WHAT DROVE THE DECLINE IN TAXPAYING? 
THE ROLES OF POLICY AND POPULATION

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Over the years 2001–2013, the share of individuals in the United States paying positive income taxes fell 6 percentage points, while the fraction with zero and negative tax liabilities increased by 1 and 5 percentage points, respectively. However, during 2008 through 2010, the fraction with negative tax liabilities increased substantially, with corresponding declines in positive and zero tax liabilities. In this paper, we examine the extent to which changes in income tax law, as compared to changes in characteristics of the population represented on income tax and information returns, drove these changes. For this study, we use a sample of tax and information returns drawn from the population of U.S. individual income tax returns over the years 2001–2013. Using this data, combined with federal income tax calculators, we first simulate counterfactual trends in taxpaying status (whether tax liability is positive, zero, or negative) assuming constant tax policy and the actual year-specific populations. We then calculate counterfactual trends in taxpaying status assuming a constant population but actual year-specific tax policy. The results suggest that changes in the population drove most of the overall trends in taxpaying status over the sample period, but changes in tax policy drove almost all of the sizable drops in positive and zero tax liabilities and increase in negative tax liabilities in 2008 through 2010.

Keywords: income taxes, distribution, tax liabilities, tax credits and deductions
JEL Codes: H24, H22

I. INTRODUCTION

The federal government in the United States relies on individual income taxes for a large share of its revenue, comprising 47.4 percent of federal revenue in 2013. However, recent tabulations have shown that a large share of the population either pays...
no individual income taxes or has a negative tax liability at the federal level, findings
that figured prominently in recent presidential elections. For example, tabulations by
the Tax Policy Center have suggested that, in 2011, 46.4 percent of tax units\(^1\) paid no
income taxes or had negative income tax liability,\(^2\) while estimates by the Office
of Tax Analysis (OTA) in the U.S. Department of the Treasury suggest that, in 2016, 44.6
percent of families will have no or negative income tax liability.\(^3\) Consistent with these
tabulations, Heim, Lurie, and Pearce (2014) find that 47 percent of tax units and 38
percent of individuals paid no income taxes or had negative income tax liability in
2011. Further, they find that the share individuals paying positive income taxes declined
by 7 percentage points over the 2001–2011 period. It is unknown, however, to what
extent these trends were the result of conscious changes in tax policy, rather than simply
due to changes in the characteristics of the population. Answering these questions will
help shed some light on the debate over declining positive taxpaying shares. In this
paper, then, we examine the extent to which changes in tax policy and changes in the
population contributed to this trend.

In a given year, a taxpayer with zero tax liability must either have no tax liability
before credits due to the sum of itemized or standard deductions and exemptions
exceeding adjusted gross income, or have nonrefundable tax credits\(^4\) that exceed their
tax liability before credits. For tax liability to be negative, one must claim a refundable
tax credit that exceeds income tax liability after nonrefundable credits.\(^5\) An individual’s
taxpaying status (having positive, zero, or negative tax liability) can change over time,
then, due to the taxpayer’s characteristics changing (an increase or decrease in income,
a change in marital status, having more children, etc.) or due to tax policy provisions
changing (a change in tax rates, the introduction of new tax credits, etc.). In addition,
the taxpaying population can change due to entry from births and immigration, and
exits from deaths and emigration.

Some analysts have attempted to gauge which tax policy provisions lead to taxpayers
having no or negative income tax liabilities. For example, Johnson et al. (2011) simu-
late that in 2011 roughly half of those who did not owe positive income tax are in that
position due to standard income tax provisions, including personal exemptions and the
standard deduction, while the other half are nontaxable due to tax preferences. Among
those who are nontaxable due to tax preferences, 75 percent are made nontaxable due
to tax preferences for the elderly (including the extra standard deduction for the elderly,
\(^1\) A tax unit consists of a nondependent primary filer, a nondependent secondary filer (if the taxpayer is
married filing jointly), and dependents claimed on the tax form (if any). In the paper we use the term tax
unit and families interchangeably.
\(^2\) See, for example, Tax Policy Center, “Tax Units with Zero or Negative Tax Liability, Current Law, 2004–
Other similar tabulations are presented in Williams (2010), Toder and Johnson (2010), and Johnson et al.
(2011).
\(^3\) See https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/Number-and-Share-of-
\(^4\) For example, the Adoption Tax Credit or the nonrefundable portion of the Child Tax Credit.
\(^5\) For example, the Earned Income Tax Credit or the Additional Child Tax Credit.
the partial exclusion of Social Security benefits, and the Tax Credit for the Elderly) and those for children and the working poor (including the Child Tax Credit, the Child and Dependent Care Credit, and the Earned Income Tax Credit). These tabulations, however, are for a particular population facing a particular set of tax policies in a particular year.

The aim of this paper, then, is to examine to what extent changes in tax policy and changes in population drove the decline in positive income taxpaying over time. The tax policy changes during this period include changes in statutory marginal tax rates, increases in some tax credits and the creation of others, and the distribution of tax rebates. For the purposes of this paper, we consider changes in the taxpaying population to include both changes in demographic characteristics (including the age profile of the population, marriage patterns, and in the presence and number of children) and changes in monetary amounts reported on tax forms (including components of income, deductions, and amounts of other tax-preferred items).

It is important to note that some of the features of the population may have resulted from behavioral responses to tax changes, and some policy changes may have been driven by changes to the population. To the extent that changes in tax law led to changes in the population, the shares attributable to population change in our simulations would be upward biased, and the share due to policy changes would be downward biased, while if changes in the population led to changes in tax law, the biases would be reversed. Further, interactions between tax policy changes and population changes may affect tax status in a manner that is missed if one or the other is held fixed. We do not, however, attempt to completely disentangle the two by predicting counterfactual populations and tax policy, and so the shares attributable to tax policy and population changes may not sum to 100 percent.

