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Homeownership and taxes: How the TCJA altered the tax code's treatment of housing

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Abstract

The federal government has long promoted homeownership through various provisions in the US income tax code. The Tax Cuts and Jobs Act of 2017 (TCJA) renewed interest and debate about the treatment of housing via the tax code, particularly with respect to the mortgage interest deduction and the limitation on deductions for state and local taxes. We document the extent that the TCJA magnifies the long-standing unequal treatment of debt and equity financing of homeownership in the tax code. Our analysis indicates that most households no longer benefit from mortgage interest and property tax deductions. We also show how the limitations on the deduction of state and local taxes alter the costs associated with homeownership across geographic areas, and we provide detailed calculations of the average and marginal tax rates at which housing-related expenses are deducted. The former are relevant to the tenure choice decision, the latter to the quantity demanded decision. Finally, we document that the lost tax savings associated with the inability to benefit from mortgage interest and property tax expenditures are often small relative to the

primary tax benefit owners still enjoy: the nontaxation of the return on equity invested in the home.

KEYWORDS
homeownership, mortgage interest deduction, net implicit rental income, tax policy, G51, H24

1 | INTRODUCTION

Incentivizing homeownership has been a bedrock public policy in the United States since the Great Depression.[1] The federal government promotes homeownership via a variety of government agencies (e.g., the Department of Housing and Urban Development and the Federal Housing Administration) and government sponsored enterprises (e.g., Freddie Mac and Fannie Mae), as well as through the income tax code. Relevant provisions in the tax code include the nontaxation of implicit rental income and exclusion of capital gains on housing used as a principal residence,[2] the ability to deduct state and local taxes (SALT) of which property taxes on housing are a large component, and the ability to deduct mortgage interest.

Support for these various policies has largely been motivated by the perceived positive externalities of homeownership (e.g., Glaeser & Shapiro, 2003). However, economists have long debated the efficacy and efficiency of these provisions (Capozza et al., 1996; Engelhardt et al., 2010; Hilber & Turner, 2014; Poterba, 1984, 1991, 1992). Moreover, there are significant negative externalities. For example, Blanchflower and Oswald (2013) find that increases in state-level homeownership rates predict increases in unemployment in that state and Bracke et al. (2018) find that mortgage debt decreases entrepreneurship activity. There is also evidence that the tax benefits of homeownership are at least partially capitalized into house prices (Damen & Goeyvaerts, 2021; Sommer & Sullivan, 2020). Such general equilibrium responses can offset or amplify the effects of tax code changes.

The passage of the Tax Cuts and Jobs Act (TCJA) of 2017 renewed interest in the treatment of housing in the tax code, particularly with respect to the mortgage interest deduction and the deduction for SALT (Davis, 2019; Gilbukh et al., 2019; Li & Yu, 2020; Peach & McQuillan, 2019; Rappoport, 2018; Sommer & Sullivan, 2020).[3] We conduct an in-depth analysis of the treatment of homeowners and renters under the current tax code to document how specific provisions within the TCJA have altered the support for homeownership but that the tax code still retains an overall substantial subsidy to homeownership—the continued nontaxation of the return on invested housing equity.

Several authors have noted that TCJA reduced the incentive for households to claim itemized deductions that subsidize homeownership (e.g., Gale et al., 2018; Sommer & Sullivan, 2020). We go beyond this to compute how this incentive varies by the level of household income, the household's use of mortgage debt, and the household's geographic location. This is especially important

[1] See Dreier and Schwartz (2014) for a concise overview of US policies designed to promote homeownership.

[2] Since May 6, 1997 when the Taxpayer Relief Act of 1997 became law, a single taxpayer who has owned and lived in the home as a principal residence for at least 2 of the 5 years prior to the sale, could permanently exclude up to $250,000 of any capital gain from taxation (Internal Revenue Code Section 121). A married couple filing jointly could exclude $500,000.

[3] Public L. No. 115-97, https://www.congress.gov/115/plaws/publ97/PLAW-115publ97.pdf.

given discussions centering on the equity and fairness of various economic policies. To calculate the complex interactions in the tax code required for this analysis, we utilize the American Housing Survey (AHS) and the NBER TAXSIM software to estimate federal income tax liabilities across income brackets for a national sample of households. In doing so, we make five key contributions.

First, we document the extent that current tax law favors the use of equity over mortgage debt in financing homeownership. To reach this conclusion, we use the detailed micro-level AHS data to calculate the extent to which housing-related deductions are "unused" in that they do not reduce taxable income below what it would have been had the household claimed the allowable standard deduction (SD). This analysis demonstrates that the specific tax benefit associated with the mortgage interest deduction (MID) has been eliminated or greatly reduced for households other than those at the very high end of the income distribution.[4] Under the current tax law, 87% of all owning households will receive *no* tax benefit from their mortgage interest payment and only the median household with adjusted gross income (AGI) greater than $400,000 fully benefits from its mortgage interest deduction.

The reduced benefit from mortgage interest expenditures for most households further favors the use of equity over mortgage debt. However, many low- and moderate-income households, especially first-time buyers, have limited ability to substitute equity for debt financing: thus, TCJA has further tilted the tax benefits of homeownership toward higher income households. Overall, the terms of the debate among economists and policymakers about the efficacy of the MID in promoting homeownership or the distortions in the housing market caused by the MID have been significantly altered by TCJA (2017).[5]

Second, geographic distortions in the tax code arise from variation in the ability to fully deduct state and local income, sales and real property taxes.[6] It is widely recognized that SALT limitations most adversely affect upper income households in markets with higher house prices and/or high rates of state taxation (Bressler & Killey, 2020; Glennon & Klinger, 2020; Sullivan, 2020). Our analysis reveals that many states without generally high house prices and low taxes still contain concentrations of affected taxpayers.

Third, we provide estimates of the marginal and average tax rates associated with housing expenses across income ranges. Several recent papers have estimated the effect that passage of TCJA would have on house prices (Li & Yu, 2020; Rappoport, 2018; Sommer & Sullivan, 2018). The user cost of capital models used in these papers require accurate estimates of the impact of the tax law on the *marginal* rate at which housing-related expenses are deducted. Furthermore, to understand the extent to which the tax code is likely to affect homeownership and the use of debt by owners, accurate estimates of the *average* rate at which a household deducts housing-related expenses are required (Hendershott & Slemrod, 1982). We provide estimates of both tax rates by income range.

