same approach is used to transform tax burdens and reweight the sample, where the earlier subperiod is based on 2000 data.

A similar decomposition is applied to changes in the Kakwani index of progressivity for federal individual income taxes. The tax change calculator is expanded such that all appropriate tax rates are applied to changes in taxable income resulting from changes in exemptions and standard deductions (rather than only the bottom rate). Also, instead of a reweighting approach that only accounts for changes in the bottom of the income distribution, actual 1985 data is used to account for inequality changes (this is the final level of tax progressivity at the bottom of Table 3). The Kakwani index is estimated as the difference between the tax concentration coefficient and Gini coefficient of pre-tax income. Pre-tax income is defined as adjusted gross income plus adjustments and excluded capital gains before 1987, where negative incomes are set to zero. The tax concentration coefficient is a Gini-type measure of federal individual income taxes but with tax units ranked by pre-tax income. See Mathews (2014) and Slavov and Viard (2016) for recent discussions.

III. FINDINGS

A. Tax-exempt Thresholds: 1913–1985

Figure 1 shows that the U.S. federal individual income tax initially excluded 99 percent of tax units. During World War II it expanded to become a mass tax, such that only a third of tax units paid no income tax. This was caused by decreases in personal exemptions. For example, between 1939 and 1944 personal exemptions for married couples fell from $43,000 to $13,000 (2016 dollars; see Seltzer, 1968). This is the most dramatic example of the fraction paying no tax changing with the amount of income at which tax is owed, referred to as the *tax-exempt threshold*.

Between 1945 and 1985, the fraction paying no tax fluctuated within a narrow range. Nominal and real income growth subjected more families to income taxes, as personal exemptions and standard deductions were not indexed to inflation. In Figure 1, this tax-exempt threshold "bracket creep" is seen as declines in the fraction paying no tax. The occasional upward jumps are partly due to tax legislation increasing tax-exempt thresholds. For example, the Revenue Act of 1948 increased personal exemptions and added an additional exemption for elderly filers.[14] The Tax Reform Act of 1969 phased in increases of personal exemptions. Reforms in 1975 increased standard deductions and introduced the EITC, and other reforms in the late 1970s increased standard deductions (Bakija and Steuerle, 1991).[15] The rest of this paper focuses on the period since 1985 because that marks a significant break in policy, with the indexation of the tax code and increasing generosity of tax credits.

B. Tax Credit Expansions: 1985–2015

Tax credit expansions resulted from a number of legislative changes. The Tax Reform Act of 1986 increased and indexed the EITC.[16] Legislation in 1990 and 1993 further expanded the EITC. The Taxpayer Relief Act of 1997 introduced the child tax credit and two education tax credits. Tax legislation in 2001 and 2003 increased the standard deduction for joint filers, expanded education credits, increased the child and dependent care credit, and doubled the child tax credit from $500 to $1,000. This contributed to the fraction of tax units paying no tax increasing to 41 percent in 2004.[17] The 2009 American Recovery and Reinvestment Act

[14] It also unified personal exemptions, increasing dependent exemption amounts to be equal to that of filers, which dramatically lowered the taxes of large families relative to childless tax units (Steuerle, 1983).
[15] Some tax rate changes may also have an effect. For example, 1945 and 1948 legislation reduced rates, while 1950 legislation reversed these decreases, and 1951 legislation increased rates through 1953, contributing to a decreasing fraction paying no tax in those years (see www.taxpolicycenter.org/laws-proposals).
[16] The 1986 reform also increased personal exemptions and standard deductions. Hausman and Poterba (1987) extrapolated 1983 tax data to estimate that the reform would cause about 6 million more tax units to pay no tax.
[17] It appears that the effect of expanding these various credits on the fraction paying no tax was generally not a topic of discussion. One exception is Hodge (2003).

increased the refundability of the child tax credit and enacted a set of temporary refundable tax credits, including the making work pay credit, the first-time homebuyer credit, and the American Opportunity Tax Credit.[18] This temporarily increased the fraction of tax units paying no tax to 48 percent. In 2011, the decrease in the fraction paying no tax to 44 percent was due in part to the expiration of the making work pay credit.[19]

Figure 2 shows that these tax policy changes since 1985 corresponded with a 13 percentage point increase in the fraction of tax units receiving refundable credits, that is, with sufficient refundable tax credits to exceed income tax liability after non-refundable credits. This implies a negative income tax and a net payment from the federal government. The increase is 17 percent when considering adults and 15 percent for working age adults. As seen in the next subsection, these increases in the fraction receiving refundable credits are almost exactly paralleled in the fraction paying no tax.

C. Effects of Elderly Filers, Unit of Observation, and Multi-year Periods

The fraction of Americans paying no federal individual income tax varies based on whether the elderly are included, the unit of observation, and if multiple years are considered. Figure 3 shows that the fraction paying no tax has increased since 1985 regardless of these various approaches. Levels, however, have persistently differed. To discuss these differences, I focus on estimates for 2009, which allows for comparisons with centered 11-year averages (which lag annual data by five years).

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[18] In 2001, the child tax credit refundability was expanded to those with fewer than three children and set the threshold above which earnings were refundable at $10,000 (indexed). In 2009, this threshold was temporarily lowered from $12,550 to $3,000 (unindexed) and this change was later made permanent. Note that these reforms did not affect the fraction paying no tax because they only changed the refundable amount received.

[19] The 2011 and 2012 two percentage point reduction in payroll taxes, called the "payroll tax holiday," is viewed as replacing the making work pay credit. This paper does not capture this shift from income taxes to payroll taxes.