For this study, we constructed an unbalanced panel of tax information from nondependent individuals by matching and merging a random sample of Internal Revenue Service (IRS) tax returns over the 2001–2013 period to a panel of information returns (including forms W-2, 1098, 1099, and others) that spans the same period. We then calculate the counterfactual amount of taxes that each taxpayer would owe if they had faced each different years’ tax parameters. In doing so, we can examine the extent to which taxpaying status would have changed over time if the population had remained fixed and tax policy had followed its actual path, if tax policy had remained fixed and the population had followed its actual path, or some combination thereof.

In performing these simulations, we follow the practice of the Treasury Department, the Congressional Budget Office, the Joint Committee on Taxation, and the Urban-

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6 Throughout this paper we focus exclusively on income tax payments, and do not consider payroll (FICA) tax payments or self-employment (SECA) tax payments. Although these tax payments are important to take into account when considering what fraction of taxpayers pay positive taxes on net, our purpose in this study is to examine what drove the decline in positive individual income taxpaying over time. Our measure of income tax payments does, however, include the SECA deduction received by self-employed individuals when filing income taxes.

7 Henceforth, the term “individuals” will be used as a shorthand for “nondependent individuals.”

8 See Cronin (1999).
Brookings Tax Policy Center in assuming that each individual bears the burden of the individual income taxes that they pay.\textsuperscript{9,10}

A spreadsheet that contains the tabulations used to create all tables and figures in this paper is available, upon request, from the authors.

Our results suggest that changes in the population drove most of the 2001-2013 trend in taxpaying status over the sample period. Of the 6.1 percentage point decline in individuals with positive tax liabilities over our sample period, about one-half to two-thirds was associated with changes in the population, while a smaller share resulted from changes in tax policy over this period. Changes in the population also drove almost all of the increase in individuals with zero tax liabilities, though the change in negative tax liabilities was split more equally between tax policy and population. However, not surprisingly, changes in tax policy drove almost all of the drops in positive and zero tax liabilities in 2008 through 2010, and almost all of the increase in negative tax liabilities.

The paper proceeds as follows. Section II describes the major tax changes that occurred during the period under analysis. Section III describes our data. Section IV presents the results and Section V concludes.

II. CHANGES IN FEDERAL INCOME TAX LAW, 2001-2013

During the period under analysis, six major tax changes were signed into law, including the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA), the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA), the Economic Stimulus Act of 2008, the American Recovery and Reinvestment Act of 2009 (ARRA), the Affordable Care Act of 2010 (ACA), and the American Taxpayer Relief Act of 2012. Taken together, these laws had the effect of decreasing marginal tax rates (then increasing them for higher income taxpayers), distributing tax rebate checks, increasing credits available for low-income taxpayers (including the Child Tax Credit and the Earned Income Tax Credit), and creating temporary new credits (the Making Work Pay Credit and the First Time Homebuyer Credit).

Prior to the passage of EGTRRA, there were five income tax brackets, with rates ranging from 15 percent to 39.6 percent. EGTRRA created a sixth 10 percent bracket (the benefits of which were sent out in the form of rebate checks for tax year 2001), reduced each of the remaining tax brackets above the 15 percent bracket in 2001 and scheduled further reductions in subsequent years. EGTRRA also phased out the limitation on itemized deductions and the phase-out of the personal exemption for high-

\textsuperscript{9} Note that we do not account for any benefits (including Social Security Benefits) that are associated with these tax payments.

\textsuperscript{10} Note, however, that evidence for the full incidence of income taxes falling on the individual who pays the tax is not particularly strong. Fullerton and Metcalf (2002) noted at the time of their survey that this assumption had never been tested. Since that time, Kubik (2004) found that pre-tax wages of workers declined when marginal tax rates decreased due to the Tax Reform Act of 1986, while Leigh (2010) found that pre-tax wages decreased when the generosity of the Earned Income Tax Credit increased. Bingly and Lanot (2002) find that higher marginal tax rates lead to higher gross wages and earnings using Danish data. These results imply that at least some of the burden of the individual income tax shifted onto employers.
income taxpayers over half a decade beginning in 2006. EGTRRA increased the Child Tax Credit in stages from $500 to $1,000 and expanded eligibility, and for low-income taxpayers increased the maximum amount of the Child and Dependent Care Credit. Finally, EGTRRA provided marriage penalty relief and increased marriage bonuses by increasing the standard deduction, the size of the 15 percent tax bracket, and the start and end of the Earned Income Tax Credit phase-out range for married taxpayers relative to single taxpayers.

JGTRRA accelerated the EGTRRA marginal tax rate changes that were to occur in subsequent years. As a result, the rates which were to be in effect in 2006 under EGTRRA ended up being implemented in 2003, with the four highest brackets carrying marginal tax rates of 25, 28, 33, and 35 percent. In addition, JGTRRA accelerated the Child Tax Credit expansion, and set the maximum long-term capital gains tax rate at 15 percent.11

The Economic Stimulus Act of 2008, which aimed to counteract the effects of the looming recession, distributed tax rebates of up to $300 per taxpayer plus $300 per qualifying child, subject to a limit. Most of these rebates were distributed between April and July of 2008, though eligible taxpayers who did not receive a rebate or were eligible for a larger credit than the one received could claim the credit when they filed their 2008 tax return. It also created a temporary $7,500 first time homebuyer tax credit, the proceeds of which were required to be paid back over 15 years.