[4] The Joint Committee on Taxation (2020) estimates that the tax expenditure associated with the deduction of mortgage interest on owner-occupied residences will total $125 billion over 2021–2024.

[5] Observed changes in homeownership rates over this period are a function of changes in economic conditions (e.g., interest rates, employment, housing prices, etc.) as well as changes in the tax code. As a result, we are unable to disentangle the overall effect of changes in the tax code on homeownership rates. Hendershott and Pryce (2006), DeFusco and Paciorek (2017), and Hanson (2020) provide evidence on the sensitivity of homeowner mortgage demand to interest deductibility limits. Furthermore, Valentine (2021) provides evidence suggesting that lenders capture part of the benefit associated with the MID through higher interest rates to borrowers more likely to itemize, thereby calling into question the extent that the MID benefits homeowners.

[6] Prior to the 2017 TCJA, homeowners that itemized expenses could fully deduct SALT taxes. However, current law limits these deductions to a combined total of $10,000 ($5000 if single or married filing separately).

Fourth, by combining the analysis of the MID with the limitations on SALT taxes, we demonstrate how households in different income ranges are likely to be affected by the change in tax law. Our analysis shows that the median owner household in the $100,000–$150,000 and $150,000–$200,000 income brackets received tax cuts of $1829 and $2714, respectively, even though they are unable to benefit fully from their property tax and mortgage interest expenses. Households with AGI below $150,000 received median tax cuts that range from $0 to $1829, even though many receive no benefit from their housing-related expenses because of the large increase in the SD. The median owner household with income above $400,000 received a $15,831 tax cut and has no unused housing expense deductions.

Lastly, we calculate the largest tax benefit of owner-occupied housing: the nontaxation of the implicit rental income and capital gain income earned on invested housing equity.[7] This analysis reveals three important findings. First, although most households no longer fully benefit from their mortgage interest and property tax expenditures, these lost tax savings are often small relative to the tax benefit associated with the nontaxation of the return on equity invested in the home. As a result, most households still receive a significant tax benefit from owning, rather than renting, their residence. Second, greater use of mortgage debt under current law disadvantages many households in two ways. They receive little or no tax benefit from their mortgage interest expenditures, a conclusion reached by other researchers and commenters (e.g., Sommer & Sullivan, 2018; Viard, 2019). Perhaps more importantly, increased leverage reduces, on a dollar-for dollar basis, the magnitude of the nontaxed return on equity in the home. This additional disadvantage has not received attention by researchers.[8] Third, our analysis reveals the extent that homeowners in high house price markets benefit relative to similar income homeowners in lower priced housing markets by the nontaxation of implicit rental income. This is another often-overlooked disparity embedded in the tax code.

Several analyses of TCJA have summarized the provisions of TCJA that affect the taxation of homeownership and discussed their likely effects (e.g., Bressler & Killey, 2020; Dantas & Hembre, 2021; Gale et al., 2018; Li & Yu, 2020; Sullivan, 2020; Viard, 2019). Others have also provided estimates of the extent to which TCJA would affect the number and percentage of taxpayers that itemize the number and percentage with a mortgage interest deduction, and the number that would pay the alternative minimum tax (AMT) (e.g., Gale et al., 2018).[9] However, our study provides estimates of these effects and others for a large sample of households; median estimates are reported for 10 AGI "buckets." Also unique to our analysis is the calculation of unused housing deductions under prior and current law, changes in tax liabilities in high price and low-price housing markets, as well as how those changes vary by the household's use of mortgage debt (no leverage, below median leverage, and above median leverage).

We also disaggregate our estimates of changes in median federal income taxes by states with an income tax and those without and by the household's use of mortgage debt. We provide estimates

[7] This benefit is affected by tax law changes insofar as they change house prices or loan-to-value ratios.

[8] Although the current tax code is not neutral between debt and equity financing of homeownership, interest payments on car loans and credit cards have not been deductible since 1986. Therefore, the use of nondeductible mortgage debt may still be preferred to equity financing if it reduces a household's use of more expensive consumer debt.

[9] The AMT is a tax code provision that, for higher-income taxpayers, phases out the benefits associated with various deductions. When first introduced, the AMT was targeted at the highest income (1%) who were perceived as taking advantage of various deductions to greatly reduce, or even eliminate, their tax liability. However, the AMT was not indexed to inflation and thus the income limits that triggered the additional tax calculations gradually hit a greater percentage of the population. Thus, one of the major revisions in the TCJA was the increase in household income that triggers the AMT provisions and their indexation to future changes in inflation.

of median marginal tax rates under prior and current law for both owners and renters as well as the marginal rates at which households deduct mortgage interest expenditures. Finally, ours is the first analysis of TCJA to provide estimates of the magnitude of the nontaxed net "implicit" income owners receive by owning the home and renting it to themselves (the nontaxation of housing services—free rent—and capital gains). These net implicit income estimates are provided for households in both high price and nonhigh price Metropolitan Statistical Areas (MSAs) and for household with no leverage, below median leverage, and above median leverage.

Our partial equilibrium analysis does not explicitly consider the potential effects of TCJA on interest rates, house prices, the relative use of debt and equity financing, homeownership rates, or the potential migration of households from states with high house prices and tax rates to low price/tax states, etc. Analysis of these general equilibrium effects is beyond the scope of the paper. Our study is part of a large literature focused on how US tax policy impacts household tenure decisions (see Aaron, 1970; Laidler, 1969; Poterba, 1984, 1992; Rosen, 1985; and Capozza et al., 1996 for earlier influential work). More recent studies have examined various individual provisions within tax codes designed to promote homeownership. For example, Sommer and Sullivan (2018) theoretically model the unexpected repeal of the mortgage interest deduction in a general equilibrium setting to show that eliminating the MID would reduce overall mortgage debt. Gruber et al. (2021) provide empirical evidence that eliminating the MID reduced the use of mortgage debt among Danish households.