In 2009, the fraction of tax units paying no income tax was 48 percent.[20] This falls to 46 percent for tax units aged 20 to 64 years old, as elderly tax units are less likely to owe tax, and removing them from the sample slightly decreases the fraction paying no tax. Taking into account the two adults in married tax units, the fraction of working age adults paying no tax was 43 percent. Married tax units are more likely to pay taxes, so increasing their weight by converting from tax units to adults as the unit of observation decreases the fraction paying no tax. Adults are used for all remaining estimates, as they are a more consistent unit of observation than tax units, which are sensitive to changes in marriage rates.

Summing positive and negative tax burdens over multiple year periods (with taxes indexed by the CPI-U) decreases the fraction of working age adults paying no tax. Over the five-year period centered on 2009, the fraction of working age adults paying no tax falls to 32 percent. Over the eleven-year period this falls to 28 percent.

A couple of examples show why a smaller fraction of adults pay no tax over five-year periods than annual periods. Someone paying zero tax for four years and paying any tax the fifth year is counted here as paying tax for that five-year period, even though four-fifths of the time they pay no tax in the annual estimates. Alternatively, an adult could have a negative tax in a number of years but pay sufficient tax during the multi-year period to offset all of these refundable credits. The largest refundable credit—the EITC—is usually claimed for only one- or two-year spells (Dowd and Horowitz, 2011b).[21] The gap between the fraction paying no tax over annual and five-year periods therefore suggests that many adults jump from having annual

[20] The Williams (2009) estimate of 47 percent was based on forecasted data. More recently, the Tax Policy Center estimated that 51 percent of tax units paid no federal individual income tax in 2009 (www.taxpolicycenter.org/model-estimates/tax-units-zero-or-negative-tax-liability/baseline-distribution-tax-units-no-tax). This estimate is likely higher than the 48 percent estimated here because of a larger assumed number of total tax units, implying more non-filers.

[21] Similarly, Ackerman, Holtzblatt, and Masken (2009) estimate that 62 percent of EITC recipients claim the credit less than half of the time in a seven-year period.

negative taxes to positive five-year taxes. This gap, however, declined since 1985 from over half of the annual fraction to about one-fifth. This was due in part to an increase in the persistence of paying no tax.[22]

In summary, removing the elderly reduces the fraction paying no tax, changing the unit of observation from tax units to adults also lowers the fraction, and moving from annual to multi-year measures of tax burdens again lowers the fraction. None of these adjustments, however, have a significant effect on the upward trend in the fraction paying no tax since 1985.

D. Demographic Effects

Changes in marriage rates, the tax benefits of claiming children, and the age composition may explain some of the trends in the fraction paying no tax. Between 1985 and 2015, the fraction of working age adults who were married fell from two-thirds to one-half. This resulted in increases in the fraction filing as single (from 29 to 37 percent) and head of household (from 7 to 12 percent). Figure 4 shows that single filers have relatively high rates of paying no tax (as compared to married filers with no dependents) and that the largest increase in the fraction paying no tax was for head of household filers. Therefore, the decline in marriage rates should contribute to the overall increase in the fraction paying no tax. In the next subsection, we see that it explains about a tenth of the increase in the fraction paying no tax.

Tax credits associated with qualifying children have also grown in importance (Ackerman et al, 2016). Figure 4 shows that the fraction of single filers paying no tax increased relatively little since 1985, as they have no qualifying children, while it doubled for head of household filers, as they usually benefit from tax credit expansions. Among married filers there

[22] Among working age adults paying no tax in the center year of a five-year period, the average years of paying no tax in 1985 was 3.8, and in 2012 it was 4.3. Dowd and Horowitz (2011b) observed a similar increase since the early 1990s in the five-year out probability of paying no tax.

is also a growing gap between fractions paying no tax among those with and without dependents. In 1985, married joint filers with no dependents and two dependents had similar fractions paying no tax. By 2015, only a tenth of those with no dependents paid no tax while a quarter of those with two dependents paid no tax.

Figure 5 shows the fraction of working age adults paying no tax by age. Even though the fraction paying no tax increased among all age groups, the increase was larger for the young, leading to a fanning out of the fraction paying no tax by age. For example, in 1985 the 35 to 44 and 55 to 64 year old age groups had a similar fraction paying no tax of 11 percent. By 2015, however, 33 percent of the younger group paid no tax and only 18 percent of the older group paid no tax. Again, the importance of children for various credits may explain some of the faster growth in the younger group.

Differences by age group, however, may suggest an exaggerated impact on the overall fraction paying no tax because of changes in the age composition. The markers in Figure 5 show in which year someone born in the middle of the Baby Boom would be in each age group. Notice that these Baby Boomers had little change in the fraction paying no tax. As they are a relatively large age cohort, they attenuated the increase in the fraction of working age adults paying no tax such that age composition changes had little effect, as seen in the next subsection.

E. Decomposition

Table 2 presents the results of the decomposition, which shows how tax policy, demographics, and the income distribution caused the 1985 to 2015 increase in the fraction paying no tax. Shift-share decompositions can be sensitive to the order in which causes are considered, therefore I reverse the sequence of estimated causes and show a second set of results. The average of the two are treated as the main results.

About half of the increase in the fraction paying no tax is explained by an increase in the EITC and child credit (44 percent).[23] Other tax credits explain an additional 17 percent of the increase, implying that all tax credits account for nearly two-thirds (61 percent) of the increase in the fraction paying no tax. Increases in personal exemptions and standard deductions explain another third of the increase (32 percent). This was due to a near doubling of personal exemptions and a large standard deduction increase for head of household filing status with the Tax Reform Act of 1986, as well as a standard deduction increase for married filers in 2003. Falling marriage rates, estimated by changes in filing status, explain 8 percent of the increase and changes in the non-filing fraction of adults explain 6 percent. Meanwhile, changes in the age distribution, number of children claimed, and income distribution have little effect. In summary, over ninety percent of the increase in the fraction of working age adults paying no tax since 1985 was explained by changes in tax policy. Especially important was the effect of increasingly generous tax credits.