The ARRA created the Making Work Pay Credit, a refundable tax credit of up to $400 per individual, and increased the first-time homebuyer credit to $8,000 while eliminating the pay-back provision. Both of these credits were temporarily available in 2009 and 2010. The act also temporarily expanded the Child Tax Credit, education credits, and the Earned Income Tax Credit (EITC).12

The ACA created a surtax on net investment income of 3.8 percent and increased the adjusted gross income (AGI) floor of the itemized medical deduction for people under the age of 65. However, these changes did not take effect until January 1, 2013.13

Finally, the American Taxpayer Relief Act of 2012 permanently extended the EGTRRA and JGTRRA tax cuts for couples making less than $450,000 and individuals making less than $400,000, but let the tax cuts expire for individuals above these income thresholds, returning the top marginal tax rate to its pre-2001 level of 39.6 percent. In addition, the limitations on itemized deductions and the phase-out of the personal exemption returned for high-income taxpayers, and the maximum dividend and long-term capital gains tax rates increased to 20 percent for taxpayers with taxable income above $450,000 ($400,000 for singles). Finally, the parameters of the Alternative

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11 Two laws passed in the following two years, the Working Families Tax Relief Act of 2004 and the Tax Increase Prevention and Reconciliation Act of 2005, extended subsets of JGTRRA through 2010. The Working Families Tax Relief Act also simplified the definition of a child for the purposes of claiming child-related tax credits. In addition, the American Jobs Creation Act of 2004 allowed individuals who itemize deductions to deduct either state and local income taxes or state and local sales taxes.

12 The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended for two years all of the EGTRRA and JGTRRA tax cuts, as well as the ARRA tax credits.

13 Since our analysis ends in 2013, we do not take into account the premium tax credit and individual shared responsibility payment enacted in the ACA, as these did not take effect until 2014.
Minimum Tax were permanently patched and indexed to inflation, and the expansions of the EITC and the Child Tax Credit were extended for five additional years.\textsuperscript{14}

Overall, the reduction in top statutory marginal income tax rates during this period and changes in the alternative minimum tax (AMT) parameters would be unlikely to affect taxpaying status, as they affect taxpayers likely to have positive liabilities with and without these tax changes. However, reductions in marginal tax rates for lower individuals, and expansion of nonrefundable credits would be likely to increase the share having zero tax liability on a persistent basis, and expansions of refundable tax credits would be likely to increase the share with negative tax liabilities. Finally, the 2008 rebate and the Making Work Pay Credit would be expected to temporarily increase the share with negative tax liabilities. It is important to note that, unlike most of the other tax law changes during this period, the 2008 rebate and the Making Work Pay Credit were explicitly designed to be temporary stimulus measures, and so an increase in the share of individuals with negative tax liabilities due to these changes would be consistent with the intention of the policy.

III. DATA AND INCOME TAX CALCULATORS

Data for this study are drawn from population files of individual income tax returns housed at the IRS.\textsuperscript{15} We select a 0.1 percent sample of individual information based upon ten four-digit endings of a person’s Social Security Number (SSN) or tax identification number (TIN), whichever applies.\textsuperscript{16}

\textsuperscript{14} During this period, limits on the Section 179 expensing were increased, and bonus depreciation was allowed in a number of years. These changes could also increase the shares of individuals with zero or negative tax liabilities.

\textsuperscript{15} These population files are a repository for many of the various tax forms collected by the IRS, including federal individual income tax returns and the corresponding information returns. The data were drawn on October 15, 2015, and include all returns (including late-filed returns) that were posted to the population files before that date. These data are different in several ways from data compiled by the IRS’s Statistics of Income (SOI) division, like the Individual and Sole Proprietorship (INSOLE) file. First, the data are not cleaned in the way that the SOI cleans and processes the INSOLE data. This means that the data could have large outliers and may have inconsistent data due to either taxpayer errors or coding errors during transcription. However, for major items (like AGI), the data are math error corrected, and for minor items (e.g., wages from W-2 forms), we performed some minor cleaning to eliminate obvious errors. Second, the INSOLE dataset is an annual sample based upon a processing year while this dataset is a continuously updated universe of returns that can be organized in a number of different ways. We have chosen to construct our panel by tax year as opposed to processing year because we are interested in the share of people that pay tax for a given year regardless of when a tax return was filed. Because the data are continuously updated, information drawn at one point in time may differ from data drawn at a later date due to late filers or amended returns, which are not included in the INSOLE files. However, data more than a couple of years old should be relatively consistent over time because it is less likely to be updated.

\textsuperscript{16} The four-digit endings of SSNs and TINs are assigned in order, effectively making them random from a sampling perspective. However, one way this sample could be nonrandom is if people tended to illegally use certain SSN or TIN combinations over others. Sampling ten of these endings equates to an approximately 1-in-1,000 sample of individuals, and so our individual weights are set to 1,000 for all observations.
Individuals are selected into our sample if they have one of the ten four-digit SSN/TIN endings and either: (1) were the primary or secondary filer on a Form 1040; (2) received a W-2 from an employer; or (3) received one of a set of other information returns. We dropped individuals who were claimed as a dependent on a Form 1040 or who filed as a dependent filer. We then matched data from all of the tax forms by individual SSN. Finally, we merge in data on the age of the primary filer (and secondary filers, when applicable), which come from a file provided by the Social Security Administration.

Table 1 summarizes the counts of nondependent individuals in our tax data over time, both overall and by whether the individual filed a Form 1040. This table shows that between 2001 and 2013, the total number of nondependent individuals for which we have a tax return or information return increased from about 199 million to 215 million. In most years, between 85 and 86 percent of these individuals filed a Form 1040, while between 14 and 15 percent were non-filers. Tax year 2007 is the only outlier, when 93 percent of individuals were 1040 filers. This was because the Economic Stimulus Act of 2008 required people to file a Form 1040 for 2007 to receive their stimulus check from the federal government.

Similar to Heim, Lurie, and Pearce (2014), we examine the share of individuals with positive, negative, or zero income tax liability. As noted in that paper, an advantage of calculating shares for individuals, rather than tax units, is that it is not necessary to utilize an alternative source of information (such as survey data) to gain data on the tax situation of non-filers, since the IRS receives information returns for the vast majority of individuals in the country.