Our paper is also related to literature examining the impact of the current tax code on housing prices (Gilbukh et al., 2019; Peach & McQuillan, 2019; Rappoport, 2018; and Li & Yu, 2020). For example, Rappoport (2018) theoretically finds that the MID results in higher house prices and thus, by implication, its repeal would lower housing costs. Li and Yu (2020) document that limitations on SALT deductions introduced by the TCJA lowered the growth rate of housing prices by up to 18% in areas where these deductions were most used. These studies conclude that recent changes in the tax code that reduced the preferential treatment to housing have had a negative impact on housing prices. Our analysis complements these findings by showing that most households no longer benefit from the MID.

2 | CURRENT TAX LAW

The TCJA of 2017 provided a modest across the board reduction in personal income statutory tax rates[10] but a large increase in the SD, almost doubling it from $12,700 in 2017 to $24,000 in 2018 for married taxpayers filing jointly and single taxpayers from $6500 to $12,000.[11] The burden of the AMT was greatly lessened, benefitting only households earning over $200,000: the AMT exemption was raised by 30% and the phase out of the exemption does not start until $400,000

[10] A comparison of statutory tax rates and income thresholds for married couples filing jointly under pre- and post-TCJA can be found at the Tax Foundation website: https://taxfoundation.org/final-tax-cuts-and-jobs-act-details-analysis/. Going forward, bracket thresholds will be adjusted based on the Chained Consumer Price Index for All Urban Consumers (C-CPI-U), which is expected to grow more slowly than the previous inflation measure.

[11] The SD for married couples filing jointly in 2021 is $25,100; for single taxpayers it is $12,550.

in adjusted gross income (AGI) for singles and $1 million for married couples filing jointly. The child tax credit was doubled to $2000 and the phase out of the credit begins at AGI of $400,000.[12]

For households moving to another home or refinancing their existing mortgage, the interest on a *new* mortgage that can be deducted is reduced from that on $1 million of indebtedness to that on $750,000. The grandfathering of existing mortgages, where deductibility remains at $1 million, should slow refinancing activity and house sales, and thus reduce, at least temporarily, the mobility of high-income households located in high-cost housing markets.[13] However, historically low interest rates appear to be offsetting this impediment to refinancing and sales. Finally, TCJA eliminated the deduction of interest on home equity loans and removed several miscellaneous itemized deductions that had been deductible to the extent that they exceeded 2% of adjusted gross income. As a result of these changes, the percentage of households that itemized plunged from 33 in 2017 to 11 in 2018.[14]

Together, the revisions in the tax code produced substantial changes in the tax treatment of housing expenses that depend upon the household's income and use of mortgage debt. For example, the reduction in maximum indebtedness increased the after-tax cost of mortgage debt for some high-income households with high debt levels. Furthermore, except among the most affluent households, the large increase in the SD and, to some extent, the $10,000 cap on SALT deductions substantially increased unused housing deductions. These changes to the tax treatment of housing expenses accelerated the trend toward increased unused mortgage interest and property tax deductions started by the Tax Reform Act of 1986 (TRA 86).[15] Thus, for many households, charitable contributions and state income taxes and sales tax liabilities were the only nonhousing deductions that remained. These changes increased the probability that a household's SD exceeded the sum of allowable nonhousing deductions, thereby causing many to lose the tax benefit associated with a larger portion of their housing-related deductions—even if they continued to itemize. As a result, the percentage itemizing fell from 39% in 1985 to 33% in 1987.[16] This decline is small relative to the 22-percentage point decline in itemizing induced by TCJA.

To illustrate how the tax code treats housing expenses depending on the household's income, we calculate unused housing deductions for a hypothetical taxpayer. Consider a household with $400,000 in accumulated wealth invested at an average rate of 4% to generate $16,000 in taxable investment income. This household purchases a $200,000 home and self-finances the acquisition. The removal of $200,000 from the household's asset portfolio would reduce taxable income

[12] The reduction of individual income tax rates, the increased child tax credit, and the increased standard deduction are set to expire in 2025. Although the current legislation may be extended, its permanence will not likely be certain for several years.

[13] The effect should be similar to that in response to the passage of Proposition 13 in California. On June 6, 1978, California's voters passed Proposition 13. Under Proposition 13 tax reform, property tax value was rolled back and frozen at the 1976 assessed value level. Property tax increases on any given property were limited to no more than 2% per year as long as the property was not sold.

[14] See Individual Income Tax Returns 2017, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev. 9-2019), Tables 2-2 and 2-3, and Individual Income Tax Returns 2018, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev. 9-2020), Tables 2-2 and 2-3.

[15] Just prior to TRA 86, the standard deduction for married individuals filing jointly was $3540 ($8606 in 2021 dollars). The Tax Reform Act of 1986 (TRA 86) eliminated the deductibility of consumer interest, limited the deduction for miscellaneous expenses to the amount in excess of 2% of AGI, and increased the floor for medical expenses to 7.5% of AGI from 5.0%.

[16] See Individual Income Tax Returns 1985, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev.4-88), Tables 2-2 and 2-3, and Individual Income Tax Returns 1987, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev. 8-90), Tables 2-2 and 2-3.

by $8000 (0.04 × $200,000), which would generate tax savings proportional to the household's marginal tax rate.

If we instead assume that the purchase is financed with $40,000 in cash and $160,000 in mortgage debt that carries an interest rate of 4%, then the reduction of $40,000 in nonhousing wealth would reduce taxable income by $1600 (0.04 × $40,000). If the household has other allowable deductions equal to or greater than the SD, the household will itemize, and taxable income is reduced by $6400 in mortgage interest expense (0.04 × $160,000). Financing the acquisition with a combination of debt and equity, instead of all equity, also generates a total reduction in taxable income of $8000. Thus, with full deductibility of mortgage interest, the borrower is indifferent between the two financing strategies assuming they have accumulated at least $400,000 in wealth. However, if the $6400 in mortgage interest expense is not sufficient to cause the household to itemize, then the use of mortgage debt in place of equity does not reduce taxable income. The $6400 in mortgage interest is effectively written off at a 0% tax rate. In contrast, self-financing reduces taxable income by the full $8000.[17] Therefore, the household does not benefit from housing deductions equal to the SD less deductible nonhousing expenses (NHEs) because this amount does not reduce taxable income below what it would be if the household claimed the SD.