Dividing the time period studied in half reveals nonlinearity in the causes of an increasing fraction paying no tax. Table 2 shows that between 1985 and 2000, over 150 percent of the increase was explained by tax policy; but this was offset by a 71 percent decrease due to falling income inequality (rising real incomes) in the region of the income distribution where filers have little tax liability. Much of the effect of tax policy in this period resulted from personal exemptions nearly doubling and standard deductions increasing, in addition to the indexation of both parameters, with the Tax Reform of 1986. Between 2000 and 2015, only 42 percent of the increase was due to tax policy. Accounting for the larger increase in the fraction paying no tax since 2000, the effect of tax policy on the fraction paying no tax was about half as large in this

[23] Breaking out the effects suggests that the child credit explains about a quarter of the increase in the fraction paying no tax and the EITC about a sixth.

more recent subperiod than the earlier subperiod.[24] Meanwhile, a 46 percent positive effect from rising inequality (stagnant real incomes) offset most of the inequality effect from the earlier subperiod.[25] In summary, decreasing and then increasingly income inequality (rising and then stagnant real incomes) near the tax-exempt threshold first offset and then contributed to the increase in the fraction of adults paying no tax. Meanwhile, both subperiods had increasingly progressive taxes.

F. Tax Progressivity

The increase in the fraction paying no federal income tax is related to changes in the Kakwani index of income tax progressivity. To understand this relationship, Figure 6 compares estimates of these two measures. Note that the fraction paying no tax and progressivity do not necessarily move together, such as when the top tax rate increased in 1993, but overall they have tended to move in parallel. Between 1985 and 2015, their correlation is 0.95.[26]

The 2017 Tax Cuts and Jobs Act (TCJA) lowered tax rates and increased standard deductions and child credits, among numerous other changes to individual incomes taxes. To estimate the effect of these changes, I compare the fraction paying no tax under prior law and the TCJA. I also compare tax progressivity under prior law and the TCJA. This is done using a microsimulation tax model to estimate forecasted incomes and federal individual tax burdens. This model consists of a complete tax calculator and uses 2013 tax returns extrapolated based on macroeconomic forecasts of the Congressional Budget Office excluding any effects from TCJA, referred to here as the baseline, as described in Joint Committee on Taxation (2015). Forecasts

[24] The fraction paying no tax increased only 6 percentage points between 1985 and 2000 and 10 percentage points between 2000 and 2015. Dividing the period at 2000 was chosen to keep starting and ending years during economic expansions and thus more comparable.
[25] These results are consistent with the findings of Heim, Lurie, and Pearce (2017) for 2001 to 2013.
[26] An alternative progressivity measure, the Suits index, has a correlation in this period with the Kakwani index of 0.996 (see the online appendix).

for the years 2015 to 2027 are shown in Figure 6. Relative to the 2018 baseline estimates, the TCJA increases the fraction paying no tax from 36.3 to 39.4 percent, a three percentage point increase, and increases the Kakwani index of tax progressivity from 31 to 34, a ten percent increase.[27] Note that these progressivity estimates only account for federal individual income taxes and therefore exclude the TCJA corporate and estate tax changes, which are considered to be regressive and could fully offset the progressivity increases shown here. The TCJA progressivity decline in 2026 is due to the expiration of most individual tax provisions, with the exception of the permanent change from CPI-U to chained CPI-U indexing, which pushes TCJA progressivity below the baseline.

Despite increasing tax progressivity in 2018, the TCJA's individual income tax provisions have been estimated to result in regressive changes in after-tax incomes. For example, Sammartino et al (2018) estimated that the bottom two quintiles have after-tax income increases of up to roughly one percent, while the top two quintiles have larger increases of roughly two percent.[28] How can the TCJA cause these regressive changes while also creating a more progressive tax system? This seeming paradox results because after-tax income changes account for the roughly ten percent decrease in the overall amount of income taxes, while the Kakwani index of progressivity only captures the relative distribution of taxes, which is independent of changes in the overall amount.[29] In summary, the TCJA reduced the overall size of the individual income tax, causing a regressive change in after-tax incomes, while at the same time making this smaller tax burden more progressively distributed.

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[27] These estimates include the revenue effect of the passthrough deduction but do not take into account behavioral responses to changes in tax policy, such as changes in health insurance status. Due to underlying differences, the number of non-filers in the forecast is adjusted down by a third to approximate the 2015 fraction paying no tax.
[28] I estimate similar changes for 2018 and that the after-tax income Gini coefficient increases by 0.3 percent under the individual income tax provisions of TCJA.
[29] Hemel and Rozema (2017) discuss how after-tax income inequality and tax progressivity can move in opposite directions and provide examples.

The increase in tax progressivity between 1985 and 2015 can be better understood by looking at how tax rates changed over the income distribution. Figure 7 shows average effective tax rates, which divide each income group's federal individual income tax by total income.[30] Effective tax rates increased for the top quintile of working age adults and decreased for all other income groups, implying an increase in the progressivity of taxes. The growth of refundable tax credits contributed to decreasing tax rates of the bottom quintile from 1 percent to negative 13 percent. Tax rates of the second quintile also fell significantly, from 8 percent to negative 3 percent. These results are similar to estimates in Congressional Budget Office (2018).