Among those who file a tax return, we use the OTA tax calculators to calculate federal income tax liability, and define an individual as paying positive income taxes if they

17 We drop individuals with an invalid SSN/TIN, either because the SSN/TIN does not exist or does not match the name on the return. We also drop individuals if they are reported as having died prior to the given tax year.
18 These include: 1098 (home mortgage interest paid), 1098-E (student loan interest paid), 1098-T (tuition statement), 1099-DIV (dividend income), 1099-G (certain government payments including unemployment compensation), 1099-INT (interest income), 1099-MISC (miscellaneous income), 1099-R (retirement distributions), 1099-SSA (Social Security income), W-2G (gambling winnings), 5498 (IRA contributions), 1065-K1 (partnership income), and 1120S-K1 (S corporation income). The information return data contained some duplicate observations; any duplicate copies were dropped.
19 A limitation of structuring the sample this way should be noted. To the extent that individuals reside in the United States, but have no contact with the IRS, they will not be included in our sample. If an individual switches between having contact with the tax system in one year and not having contact in another, they will be in the sample in the years they had contact, and would be excluded in years they did not.
20 We are not able to observe dependent status for dependents who are not claimed on an individual tax return. Because of this, some individuals who are treated as non-filers in our data may actually be dependents of other non-filers.
21 This includes aggregating wage amounts from W-2 forms for those with multiple jobs during a year.
22 The tax calculators used in this study differ from the calculators that OTA uses for tax policy analysis, in that the calculators take a less detailed set of variables as inputs, and create a more limited set of variables as outputs.
Table 1
Nondependent Individuals by Tax Filing Status

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<tr>
<td>Percent of Total</td>
<td>86</td>
<td>86</td>
<td>86</td>
<td>86</td>
<td>86</td>
<td>87</td>
<td>93</td>
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<tr>
<td>Nondependent 1040 filer</td>
<td>171,338</td>
<td>172,104</td>
<td>173,015</td>
<td>174,823</td>
<td>177,559</td>
<td>182,052</td>
<td>196,678</td>
<td>186,915</td>
<td>186,009</td>
<td>188,060</td>
<td>188,685</td>
<td>187,718</td>
<td>182,282</td>
</tr>
<tr>
<td>Total</td>
<td>198,874</td>
<td>200,130</td>
<td>201,505</td>
<td>203,805</td>
<td>206,485</td>
<td>209,364</td>
<td>212,254</td>
<td>213,932</td>
<td>214,481</td>
<td>216,596</td>
<td>218,083</td>
<td>219,268</td>
<td>215,458</td>
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were a primary or secondary filer on a 1040 with a calculated net positive tax liability of $5 or more (in 2013 dollars) during the year. We define an individual as having a negative income tax liability if they were a primary or secondary filer on a 1040 with a negative tax liability in excess of $5 during the year due to refundable tax credits. Any remaining individuals are classified as having zero income tax liability for a year.

The issue remains, however, how to treat individuals that receive information returns, but then ultimately do not file a tax return. One approach would be to treat all of these individuals as paying no income tax, since the government received no income tax via a 1040. However, some such individuals had taxes withheld and sent to the government on their behalf, and so made a positive tax payment even though they did not file. Further, some of these individuals may have received all of their withholding back or had a negative tax liability had they filed a tax return. Since the focus of this paper is not on modelling filing behavior, but rather on exploring how tax policy and population characteristics affect the likelihood of paying positive, negative, or no taxes, we use the OTA tax calculators (along with whatever information can be gleaned from information returns) to simulate the amount of taxes that the individual would have owed had they filed a tax return as a single individual with no dependents. We then assign them to the positive, zero, or negative taxpaying status groups using their simulated tax amount.

We also use the OTA tax calculators to calculate counterfactual amounts of taxes owed. For such calculations, we inflate or deflate all monetary amounts for each taxpayer to the counterfactual year’s levels using the Consumer Price Index (CPI). We then calculate the amount of income taxes that the individual would have owed, given the tax policy parameters that existed in the counterfactual year. So, for example, to simulate what the actual 2001–2013 population would have paid in taxes if tax parameters remained fixed at 2001 levels, we take the returns from 2001–2013, deflate all monetary values to 2001 levels, and then run each year’s returns through the 2001 tax calculator. Conversely, to simulate what the population in 2001 would have paid in taxes over the years 2001–2013 if the population had remained fixed but tax parameters followed their actual 2001–2013 values, we take returns from 2001, inflate the monetary amounts to 2002 levels and run the returns through the 2002 calculator, then inflate the monetary amounts to 2003 levels and run the returns through the 2003 calculator, and keep iterating similarly up to tax year 2013.

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23 For example, an individual may work for wages, have income taxes withheld and be issued a W-2 form, but then may not file a 1040 at the end of the year.
24 Most of the withholding for non-filers comes from wage income via W-2s. Tabulations in Heim, Lurie, and Pearce (2014) show that counting non-filers who had withholding as positive income tax payers increases the share estimated to have paid positive income tax, but does not affect the trend over the 2001–2011 period.
25 Specifically, we use the change in the annual average Consumer Price Index for All Urban Customers (CPI-U).
26 Note that by using the 2001 cross-section in these calculation, rather than following the 2001 cohort over time, we eliminate any changes over time that would occur due to the aging of the cohort. The impact of this cohort aging on taxpaying status can be seen in Figures 10–12.
When performing these counterfactual tax calculations we save the amounts of income taxes owed before credits, AMT, nonrefundable credits (including education credits, a portion of the Child Tax Credit, and other nonrefundable credits), refundable credits (including the EITC, the refundable portion of the American Opportunity Tax Credit, the refundable portion of the Child Tax Credit, the Making Work Pay Credit, and the 2001 and 2008 tax rebates), so that we can simulate the extent to which changes in each of these provisions drove the overall trends.