3 | DATA

Unlike datasets used in previous income tax studies, such as the IRS Statistics of Income (SOI) data (Rappoport, 2018; Viswanathan, 2019), the Home Mortgage Disclosure Act (HMDA) records (Li & Yu, 2020), the American Community Survey (Dantas and Hembre, 2021), or household level mortgage data (Rappoport, 2018; Valentine, 2021), the AHS data provide a greater ability to analyze the distributional effect of the TCJA on housing-related costs. Actual IRS data only contain information on mortgage interest deductions, state income and sales taxes, real property taxes, and other itemized deductions if the taxpayer itemizes rather than uses the SD. Consequently, for nonitemizing households, the IRS data contain no housing cost information. In contrast, AHS data provide information on housing costs for all homeowners, regardless of their income tax filing status. More specifically, the AHS contains microdata that includes geographic location, the number, age, relationship, and marital status of occupants, income type and level, tenure status, property tax payments, and original and current home values. Moreover, the 2013 AHS contains detailed mortgage information, including the number, amount and type of mortgages, and mortgage interest rates and payments as well as original and remaining terms. Unfortunately, these mortgage data are not available in the 2015 and 2017 public use AHS files, which eliminates their usefulness in an analysis of homeowner tax burdens. We therefore use the 2013 AHS for our analysis.

To calculate how much the use of earlier data might matter, we compare the key variables in the 2013 and 2017 public use files for both owner and renter households. The percentage of households in each AGI range is very similar across 12 of the 14 income categories. As expected, slightly more owner households in 2017 have AGIs greater than $80,000 than in 2013; the reverse is true for AGI less than $80,000. The percentage of AGI derived from various sources (wages, social security, self-employment, etc.) are nearly identical across the two years, as are the percentages of households

[17] If the interest rate on an additional dollar of debt is substantially less the household's perceived before-tax cost of equity, the after-tax cost of debt could still be less than the after-tax cost of equity (self) financing, even if there are no tax savings associated with the interest expenditure.

TABLE 1 Sample construction using American Housing Survey (AHS) data

	Number of observations	
	Raw observations	**Weighted observations**[a]
Total housing units in the United States from AHS data	84,355	132,866,433
Minus observations with no state info	−38,314	−67,999,400
Minus observations with negative AGI	−1080	−1,645,081
Minus vacancy and seasonal units	−12,443	−16,834,558
Adjusted sample	32,518	46,387,394
Minus number of renters	−14,464	−19,471,751
Equals number of owners	18,054	26,915,643
Minus owner observations with no house value	−3652	−232,527
Minus owner observations with LTV > than 250%	−124	−199,368
Final owner sample	14,278	26,483,748

[a]According to the US Census Bureau, every housing unit in the AHS represents itself and about 1896 other units.

that reside in the eight different Census divisions. There is a slight (3 percentage point) increase in the percentage of owner households with a college degree accompanied by slight decreases in the other educational attainment categories. As expected, given that the same homes are followed across time, we observe small increases in the percentage of household heads over 65 years of age and corresponding decreases in the percentage of younger households. The data for renter households display similar patterns. Overall, these comparisons indicate that the use of the 2013 AHS data will not lead to materially different conclusions than an analysis of the 2017 data.

The owning and renting households in our data sample, as well as the number of households they represent using AHS household weights, are displayed in Table 1. We begin with the relevant households in the 2013 AHS and then exclude (1) units without a MSA and state identification, (2) units occupied by households with negative AGI, and (3) vacant and seasonal units in which households could not be identified as either owners or renters. The first exclusion is because MSA and state location is required for any geographical analysis. In addition, the AHS data top-codes several variables to protect the confidentiality of survey respondents. In the context of this analysis, the important top-coded variables are the salary of individual household members ($341,943), other income of individual household members ($628,670), the market value of the owned residences ($2,520,000), and the amount of the household's first mortgage at inception ($960,000).

These exclusions produce an adjusted sample size of 32,518 units that represents over 46 million households (30% of total US households). Of this adjusted sample, 14,464 households are identified as renters, which is representative of over 19 million households. The remainder, or 18,054 households, are identified as owners; however, 3652 of these are deleted because the owner did not provide an estimated house value and 124 are deleted because the reported current loan-to-market value ratio exceeded 250 percent. Our final owner sample therefore contains 14,278 homeowners that represent more than 26 million households.

The raw data required to compute each household's federal income tax liability are largely present in the AHS data. Our household tax calculations are very detailed, following actual federal income tax rules, and include determination of income from all sources, calculation of exemptions, deductions, and credits. In effect, our tax calculations replicate the individual Form 1040 and key supplemental schedules. The key features of our income tax calculations under old and current law are summarized below. More detail is provided in the appendix.

- *Filing status*: Households are classified as married filing a joint return, single, or head of household (if dependents are present in the household).
- *Income*. The AHS contains data on wages and other income (or losses). Information is also provided on whether anyone in the household receives Social Security income. The household's gross income includes the income of the household head and spouse (if any), including any taxable portion of Social Security income.
- *Exemptions*. Taxpayers received a 2017 personal exemption of $4050 for themselves, spouse, and any dependent children or other dependents. The number of allowable dependents is determined based on an application of the tax eligibility rules as applied to the reported family relationships, ages, and income of all household members. The allowed personal exemption amount is phased out for certain higher-income households under 2017 law based on income thresholds adjusted for inflation. TCJA eliminated all personal exemptions.
- *SD*. All households are allowed a SD amount based on filing status. Households may deduct the larger of the SD or actual itemized deductions (from Form 1040, Schedule A). The SD for single (married) households in 2017 was $6500 ($12,700). Under current law, the SD for single (married) households in 2018 was $12,000 ($24,000).
- *Household-related itemized deductions*. The AHS data contain information on property tax payments and enough detail on mortgage loans to compute 2013 mortgage interest (including interest related to second and third mortgages and home equity loans).
- *Nonhousing itemized deductions*. The AHS data are supplemented with micro data from the IRS and the National Bureau of Economic Research (NBER's) TAXSIM model to compute household-level estimates of state and local income taxes, sales tax deductions, charitable contributions, and miscellaneous itemized deductions. To obtain a household's state income tax liability, we use the TAXSIM model to estimate the 2013 state income tax liability based on 13 variable inputs, including state location (Feenberg & Coutts, 1993). To estimate a household's sales tax deduction, we use regression equations that estimate the standard amount allowed by the IRS tables based on income, family size, and state location.[18] For charitable contributions and miscellaneous itemized deductions, we use the 2013 IRS Statistics of Income data on averages by income range to estimate an average household level charitable contribution and miscellaneous itemized deductions.
- *Tax calculations*. Each household's taxable income is determined following all rules regarding allowance of deductions, phase-outs, and so on. Each household's tax liability is first calculated by applying the appropriate 2017 tax rate schedule (married filing jointly, single, or head of household) to taxable income. The Net Investment Income Tax (NIIT)[19] is also calculated for each household, as is the AMT, with the final tax liability being the greater of the regular tax or AMT. These calculations are repeated for current law.
- *Tax credits*. The net tax liability of a household is after allowance for any tax credits for which the household is eligible. Credits considered include the earned income credit, the credit for the elderly, and the child credit.