Table 3 presents the results of the second decomposition, which shows how tax policy, demographics, and the income distribution caused changes in the Kakwani index of progressivity. Between 1985 and 2015, this measure of federal individual income tax progressivity increased from 21.9 to 31.4. Larger personal exemptions and standard deductions account for some of the increase in tax progressivity, although increasing income inequality offset their contribution. As with the fraction paying no tax, increasingly generous child and earned income tax credits explain the overwhelming majority of the increase in the Kakwani index of tax progressivity.

IV. CONCLUSION

Using administrative tax data, this paper presents estimates of the fraction of tax units and adults with no federal individual income tax burden. Relative to measures based on tax units, the fraction paying no tax falls when considering adults, as married couples are more likely to pay taxes. It falls again when considering taxes paid over multi-year periods, as incomes tend to

[30] These measures have a number of limitations. They exclude taxes other than federal individual income taxes, measure statutory rather than economic incidence, and are based on incomes reported on tax returns, which provide inconsistent measures over time due to changes in the tax base and reporting and filing behavior (Auten and Splinter, 2017).

recover quickly from negative shocks. A decomposition shows that over ninety percent of the rise in the fraction paying no tax since 1985 was caused by changes in tax policy. In particular, increases in the value of tax credits explain two-thirds of the change.

Besides increasing the fraction of taxpayers paying no tax, increasingly generous tax credits have also contributed to an increase in federal individual income tax progressivity, as measured by the Kakwani index. The 2017 tax reform further expanded tax credits and increased forecasted tax progressivity. As income volatility causes frequent churning in and out of the bottom of the distribution (Dowd and Horowitz, 2011b; Rank and Hirschl, 2015), increasing tax progressivity at the bottom of the distribution provides not only medium- and long-term income support, but also contributes to the insurance effect of taxes by providing a temporary safety net.

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Table 1
CWHS Tax Return Data Summary Statistics (Figure 3 only)

	Fraction Filing			N. Observations		
	1985	**1995**	**2012**	**1985**	**1995**	**2012**
Panel A: Cross-section (Tax Units)						
20+ years old	0.84	0.84	0.85	118,140	113,986	332,828
20–64 years old	0.89	0.90	0.89	100,641	91,185	258,133
Panel B: Cross-section (Adults)						
20+ years old	0.85	0.85	0.84	118,140	113,986	332,828
20–64 years old	0.91	0.91	0.90	100,641	91,185	258,133
Panel C: 5-year panel (Adults)						
20–64 years old	0.88	0.88	0.87	8,555	20,536	129,478
Panel D: 11-year panel (Adults)						
20–64 years old	0.88	0.87	---	7,123	17,856	---

Notes: Age restrictions apply in all years of each multi-year period and the primary must not have died by the end of the multi-year period. Estimates for the center year of each multi-year period are shown. For the 5-year panel, included TINs filed at least one year during each multi-year period; for the 11-year panel at least three years. Married filing joint returns are counted as two adults and non-filer tax units as 1.4 adults. Ages are based on the age of the primary filer.
Source: Author's calculations using IRS data.

Table 2

Decomposition of Increase in the Fraction of Working Age Adults Paying No Federal Individual Income Tax

	1985–2015					1985–2000	2000–2015
	Fraction no tax	**Change**	**Percent of total change**	**Reverse percent of total change**	**Avg. percent total change**	**Avg. percent total change**	**Avg. percent total change**
2015 fraction paying no tax	**36.5**						
A. Tax policy changes							
Child credit and EITC	30.0	-6.4	40	48	44	61	23
Other credits	27.3	-2.7	17	18	17	---	16
Exemptions & std. deductions	21.8	-5.6	34	29	32	93	3
B. Demographic changes							
Age cohorts	22.5	0.7	-4	-1	-3	-3	-3
Filing status	20.7	-1.7	11	6	8	5	5
Number of children	20.7	0.0	0	-5	-2	13	2
Non-filers	19.6	-1.1	7	5	6	4	8
C. Income distribution	20.2	0.6	-3	0	-2	-71	46
D. Cumulative effect		–16.3	100	100	100	100	100
1985 fraction paying no tax	**20.2**						

Notes: All values shown in percentage terms. For the 1985–2015 decomposition, 2015 tax burdens are adjusted by removing tax credits not available in 1985 and applying indexed 1985 EITC amounts and indexed exemptions and standard deductions. 2015 base data is adjusted to match 1985 income distribution and demographics by reweighting observations. The same approach is applied to the two other periods. Reverse percent total change applies changes in the reverse order as listed. Avg. percent total change is the average of percent of total change and reverse percent of total change.

Source: Author's calculations using IRS data.

Table 3

Decomposition of Increase in Federal Individual Income Tax Progressivity between 1985 and 2015

	Tax progressivity	**Change**	**Percent of total change**
2015 tax progressivity	**31.4**		
A. Tax policy changes			
Child credit and EITC	23.3	-8.1	87
Other credits	22.2	-1.0	11
Exemptions & std. deductions	19.8	-2.4	26
B. Demographic changes			
Age cohorts	20.4	0.6	-7
Filing status	20.2	-0.2	3
Number of children	20.3	0.1	-1
Non-filers	20.9	0.6	-6
C. Income distribution	21.9	1.7	-19
D. Cumulative effect		-8.8	100
1985 tax progressivity	**21.9**		