Figure 1 presents the trends in the fraction of the population with positive, zero, and negative individual income tax liabilities over the 2001–2013 period. Panel A presents these trends for the full sample. Consistent with prior tabulations, the figure demonstrates a decline in the share of individuals with a positive tax liability over the period, and increases in the share with zero or negative tax liabilities. Starting at 67.6 percent in 2001, the positive tax share declined to around 63 percent during the 2003–2007 period, while the shares with zero and negative tax liabilities increased from 16 percent to around 18 and 19 percent, respectively. In 2008, with the onset of the Great Recession and the distributing of the 2008 tax rebates, the positive and zero tax liability shares each dropped by about 10 percentage points, while the negative liability share spiked by 20 percentage points. Subsequently, the share with positive tax liabilities increased, hovering around 61 percent toward the end of the sample period, while the share with negative tax liabilities declined. Panels B and C present the trends separately for filers and non-filers. The trends for filers match closely the trends for the full sample, though with a larger share of individuals having a positive tax liability and smaller shares with zero and negative liabilities. The trends for non-filers show that, given the assumption that non-filers are single with no dependents, the vast majority of such individuals would have zero tax liability in most years had they filed an income tax return. The exception to this trend is 2008, during which the majority of non-filers would have had a negative liability had they filed an income tax return.

IV. IMPACT OF CHANGES IN POPULATION CHARACTERISTICS AND INCOME TAX LAW ON TAXPAYING STATUS

We now proceed to examine the extent to which the decline in positive tax liabilities, and the increases in zero and negative tax liabilities, were driven by changes in the population (including changes in the age distribution, marital statuses, the presence and number of children, and the distribution of adjusted gross income) or changes in tax policy.

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27 Single taxpayers with no dependents are ineligible for the Child Tax Credit, and would only be eligible for the EITC if their income was below $14,340 (in 2013 dollars).

28 In 2007, there was an increase in the share of non-filers who would have had positive liability had they filed, and a corresponding increase in the share of filers who had no tax liability. This is likely due to taxpayers who had no tax liability and were not required to file a return, but who nonetheless filed returns in 2007 in order to claim the 2008 stimulus rebates, which changed to composition of both the filing and non-filing populations.
Figure 1
Share of Nondependent Individuals with Positive, Zero, and Negative Income Tax Liabilities (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns.
A. Changes in Population Characteristics

We first focus on changes in the population, and perform counterfactual simulations in which we examine how taxpaying statuses would have evolved had the population changed as it actually did but tax laws remained constant at a particular year’s parameters. To do so, we run each year’s population through the tax calculator for select years spaced throughout our sample period, and calculate the taxes that would have been owed had each individual faced the tax law of the fixed year. We then divide individuals into groups that would have had a positive, zero, or negative tax liability under such a scenario. These trends are presented in Figure 2.

Panel A presents these results for the share with positive income tax liability. Recall that this share dropped by about 6 percentage points between 2001 and 2013. This figure shows that one-half to two-thirds of this decline can be attributed to changes in the population over this time period. For example, had tax policy remained at 2001 parameters throughout the sample period, the simulations suggest that the share with positive taxes would have declined from 67.6 percent to 64.2 percent (or 3.4 percentage points) due to changes in the population, while if tax policy remained fixed at 2013 parameters, the share with positive taxes would have declined from 65.5 percent to 61.6 percent (or 4 percentage points) due to changes in the population.

In Panel B, changes in the population account for virtually all of the increase in those paying zero income tax. The actual share paying zero income taxes increased by 1.2 percentage points over the period. Had tax policy remained fixed at 2001 parameters, the figure suggests this fraction would have increased by slightly more (1.3 percentage points), while if tax parameters remained fixed at 2013 levels, the increase would have been 0.9 percentage points.

Finally, in Panel C, which presents trends in negative taxpaying, 40–65 percent of the increase in the share with negative tax liabilities can be attributed to changes in the population, with the actual share increasing by 4.8 percentage points and the tax policy constant shares increasing by 2.2 percent if tax policy remained fixed at 2001 parameters and 3.1 percentage points if tax policy remained fixed at 2013 parameters.29

Notably, across these three figures, virtually none of the 2008 decline in positive and zero taxpaying or the corresponding spike in negative tax liabilities can be attributed to changes in the population.

To examine which changes in the population led to the overall changes in taxpaying status, in Figure 3 we perform a decomposition of the results in Figure 2 with tax policy held constant at 2001 parameters.30 The solid line presents the trends in taxpaying status if tax policy had remained fixed at 2001 parameters and the population evolved how it actually did over this period.

We then successively reweight the sample so that the shares of the population with various demographic characteristics are held fixed across the sample period. We first

29 The smallest change is found for 2004 parameters, at 1.9 percentage points.
30 Tax policy was kept fixed at 2001 parameters so that the trends display a departure from 2001 levels.
Figure 2
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Actual Population, Holding Tax Policy Constant (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns.
Figure 3
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Population Changes (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, tax policy is held constant at 2001 parameters.
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reweight the sample so that the age distribution remains fixed at the 2001 distribution. We then reweight the sample so that the distribution of filing statuses is additionally held fixed at the 2001 distribution, then additionally hold fixed the distribution of the number of children at the 2001 distribution, and then additionally hold fixed the distribution of AGI at the 2001 distribution. We finally hold all characteristics of the sample fixed at the 2001 distribution, which results in a flat trend in taxpaying status.

Looking across the panels of Figure 3, a number of features are apparent. First, changes in the distribution of ages, filing statuses, and number of children did not appreciably affect the trends in taxpaying status, because when these factors are held constant, the trends in taxpaying status are quite similar to the trends with the actual population. Second, when the AGI distribution is held fixed at 2001 levels, the year to year changes in the shares of individuals with positive, zero, or negative income tax liabilities are attenuated compared to when the income distribution is not held fixed, suggesting that about half of the trend was driven by changes in the income distribution. Finally, other characteristics not being held constant by these simulations appear to be driving the remaining difference in the trends. Since changes in the age distribution, filing status distribution, and distribution of the number of children did not affect the trends in taxpaying status, it is likely that the residual is driven by changes in incomes that are not accounted for when the AGI distribution is held constant.