[18] See the NBER TAXSIM site for more information on obtaining these sales tax estimates (http://www.nber.org/~taxsim/sales-tax-irs-publication-600/).

[19] The American Taxpayer Relief Act of 2012 introduced a Net Investment Income surcharge under IRC Section 1411 of 3.8% that applies to married (nonmarried) households with modified AGI in excess of $250,000 ($200,000), effectively raising the maximum tax rate. The NIIT surtax of 3.8% is applied to the lessor of: (1) net investment income and (2) the excess of the taxpayer's modified gross income over $250,000 ($200,000) for joint (single) filers. "Real Estate professionals" who spend substantial time working (more than 750 h per year) in activities related to real estate, broadly defined, may avoid the 3.8% surcharge. For details, see:http:/taxfoundation.org/article/federal-capital-gains-tax-rates-1998-2013.

Table 2 provides the summary information for homeowners in nine income ranges. The values include the percent of weighted observations in each income class, the percent of households in high-cost metropolitan areas, the percent of households in a state without an income tax, and the median AGI, and age of the homeowner. Also reported for each income range are median house value, loan-to-value (LTV) ratios, mortgage interest expenses, property taxes, and the value of several itemizable expenses. Because numerous variables in the AHS are self-reported by the household, we use median rather than mean values to minimize the effect of data errors/outliers.

Each of the first six income ranges contains 12%–17% of the owner sample; the next two have 6%, and the highest income class contains only 1.5%. The median ages of the lowest two classes are 73 and 59 years, respectively, while the median for the two highest income classes is 51. The older median age for the first two classes reflects the number of retired households with modest annual incomes. Median home values are relatively constant around $140,000 for the first three income classes and then rise to $730,000 for the highest income class. The 2013 median estimated house value for our owner households is $200,000. The percent living in high-cost locations is 18% or less for the lowest five AGI classes and then increases to 27% for the highest AGI class. The overall average is 18%.[20]

The percent of owner households in states with an income tax increases from slightly under 80% for the lowest three classes to 86% for those with AGI of $150,000–$400,000, but then declines to 81% for the highest class. The median leverage ratio, defined as total mortgage debt divided by estimated house value, is also hump shaped. The median ratio is 0 for older (73 years) low-income owners, reflecting the large presence of retired households with no mortgage debt in this income category. The median ratio rises to 60 percent for those with AGI of $75,000–$100,000 and then declines to 34% for the highest income class.[21] The initial rise in leverage ratios reflects the corresponding decline in median age. The overall median is just 37%. Thirty-two percent of owner households in our sample have no mortgage debt. Among the two lowest income classes, 67% and 44% of owners report no mortgage debt. This percentage declines to 16% among households with $100,000–$150,000 in AGI and then increases to 22% for the highest income households. Median mortgage interest and property tax expenses rise with AGI, as do itemizable nonhousing expenses. Median state income taxes rise dramatically with income.

Table 3 provides the corresponding information for renters in our nine AGI ranges. More than three-quarters of the renter sample report 2013 AGIs of less than $50,000, and only 2% have income over $150,000. In contrast, the corresponding percentages for owners in the low- and high-income classes are 35% and 13%. This demonstrates the strong positive correlation between household income and home ownership. The median AGI in our owner sample is $59,676 (Table 2), while the median AGI of our renter sample is just $26,000.

The median age of renting household heads is 40 versus 54 for owners. Like owners, the median age among renters of the lowest income class is far higher (55) than the average, which again reflects the number of retired households with modest annual incomes. Twenty-five percent of renter households live in CBSAs with high house prices, while the percentage is 36 or higher for households with AGIs greater than $100,000. Seventy-nine percent of renters live in states with an

[20] High house price areas are locations in the top decile of house prices based on the 2013 mean price of owner-occupied housing in the household's core-business statistical area (CBSA), as determined from data collected by the Federal Housing Administration.

[21] The modest use of leverage by higher income households calls into question studies that conclude the mortgage interest deduction drains significant revenues from the Treasury.

TABLE 2 Value of selected variables for owning households

AGI ($000s)	(1) Percent of sample	(2) Median AGI[a] ($000s)	(3) Median age	(4) Median home value[b] ($)	(5) Percent high cost location[c]	(6) Percent in state w. Inc. tax[d]	(7) Median leverage ratio[e]	(8) Percent with *no* leverage	(9) Median mortgage interest[f] ($)	(10) Median property tax ($)	(11) Median nonhousing expenses[g] ($)	(12) Median itemizable expenses[h] ($)	(13) Median state Inc. tax ($)
0–10	16	200	73	150,000	16	77	0	67	0	1450	150	3151	0
10–30	13	20,792	59	130,000	14	79	9	44	502	1450	3969	7215	0
30–50	15	39,987	53	150,000	15	77	43	30	2657	1750	5519	10,668	507
50–75	17	62,060	51	180,000	18	81	53	24	3870	2050	6137	12,675	1556
75–100	12	86,987	50	220,000	18	83	60	19	4983	2550	7519	15,300	2656
100–150	14	119,987	49	270,000	22	85	57	16	5835	3050	9316	18,839	4420
150–200	6	169,974	49	360,000	23	86	51	17	7071	3850	14,121	25,581	7216
200–400	6	314,209	51	500,000	26	86	44	21	7696	5050	23,565	38,975	13,490
400–1100	1	441,930	51	730,000	27	81	34	22	10,518	6750	42,222	63,347	25,224
All	100	59,676	54	200,000	18	81	36	32	2963	2150	5925	12,433	843

Source: Authors' tabulations and estimates from the American Housing Survey, 2013 National File supplemented with nonhousing expense estimates from the Internal Revenue Service tax return data and household level state income tax estimates from the NBER TAXSIM model. Number of households is based on the AHS survey sample of 14,278 owning households with SMSA (state) identification, projected back to the population of 26,483,748 based on household weights.