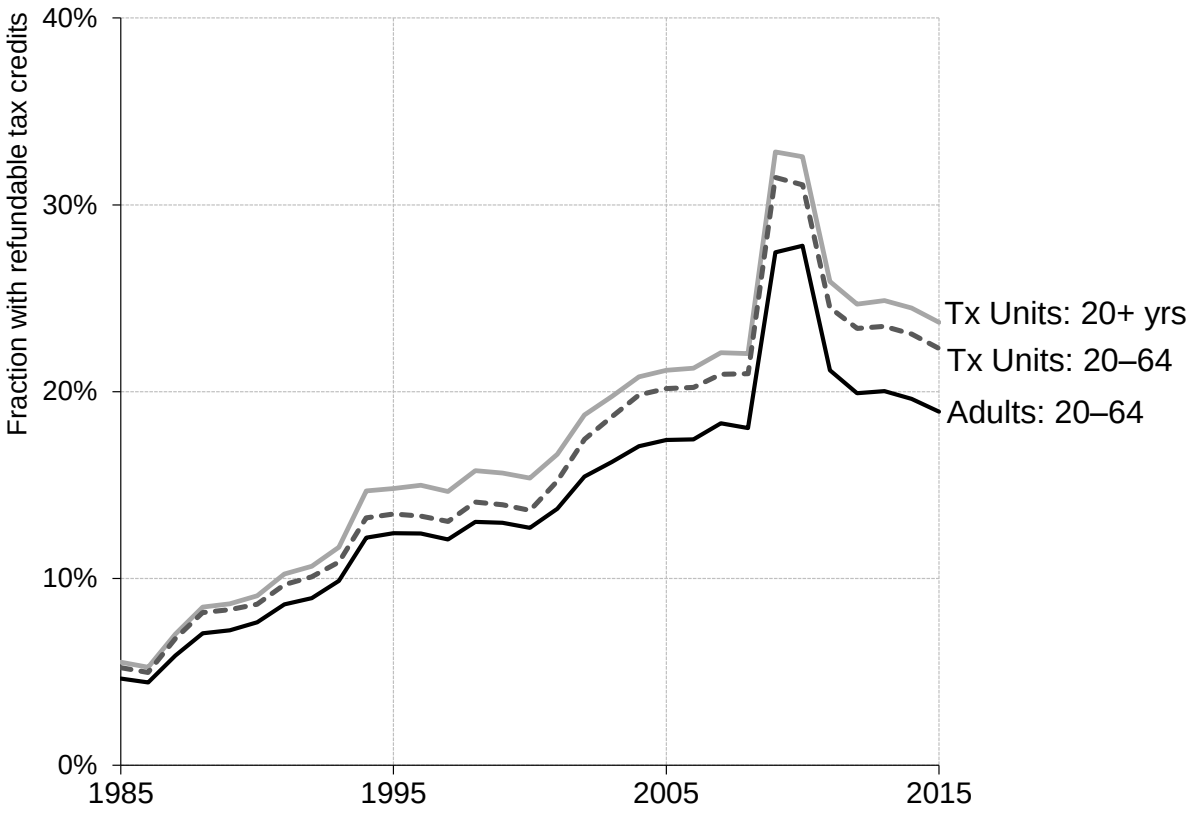
Notes: Only includes adults 20 to 64 years old. See Table 2 and text for description of decomposition. Tax progressivity is measured by the Kakwani index, estimated as the difference between the tax concentration coefficient and Gini coefficient of pre-tax income (adjusted gross income plus adjustments).

Source: Author's calculations using IRS data.

Figure 1
Fraction of Tax Units Paying No Federal Individual Income Tax, 1913–2015

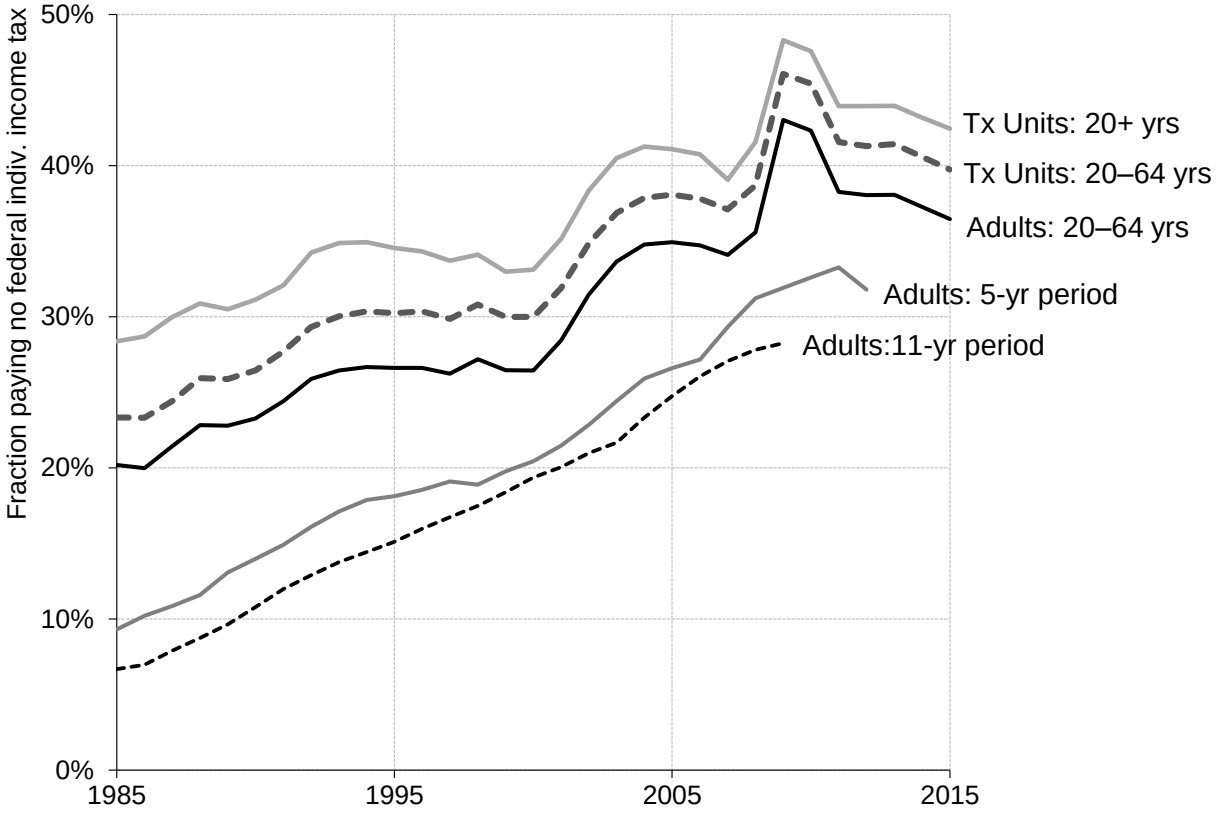
Notes: Estimates are for tax units 20 years or older. For 1913 to 1915, all tax returns filed are assumed to pay tax. For 1916 to 1942, no tax filers younger than 20 years old are assumed to pay tax. For 1943 to 1959, 4 percent of tax returns paying tax (IRS data book definition) are assumed to be either younger than 20 years old or not pay tax after removing payroll taxes. Since 1960, estimates are based on annual microdata (with 1961, 1963, and 1965 interpolated).
Source: Author's calculations using IRS data.