B. Changes in Tax Law

We focus next on changes in tax law and perform counterfactual simulations in which we examine how taxpaying statuses would have evolved had population characteristics remained fixed but tax laws changed as they actually did. To do so, we take the popula-

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31 Specifically, we calculate the fraction of the population in each single year of age cell in 2001, and reweight each subsequent year’s sample so that the fraction of the population in each of these cells is held constant at 2001 levels.

32 Specifically, we calculate the fraction of the population in each age x filing status cell in 2001, and reweight each subsequent year’s sample so that the fraction of the population in each of these cells is held constant at 2001 levels.

33 Specifically, we calculate the fraction of the population in each age x filing status x number of children (0, 1, 2, 3, or more) cell in 2001, and reweight each subsequent year’s sample so that the fraction of the population in each of these cells is held constant at 2001 levels.

34 Specifically, we calculated the income (AGI) decile cutpoints among the entire sample in 2001. We then calculated the fraction of the population in each age x filing status x number of children x income decile cutpoint cell in 2001. For each subsequent year, we deflated AGI to 2001 levels, and calculated the fraction of the population in each age x filing status x number of children x income decile based on the 2001 cutpoints. Finally, we reweighted each subsequent year’s sample so that the fraction of the population in each of these cells is held constant at 2001 levels.

35 It is also possible that distributional changes within AGI deciles are driving some of the residual. In theory, one could test this by reweighting by income percentile instead of income decile, but in practice cell sizes were too small. However, we tried a specification in which we only reweighted to match the fraction in each overall income decile cell in 2001 (i.e., not within age-filing status-number of children cell). The results from these specifications are qualitatively similar to those presented in Figure 3. We also tried a specification in which the cells were income percentiles, and the results were almost identical to when deciles were used.
tion in select years spaced throughout our sample period, run these populations through the tax calculator for each year, and calculate the taxes that would have been owed had each individual from that year faced the actual tax code from each other year. As before, we divide individuals into groups that would have had a positive, zero, or negative tax liability under such a scenario.

Panel A of Figure 4 presents these results for the share with positive income tax liability. Again, recall that this share dropped by about 6 percentage points between 2001 and 2013. This figure shows that 15–44\(^{36}\) percent of this decline can be attributed to changes in tax policy over this time period. For example, had the population remained fixed at its 2001 composition, the simulations suggest that the share with positive taxes would have declined from 67.6 percent to 65.5 percent (or 2.1 percentage points) due to changes in tax policy, while if the population remained fixed at its 2013 composition, the share with positive taxes would have declined from 64.2 percent to 61.6 percent (or 2.6 percentage points) due to changes in tax policy.

Interestingly, changes in tax policy explain almost all of the steep decline in positive tax liabilities in 2008. Of the actual drop of 10 percentage points, the simulations imply that changes in tax policy are associated with a decline in positive tax payment of between 8.7 and 9.4 percentage points.\(^{37}\)

Panels B and C of Figure 4 show analogous simulations for individuals with zero and negative tax liabilities. In Panel B, changes in tax policy can account for at most 28 percent of the increase in zero tax liabilities,\(^{38}\) while in Panel C, changes in tax policy can account for anywhere from 17–55 percent of the increase in negative tax liabilities, depending on which year’s population is used.\(^{39}\) However, change in tax policy account for almost all of the 10 percentage point decrease in zero tax liabilities in 2008 and the 20 percentage point increase in negative tax liabilities in 2008.

To examine which policy change led to the overall changes in taxpaying status, in Figure 5 we perform a decomposition of the results in Figure 4 when the population is fixed at its composition in 2013.\(^{40}\) We begin by assuming that the fraction of the population with positive, zero, and negative tax liabilities in each year had remained constant under 2001 law. Since both the population and tax policy is being held constant, the resulting trends in taxpaying status are constant over the sample period.

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36 Changes in tax policy implied a decline of 0.9 percentage points (15 percent of the actual) when the population is held fixed at its 2009 composition, and 2.6 percentage points (44 percent of the actual) when the population is held fixed at its 2013 composition.

37 The drop is 8.7 percentage points when the population is fixed at its 2013 composition, and 9.4 percentage points when the population is fixed at its 2001 composition.

38 Tax policy accounts for 28 percent if the population is fixed at its 2001 composition; in all other years, tax policy explains less.

39 Tax policy accounts for 17 percent of the increase when the 2004 population is used, and 55 percent when the 2013 population is used.

40 The population is held fixed at the 2013 population because the number of tax provisions expanded over the sample period. As a result, the 2013 population contains information for all taxpayers on all provisions available during the sample period, which eases simulation of counterfactual taxes, whereas simulating taxes for the 2001 population given subsequent years’ tax laws would require imputing amounts eligible for new provisions.
Figure 4
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Actual Tax Policy, Holding Population Constant (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns.
Figure 5
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, the population is held fixed at the 2013 population.
We then recalculate the tax liability in each year for individuals from 2013 by replacing the amount of taxes owed before credits but inclusive of the AMT changed with the actual amounts from 2002–2013 tax policy, while keeping the amounts of credits (both nonrefundable and refundable) and rebates at their 2001 calculated levels, and recalculate the shares of those with positive, zero, and negative tax liabilities. We next replace nonrefundable credits with their actual amounts, then refundable credits, and finally tax rebates and the Making Work Pay Credit. These categories are exhaustive, so that after this last step, all tax liabilities follow their actual paths over the 2001–2013 period.