[a]AGI is Adjusted Gross Income in thousands.

[b]Estimated current fair market value of home (including land).

[c]High housing cost areas are locations in the top decile of housing cost areas based on the 2013 mean price of owner-occupied housing in the core-business statistical area (CBSA) as determined from data collected by the Federal Housing Administration.

[d]States without a comprehensive personal income tax are Alaska, Florida, New Hampshire, Nevada, South Dakota, Tennessee, Texas, Washington, and Wyoming.

[e]Leverage ratio is the household's total outstanding mortgage debt divided by the estimated home value.

[f]Total annual mortgage interest including first and second mortgages and home equity lines of credit.

[g]Estimated nonhousing itemizable expenses available for deduction on Schedule A, Form 1040.

[h]Total of mortgage interest, property taxes, and nonhousing expenses available for deduction before any caps on mortgage interest or state and local property taxes.

TABLE 3 Value of selected variables for renter households

AGI ($000s)	(1) Percent of sample	(2) Median AGI[a] ($000s)	(3) Median age	(4) Percent high cost location[b]	(5) Percent in state w. income tax[c]	(6) Median itemizable expenses[d] ($)	(7) Median sales tax ($)	(8) Median state income tax ($)
0–10	23	2000	55	22.29	82.31	1315	82	0
10–30	33	19,987	39	22.77	76.01	3827	354	0
30–50	20	39,987	37	22.88	79.22	5677	531	949
50–75	12	60,987	37	29.10	77.89	6446	707	1866
75–100	6	85,987	39	34.62	84.24	8224	860	3455
100–150	4	119,987	39	36.29	82.13	10,264	1050	5501
150–200	1	166,160	38	35.82	86.29	15,584	1412	8894
200–400	1	314,235	41	39.22	86.16	25,958	1753	16,028
400–1100	0	439,943	36	47.67	91.03	46,715	2036	31,990
All	100	26,000	40	25.03	79.31	4964	400	44

Source: Authors' tabulations and estimates from the American Housing Survey, 2013 National File supplemented with nonhousing expense estimates from the Internal Revenue Service tax return data and household level state income tax estimates from the NBER TAXSIM model. Number of households is based on the AHS survey sample of 14,464 renting households with SMSA (state) identification, projected back to the population of 19,471,751 based on household weights.

[a]AGI is Adjusted Gross Income in thousands.

[b]High housing cost areas are locations in the top decile of housing cost areas based on the 2013 mean price of owner-occupied housing in the core-business statistical area (CBSA) as determined from data collected by the Federal Housing Administration.

[c]States without a comprehensive personal income tax are Alaska, Florida, New Hampshire, Nevada, South Dakota, Tennessee, Texas, Washington, and Wyoming.

[d]Estimated nonhousing itemizable expenses available for deduction on Schedule A, Form 1040.

income tax, close to the owner percentage. The median renter in the two highest income ranges faces larger state income tax burdens than owners in these high-income groups.

4 | THE IMPACT OF TCJA ON TAXES

Before reporting our results on the effects of the TCJA on households in different income ranges in different geographic locations with different degrees of leverage, it is useful to show that our overall results are consistent with aggregate IRS data pre and post TCJA (2017 and 2018). We check two items: the percent taking the SD and the percent subject to the AMT. Of course, our data should differ from aggregate IRS data because we are analyzing a data source that is top coded (income, house, and original mortgage value). Because we are missing very high income/wealth households, we will have fewer households itemizing and paying the AMT. Between 2017 and 2018, the actual number of itemizers declined from 31% to 11% (a 65% reduction) and those subject to the AMT fell 95%.[22] Our calculations show a decline in the percentage of owners itemizing from 59% to 23% (a 61% reduction) and a 100% decline in owners paying the AMT. The percentage declines are quite similar, suggesting that our results should be viewed as consistent with IRS tax return data.[23]

Table 4 gives the basic data on the effect of TCJA on our nine income ranges for both owners and renters. These data include the percentages of households paying no tax, the dollar and percentage changes in taxes, and the change in the effective tax rate (taxes paid divided by AGI). Higher income households received greater dollar tax cuts than lower income households because the former paid most of income taxes. The top 1% earning households paid 40% of taxes; the top 5% (those earning over roughly $200,000) paid 60%. For owners, low-income households did not get a tax cut because they did not pay taxes. For owners, those with higher incomes get the larger reductions in the effective tax rates, but this is not true for renters. On the other hand, the percentage reduction in tax liability is greater for lower income households who were previously paying taxes, owing to the large increase in the SD.

These median tax reduction statistics are greatly affected by the impact of the tax law change on the decision to itemize, the relevance of the AMT, and the amount of property tax and mortgage interest expenditures that do not reduce tax liabilities. To illustrate, Columns (1)–(3) in Table 5 indicate the percent of owners (renters) that itemized prior and post TJCA, as well as the change in the percentage itemizing. Itemization increases with AGI because deductible expenses typically rise with income. Under the old law, only 11% of owners in the lowest income class should have itemized, with this percentage rising to 100% for those with AGI > $400,000. Renters are less likely to itemize (only 12% of entire sample versus 59% for owners). No renter in our AHS sample with AGI < $100,000 is expected to itemize under current law.

Columns (4) and (5) indicate the percentages likely paying the AMT under the prior and current law, respectively. For both owners and renters, virtually no household with AGI < $150,000 should

[22] See Individual Income Tax Returns 2017, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev. 9-2019), Tables 2-2 and 2-3, and Individual Income Tax Returns 2018, Statistics of Income Division, Internal Revenue Service, Publication 1304 (Rev. 9-2020), Tables 2-2 and 2-3, and page 25 for the AMT statistics. To the extent some household underestimate allowable itemized deductions, they may not take full advantage of their deductible expenses and therefore pay higher taxes than necessary under TCJA.

[23] The Tax Policy Center (2018) estimated that the number of itemizers, including renters, would fall by more than half in 2018, from 26% under prior law to about 11% (58%) under TCJA. Derousseau et al. (2018) estimated the percentage of itemizers would decline by 78%. Our 65% is much closer to the official 67%.