Figure 2
Fraction with Refundable Tax Credits



Note: Receiving refundable credits means having sufficient tax credits to have a negative federal individual income tax liability. Married filing joint returns are counted as two adults and non-filer tax units as 1.4 adults. Ages are based on the age of the primary filer.
Source: Author's calculations using IRS data.

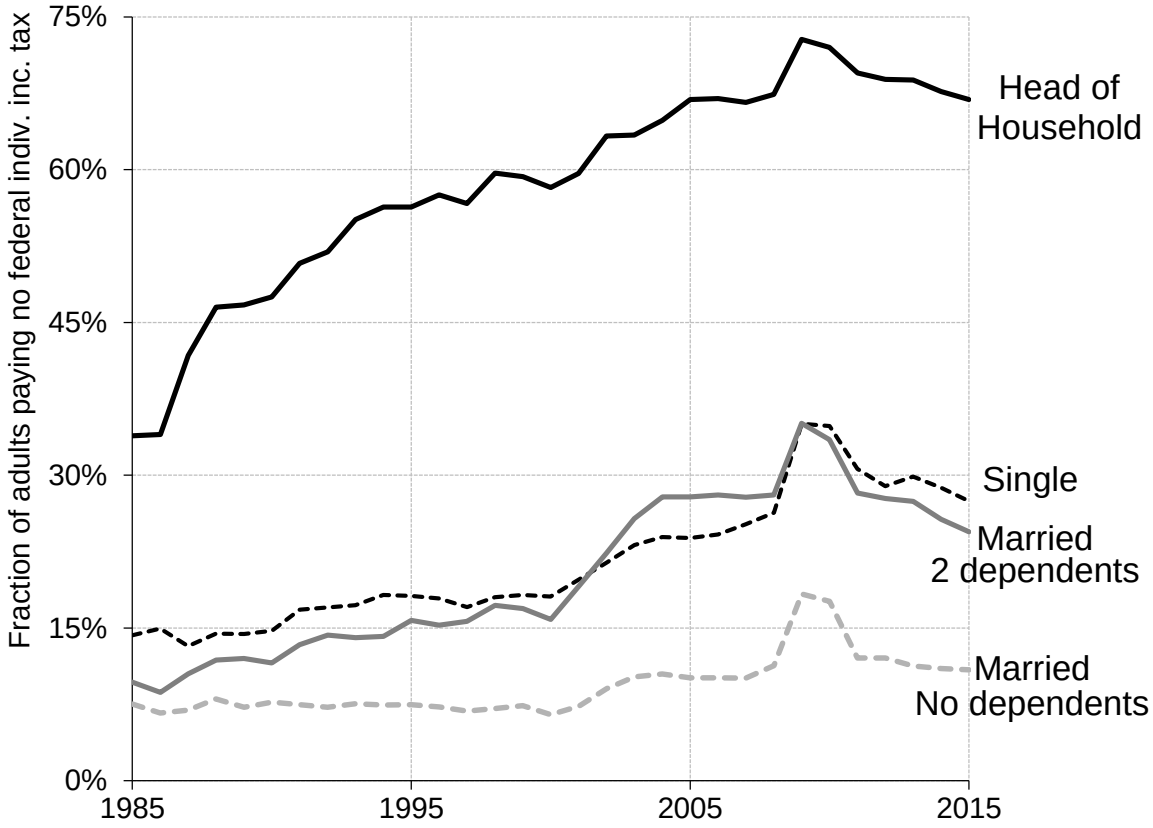
Figure 3
Fraction Paying No Federal Individual Income Tax



Note: See Table 1 Notes.
Source: Author's calculations using IRS data.