Panel A of Figure 5 presents these results for the share with positive tax liabilities. Recall that when the population is fixed at its 2013 composition, changes in policy are predicted to have led to a 2.6 percentage point decrease in positive tax paying between 2001 and 2013. In this figure, our decomposition suggests that changes in taxes before credits and changes in the AMT led to a 1.2 percentage point decrease in positive taxpaying, with changes in nonrefundable credits leading to an additional 0.8 percentage point drop, and changes in refundable credits leading to a further decline of 0.6 percentage point decline. The 2008 rebate and the Making Work Pay Credit did not affect the overall trend, but account for almost all of the steep decline in positive taxpaying between 2008 and 2010.

Panel B presents the results for the share with zero tax liability. The simulations noted earlier suggested that had the population remained fixed at 2013 composition, changes in tax policy would not have led to any change in zero tax liabilities. Here, changes in tax before credits and AMT are simulated to have led to a 0.8 percentage point increase in zero tax liabilities, and changes in nonrefundable credits led to an additional 2.1 percentage point increase. However, changes in refundable credits completely offset this increase. Again, the 2008 tax rebate and the Making Work Pay Credit account for almost all of the decline in owing no tax liability that occurred between 2008 and 2010.

Finally, in Panel C, we present the results for the share with negative tax liability. Here, changes in taxes before credits and AMT are associated with a slight increase in negative tax liabilities of 0.4 percentage points. However, changes in refundable credits are associated with a 3.6 percentage point increase, driving the overall increase of 2.7 percentage points. The steep increase in negative taxpaying between 2008 and 2010 is again almost exclusively accounted for by the 2008 rebate and the Making Work Pay Credit.

To examine what types of individuals were affected by each of these provisions, in Figures 6–9, we perform similar decompositions, but split the sample by various demographic groups.

41 We include the 2001 rebate in taxes before credits, since this rebate reflected the benefits from the creation of the 10 percent bracket that was in place in subsequent years.

42 Refundable credits were categorized entirely as refundable, and were not broken out into the portion that offset liability versus the remaining portion.

43 As a result, once all four adjustments have been made, the predicted trends are the same as the trends for the fixed 2013 population from Figure 3.

44 Though changes in nonrefundable credits are associated with a 1.3 percentage point decline, this is largely due to an interaction between taxes before credits and nonrefundable credits. The trend over the time period was for lower tax liabilities before credits, which mechanically creates fewer usable “nonrefundable credits” because they can only be used against positive tax liabilities. So, when 2001 nonrefundable credits are replaced with nonrefundable credits for 2002–2013, some taxpayers end up getting smaller nonrefundable credits because there was less tax liability before credits to offset in the subsequent years, which might mechanically move these taxpayers from a negative tax liability to zero or positive as a result.
Figure 6
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Filing Status (in Percent)
Figure 6 (Continued) Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Filing Status (in Percent)
Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, the population is held fixed at the 2013 population.
Figure 7
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Presence of Children (in Percent)

A. With Children

- **Positive Income Tax Liability**
- **Zero Income Tax Liability**
- **Negative Income Tax Liability**

**Base**

- **Changes in Tax Before Credits and Changes in AMT**
- **Changes in Non-Refundable Credits**
- **Changes in Refundable Credits**
- **Changes in 2008 Rebate and Making Work Pay Credit**
Figure 7 (Continued) Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Presence of Children (in Percent)

B. Without Children

Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, the population is held fixed at the 2013 population.
Figure 8
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Income Quartile (in Percent)

A. First Quartile

1. Positive Income Tax Liability
2. Zero Income Tax Liability
3. Negative Income Tax Liability

Base
Changes in Tax Before Credits and Changes in AMT
Changes in Non-Refundable Credits
Changes in Refundable Credits
Changes in 2008 Rebate and Making Work Pay Credit
Figure 8 (Continued) Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Income Quartile (in Percent)

B. Second Quartile

- Positive Income Tax Liability
- Zero Income Tax Liability
- Negative Income Tax Liability

Base

- Changes in Tax Before Credits and Changes in AMT
- Changes in Non-Refundable Credits
- Changes in Refundable Credits
- Changes in 2008 Rebate and Making Work Pay Credit
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Figure 8 (Continued) Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Income Quartile (in Percent)
Figure 8 (Continued) Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Income Quartile (in Percent)

Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, the population is held fixed at the 2013 population.
Figure 9
Simulated Shares of Nondependent Individuals with Positive, Negative, and Zero Tax Liabilities: Decomposition of Tax Policy Changes — by Filing Status (in Percent)

A. Filers

- Positive Income Tax Liability
- Zero Income Tax Liability
- Negative Income Tax Liability

Base + Changes in Tax Before Credits and Changes in AMT
- Changes in Non-Refundable Credits
- Changes in Refundable Credits
- Changes in 2008 Rebate and Making Work Pay Credit
Notes: Data from 2001–2013 population of U.S. individual income tax returns. In these simulations, the population is held fixed at the 2013 population.
When we split the sample by filing status in Figure 6, it appears that changes in policy, particularly changes in refundable credits, led to larger percentage point changes in taxpaying status for married joint filers and head of household filers than it did for single filers. Conversely, the 2008 rebate and the Making Work Pay Credit led to a larger increase in negative tax liabilities for heads of households than for the other two filer groups.

Figure 7, which splits the sample by presence of children, shows that changes in taxes before credits, and nonrefundable and refundable credits, led to more of a decline in positive taxpaying and an increase in negative taxpaying among those with children. However, the increase in negative taxpaying due to the 2008 rebate and the Making Work Pay Credit was larger for those without children.

Figure 8 splits the sample by income quartile. In this figure, it is apparent that among the lowest quartile, only the 2008 rebate and Making Work Pay Credit impacted taxpaying statuses, and only on a temporary basis, while among the highest quartile, none of these provisions affected taxpaying status much, as virtually all of this group have positive tax liabilities. Only for the second and third quartiles did all of the tax policy provisions appreciably affect the trends in taxpaying status, with a greater impact found in the second quartile.