TABLE 4 Effects of tax law changes on owner and renter households

AGI ($000s)	(1) % Paying no taxes in 2017	(2) % Paying no taxes in 2018	(3) $ Change in tax liability	(4) % Change in tax liability	(5) Change in effective tax rate
Panel A: Owner Households					
0–10	93	93	0	0	0.00
10–30	30	31	−55	0	−0.25
30–50	2	2	−330	−7	−0.89
50–75	0	1	−852	−16	−1.45
75–100	0	0	−1371	−16	−1.56
100–150	0	0	−1829	−12	−1.50
150–200	0	0	−2714	−11	−1.60
200–400	0	0	−6121	−13	−2.49
400–1100	0	0	−15,831	−14	−3.50
All	19	20	−558	−8	−0.98
Panel B: Renter Households					
0–10	81	81	0	0	0.00
10–30	11	15	−180	−1	−7.31
30–50	1	2	−804	−2	−20.22
50–75	0	0	−1469	−2	−20.31
75–100	0	0	−1907	−2	−17.35
100–150	0	0	−2953	−3	−18.46
150–200	0	0	−4682	−3	−15.41
200–400	0	0	−4269	−2	−6.03
400–1100	0	0	−14,489	−3	−12.92
All	23	24	−384	−1	−12.33

Source: AHS data and authors' calculations.

have paid the AMT under the prior tax law; however, more than 60% of those with AGI > $200,000 should have. Under current law, we calculate that no owner or renter household in our AHS sample should pay the AMT, although a small number of high-income households will still be negatively affected by the AMT.[24] In short, although it is still part of the tax code, exposure to the parallel AMT has effectively been eliminated for almost all households.

Table 6 contains estimates of total unused housing expenses, defined as the SD minus the sum of all nonhousing-related deductions, if positive. For owners with AGI less than $10,000, the median amount of unused housing deductions under prior law was $2050, that is, the first $2050 in mortgage interest and property tax deductions produce no tax benefit because they do not increase total itemizable deductions to above the SD. This portion of housing-related expenses is essentially written off at a 0% tax rate.

[24] AHS data caps reported income and thus does not capture high-income earners still likely be subject to the AMT. According to the Tax Policy Center (https://www.taxpolicycenter.org/model-estimates/baseline-alternative-minimum-tax-amt-tables-oct-2018/t18-0145-aggregate-amt), among households making $1 million or more, only about 11.5% will pay the AMT, about half as many as in 2017. For more details, see Gleckman (2018).

TABLE 5 Changes in percentage of households itemizing and paying the alternative minimum tax (AMT)

AGI ($000s)	(1) % of HHs itemizing prior law	(2) % of HHs itemizing current law	(3) Change in % of HHs itemizing	(4) % of HHs paying AMT prior law	(5) % of HHs paying AMT current law
Panel A: Owning households					
0–10	11	3	−9	0	0
10–30	32	6	−26	0	0
30–50	59	18	−41	0	0
50–75	64	22	−42	0	0
75–100	75	25	−50	1	0
100–150	86	33	−53	0	0
150–200	97	50	−47	6	0
200–400	99	71	−28	61	0
400–1100	100	94	−6	66	0
All	59	23	−36	5	0
Panel B: Renting households					
0–10	0	0	0	0	0
10–30	0	0	0	0	0
30–50	13	0	−13	0	0
50–75	30	0	−30	0	0
75–100	39	0	−39	0	0
100–150	41	15	−27	0	0
150–200	85	21	−64	9	0
200–400	94	49	−45	60	0
400–1100	100	100	0	56	0
All	12	1	−11	1	0

Source: AHS data and authors' calculations.

TABLE 6 Unused housing deduction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Unused housing deductions ($)[a]			Unused interest deduction in 2017 ($)[b]		Unused interest deduction in 2018 ($)[b]		Change in unused interest deduction ($)	
AGI ($000s)	2017	2018	Change from 2017 to 2018	Below median leverage	Above median leverage	Below median leverage	Above median leverage	Below median leverage	Above median leverage
0–10	2050	2050	0	1572	4000	1770	5331	0	0
10–30	2450	3079	0	1040	2332	1761	4543	0	1424
30–50	2050	4976	1082	505	1443	2336	4654	549	2966
50–75	3153	5403	1850	975	1966	2773	5051	640	3248
75–100	3842	6285	3033	643	1708	3415	5999	1265	3667
100–150	2450	7934	5191	0	0	3671	7927	2891	6939
150–200	0	7707	7255	0	0	4406	7027	4372	6871
200–400	0	3123	3018	0	0	2050	4144	2050	4144
400–1100	0	0	0	0	0	0	0	0	0
All	2050	4750	1054	253	790	2600	5511	781	3663

Source: AHS data and authors' calculations.

[a]Housing-related deductions are unused if they do not reduce taxable income below what it would have been had the household claimed the allowable standard deduction, after consideration of nonhousing expenses.

[b]Mortgage interest expense is unused if it does not reduce taxable income below what it would have been had the household claimed the allowable standard deduction, after consideration of property taxes and nonhousing expenses.

Because nonhousing-related expenditures, such as charitable contributions, state and local income and sales taxes, and excess medical expenses, generally rise with household income, lesser amounts of mortgage interest and property tax expenditures are required to justify itemization. The median amount of unused housing deductions under prior law is zero for households with AGI greater than $150,000. Under current law, unused housing deductions are substantially higher for most owning households. For example, the median increase in unused deductions for households with $100,000–$150,000 in AGI is $5191; for households with $150,000–$200,000 in AGI the median increase is $7255. These large increases in unused housing expenditures significantly reduce the tax savings associated with owning for all but the highest income households.

Calculations of unused MID are presented in Table 6 for those with below and above median leverage. Under 2017 tax law, the median unused MID for incomes above $100,000 was zero; the median for households with AGI greater than $30,000 and less than $100,000 was less than $1000. Of course, unused MIDs among households with less than $100,000 in AGI were greater for those with more mortgage debt. The median household in our AGI sample with AGI greater than $100,000 received a dollar reduction in taxable income for each dollar of mortgage interest expense.