Figure 4

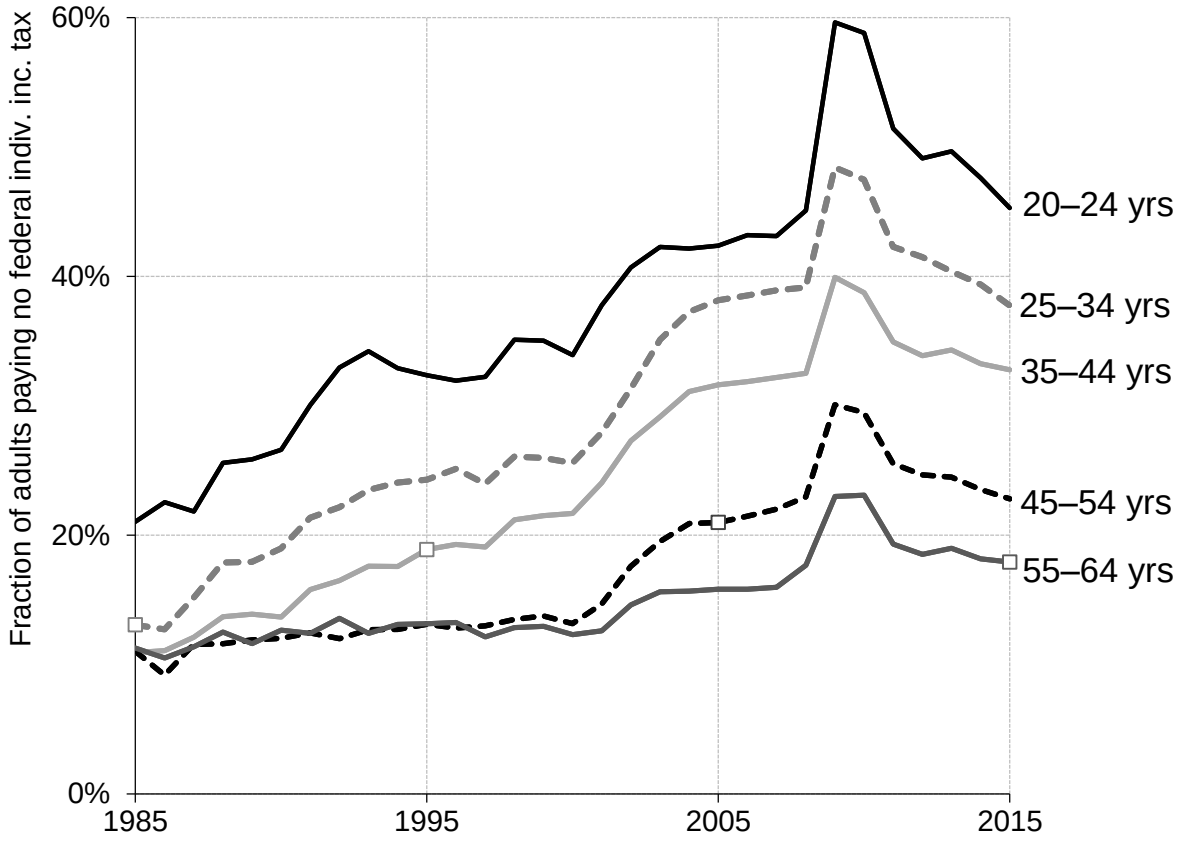
Fraction of Adults Paying No Federal Individual Income Tax by Filing Status



Note: Only includes 20 to 64 year old adults and excludes married filing separately returns and non-filers.

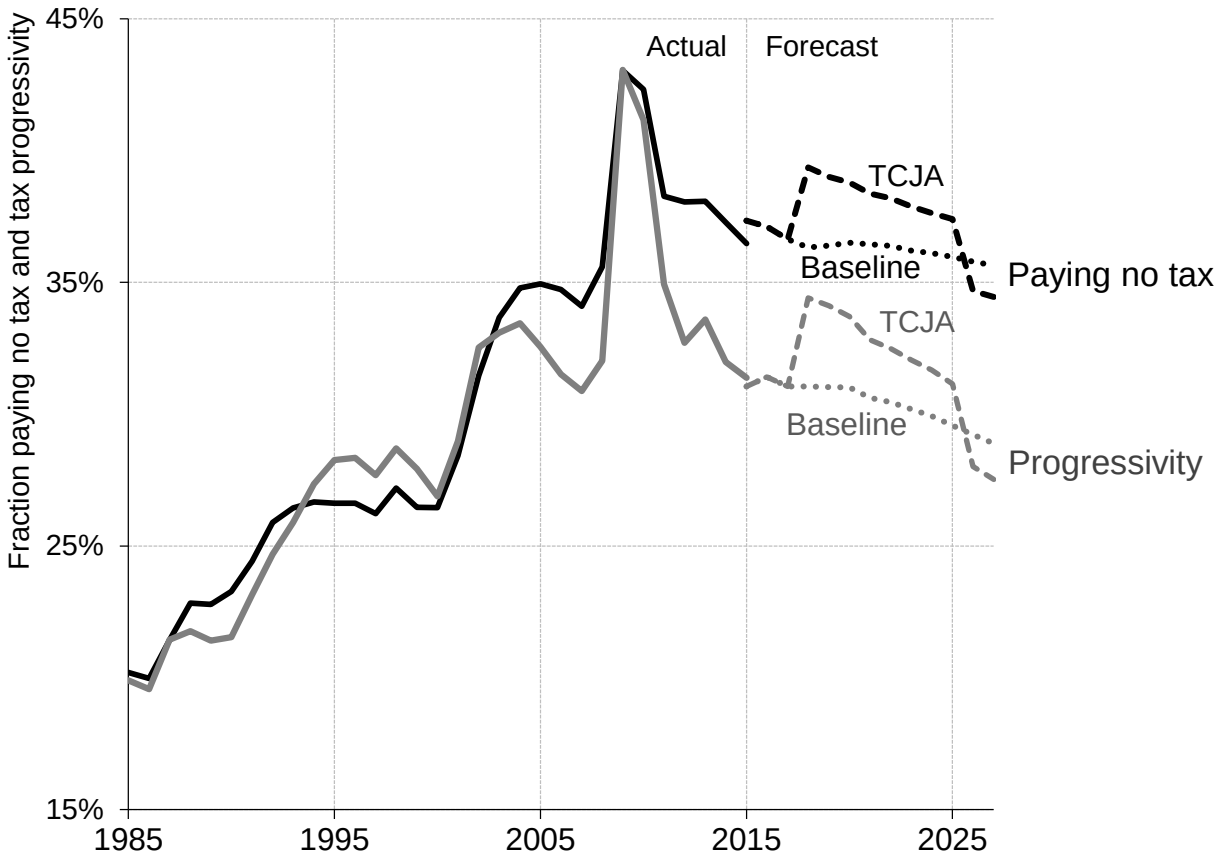
Source: Author's calculations using IRS data.