Finally, Figure 9 splits the sample according to whether or not the individual filed a tax return. The trends among filers are similar to those among the sample as a whole. However, among non-filers, only the 2008 rebate and Making Work Pay Credit would have impacted taxpaying status, leading to a sharp decline in those with zero tax liability and a sharp increase in those with negative liabilities.

C. Cohort Analysis

We now examine the extent to which the overall trends in taxpaying status differ according to an individual age and income when a cohort is followed over time. To do so, we look at two different age cohorts (those that are 30–34 in 2001, and so are in the early portion of their prime earning years during our sample period, and those that are 45–49 in 2001, and so are nearing retirement at the end of our sample period) and two different income groups within these age cohorts (those who were in the bottom income quartile, and those who were in the top income quartile). We follow the same individuals over time, and include in our analysis only those who are continuously in our sample over the 2001–2013 period.

For each taxpayer in this analysis, we calculate the actual taxes owed, as well as the taxes that would have been owed if policy had been fixed at 2001, 2004, 2009, and 2013 parameters, and divide the sample into those with positive, zero, and negative tax liabilities. Figure 10 presents the trends in shares with positive tax liabilities for these four subsamples: Panel A for the bottom quartile and Panel B for the top quartile of those age 30–34 in 2001, and Panel C for the bottom quartile and Panel D for the top quartile of those age 45–49 in 2001.

In Panel A, which includes the bottom income quartile of those age 30–34 in 2001, the fraction paying positive taxes increased by around 23 percentage points over the sample period (regardless of whether actual or a fixed year’s tax policy is applied), while in Panel B, which includes the top income quartile, the share paying positive taxes
declined by about 7 percentage points in both actual and fixed tax policy scenarios. The former results are likely due to a combination of these individuals’ incomes increasing as their careers progressed and as they married, along with mean reversion at the lower end of the income distribution, while the latter result is likely driven by some combination of mean reversion and the Great Recession causing incomes to fall at the top end of the income distribution and eliminating those individuals’ positive income tax liabilities. Similar results are found in Panels C and D, which include the top and bottom income quartiles of those age 45–49 in 2001. Here, when tax policy is held constant, positive taxpaying increases around 14 percentage points and then levels off.
for those in the lowest income quartile, as this cohort enters its maximum earning years toward the end of the sample, while the share paying positive taxes among those highest income group falls by 5 or 6 percentage points, again likely due to mean reversion and the Great Recession.45

Figures 11 and 12 present similar analogous simulations for zero and negative taxpaying. In Figure 11, among the lowest income quartiles, the share paying zero income taxes

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**Figure 11**

Simulated Shares of Nondependent Individuals with Zero Income Tax Liabilities: Selected Cohorts (in Percent)

A. Ages 30–34 in 2001, Bottom Quartile

B. Ages 30–34 in 2001, Top Quartile

C. Ages 45–49 in 2001, Bottom Quartile

D. Ages 45–49 in 2001, Top Quartile

Notes: Data from 2001–2013 population of U.S. individual income tax returns.

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45 Across these figures, the 2009 trend is lower than those for other years due to the Making Work Pay Credit, which was available in 2009 but not available in the other years depicted in these figures.
declines and then increases for the age 30–34 cohort, while it consistently increases for the 45–49 year old cohort. Among the top quartiles, the shares having zero tax liability consistently increase over the sample period. In Figure 12, the share paying negative taxes declines over the sample period for both lowest income quartiles, while for both top income quartiles the shares with negative tax liabilities increase through 2009 and then decline. The shares of the top income quartiles in both the negative and zero tax liability groups, however, remain small throughout.
V. CONCLUSION

In this paper, we use a sample of individual income tax and information returns that spans 2001–2013 to investigate the extent to which changes in tax law as compared to changes in the taxpaying population drove the decline in positive income taxpaying, and the increase in zero and negative tax liabilities over this period. We first simulate counterfactual trends in taxpaying status assuming constant tax policy and the actual taxpaying population, and probe which changes in population characteristics had the largest impact. We then simulate counterfactual trends in taxpaying status assuming a constant population but actual tax policy, and probe which changes in tax policy were responsible for the overall impact.

Overall, we find that changes in the population drove most of the overall trends in taxpaying status over the sample period. Of the 6.2 percentage point decline in positive tax liabilities over our sample period, about one-half to two-thirds was associated with changes in the population, while a smaller share resulted from changes in tax policy over this period. Changes in the population also drove almost all of the increase in individuals with zero tax liabilities, though the change in negative tax liabilities was split more equally between tax policy and population.

The changes in taxpaying status due to changes in population characteristics were primarily driven by changes in incomes. To the extent that changes in tax policy drove changes in taxpaying statuses, changes in taxes before credits and inclusive of the AMT appeared to be the main contributor, with changes in nonrefundable and refundable credits contributing smaller shares. However, changes in tax policy (specifically tax rebates and the Making Work Pay Credit) drove almost all of the sizable drops in positive and zero tax liabilities, and almost all of the increase in negative tax liabilities, between 2008 and 2010.

A limitation of our method should be noted. In our simulations, we implicitly assume that population characteristics are exogenous, and unaffected by changes in tax law. To the extent that population characteristics changed over time due to changes in tax law, the share attributed to population changes may be upward biased while the share attributed to tax law changes would be downward biased. To properly account for this would require simulating what the population would have looked like absent the tax changes, and calculating tax statuses for this counterfactual distribution. Such an exercise is beyond the scope of this paper, but may be a fruitful avenue for future research.

Nevertheless, these results suggest that the longer-term, secular decline in positive income taxpaying over the previous decade was driven more by changes in population characteristics than by intentional changes in tax laws passed by policymakers. As such, policymakers may want to evaluate whether such changes in tax statuses were intended or desirable, and potentially adjust tax policy accordingly.

DISCLAIMER

The views expressed are those of the authors and are not necessarily those of the U.S. Department of the Treasury.
DISCLOSURES

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