Figure 5
Fraction of Adults Paying No Federal Individual Income Tax by Age Group



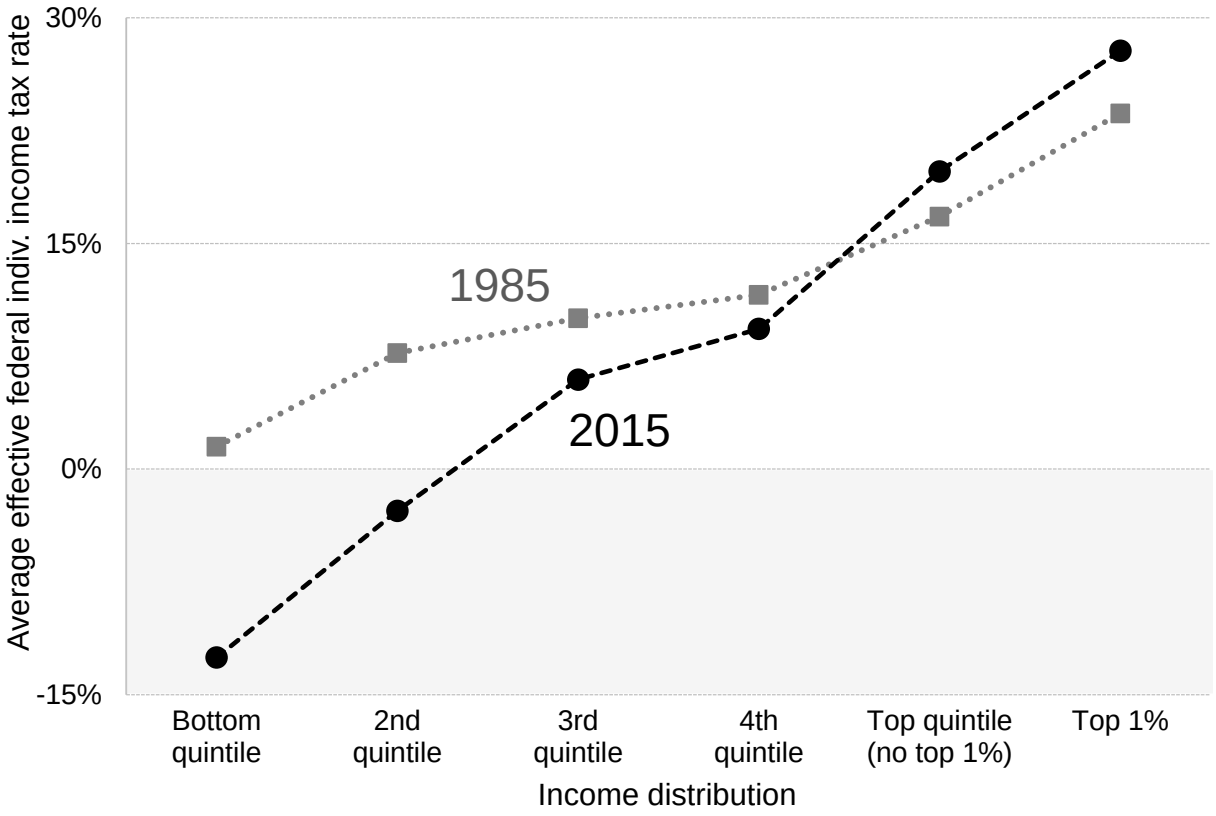
Note: Markers indicate the year in which someone born in the middle of the Baby Boom would be in the middle of the age group.
Source: Author's calculations using IRS data.

Figure 6
Fraction Paying No Federal Individual Income Taxes and Tax Progressivity



Notes: Only working age adults are included. Tax progressivity is measured by the Kakwani index. Forecasts begin in 2015, where baseline estimates are forecasts prior to the enactment of the 2017 Tax Cuts and Jobs Act (TCJA). The number of working age non-filing adults and average non-filer income are set to grow at 2 percent rates from 2013.
Source: Author's calculations using IRS data and the Joint Committee on Taxation Individual Tax Model.

Figure 7
Average Effective Tax Rates by Income Group in 1985 and 2015



Notes: Only includes adults 20 to 64 years old and thresholds set such that each quintile has the same number of adults. Average effective tax rates are total income group taxes divided by income. Taxes only include federal individual income taxes. Income for filers is adjusted gross income plus statutory adjustments, and in 1985 includes excluded capital gains. Income of non-filers is 30 percent of average filer income. Incomes are bottom-coded at zero.
Source: Author's calculations using IRS data.