The passage of TCJA substantially increased unused MIDs because the SD was nearly doubled. In the absence of a downward adjustment in the use of leverage, highly leveraged households with $100,000–$150,000 in AGI would now be deducting a median of $7927 in interest expenditures at a 0% tax rate. Across all highly leveraged households, the median amount of unused mortgage interest is $5511, a $4721 increase over prior law. Overall, these calculations indicate that the full tax benefit of interest deductibility under current law accrues to a small subset of mostly very high-income households that itemize their deductions. In the absence of large declines in the cost of mortgage debt relative to the cost of equity financing, owners should be expected to reduce their use of mortgage debt.

5 | THE IMPORTANCE OF GEOGRAPHY

In this section, we show that the impact of TCJA on tax liabilities varies with the household's geographic location as well as the use of leverage. For this analysis, we explore the differences in tax position depending on whether the household lives in a high- or low-cost housing market. A high price market is a core-business statistical area (CBSA) with house prices in the top 50% of house prices based on the 2013 mean price of owner-occupied housing in the household's CBSA, as determined from data collected by the Federal Housing Administration. The higher the price of housing, the greater are mortgage debt and property taxes. We then turn to an analysis of the representative household's tax position based on whether it is subject to a state income tax.

5.1 | Effect of house price levels

The top panel in Table 7 displays the estimated dollar reductions in median tax liabilities for all owner households in different income ranges living in nonhigh house price MSAs with different degrees of leverage, Columns (1)–(3), and high house price MSAs, Columns (4)–(6). The decrease in taxes should be greater the lower is leverage because the typical increase in unused MIDs is less for households with below median leverage. The median dollar magnitude of the tax decrease associated with TCJA for households with no leverage living in nonhigh price MSAs ranges from

TABLE 7 Median changes in owner taxes for different levels of house prices and leverage

	(1)	(2)	(3)	(4)	(5)	(6)
	Nonhigh house price markets			High house price markets		
AGI ($000s)	No leverage	Below median leverage	Above median leverage	No leverage	Below median leverage	Above median leverage
Panel A: Median $ Change in Tax Liability						
0–10	0	0	0	0	0	0
10–30	−152	−30	−20	0	0	0
30–50	−504	−330	−193	−372	−59	56
50–75	−1095	−919	−585	−1069	−491	−227
75–100	−1717	−1411	−1274	−1548	−1175	−682
100–150	−2845	−2021	−1616	−2635	−1370	−929
150–200	−3841	−2713	−2634	−3501	−1680	−1924
200–400	−6239	−7518	−6523	−5282	−7328	−2755
400–1100	−15,251	−15,902	−17,040	−15,143	−14,934	−15,304
All	−175	−776	−848	−320	−599	−543
Panel B: Median % Change in Tax Liability						
0–10	0	0	0	0	0	0
10–30	−8	0	2	0	0	0
30–50	−20	−9	1	−18	0	7
50–75	−20	−17	−9	−20	−7	−4
75–100	−20	−16	−17	−20	−12	−7
100–150	−18	−14	−12	−16	−8	−7
150–200	−14	−10	−11	−13	−7	−9
200–400	−15	−14	−14	−13	−14	−7
400–1100	−13	−14	−15	−13	−13	−14
All	−7	−10	−9	−6	−6	−5

Source: AHS data and authors' calculations. Values in columns for above and below median leverage are conditional on households reporting having leverage.

0 to $15,251; the overall median is $175. Percentage reductions range from 0% to 20% with the largest decreases concentrated among households with $30,000 to $100,000 in AGI. Generally, for households in nonhigh price housing markets, the use of leverage tends to reduce their tax savings and the impact is more pronounced for highly levered households, all else equal. The only exception is for those in the highest income category who can typically deduct all mortgage interest expenditures at their marginal tax rate and are thus not disadvantaged by their use of debt.

The median dollar magnitude of the tax cut for owner households with no leverage living in high price MSAs (Column (5)) ranges from 0 to $15,143 with an overall median of $320. For each income range, the median tax cut received is less than the cut experienced by households in lower cost housing markets. This smaller tax cut reflects their reduced ability to fully deduct the higher property tax expenditures associated with these higher cost markets. Greater use of leverage continues to reduce tax savings for these households, especially for households with AGIs in the $200,000–$400,000 range. The median tax cut among low leverage households in this range is $7328. For high leverage households the median tax cut declines to $2755. These households are significantly affected by large amounts of unused MIDs. The bottom panel of Table 7 presents the corresponding calculations of median percentage changes in tax liabilities. These calculations reinforce the conclusion that households with less than $400,000 in AGI living in high price housing markets generally received smaller percentage tax cuts. This reduction in tax savings is amplified among high leverage households.

Overall, these results reinforce the conclusion that current tax law is not neutral with respect to the choice of debt and equity financing in the housing market, especially for low-to-moderate income households. Moreover, the lack of accumulated wealth among these households makes it difficult for many to substitute tax-preferred equity financing for (largely) nondeductible debt.[25]

5.2 | Effect of state income tax rates

The $10,000 SALT limit on the deductibility of state and local taxes more heavily impacts households subject to a state income tax. This state income tax effect will be magnified for households living in housing markets with high home prices and/or high rates of property tax. Table 8 displays the estimated TCJA-induced dollar and percentage reductions in median tax liabilities for owner households subject to a state income tax (Columns (1)–(3)) as well as those in states without an income tax (Columns (4)–(6)). The median dollar magnitude of the tax reduction for owner households with no leverage living in income tax states ranges from 0 for those in the lowest income range to $15,126 for those in the highest. Greater use of leverage tends to reduce tax savings, all else equal, for households with AGIs less than $200,000, many of whom are not itemizing under current law and therefore unable to benefit from their state income taxes, property tax, and mortgage interest expenditures. Once again, higher income households are not disadvantaged by using more leverage because these households have sufficient nonhousing expenditures to take advantage of itemizing.

The median dollar magnitude of the tax cut for owner households with no leverage living in states without an income tax rises from 0 to $17,667. For households with AGI greater than $100,000, the median tax cut received is greater than the tax savings experienced by households

[25] The inability to substitute equity for debt financing is exacerbated by the existence of expensive credit card debt or other consumer loans.

TABLE 8 Median changes in owner taxes by state income tax and leverage

	(1)	(2)	(3)	(4)	(5)	(6)
	State with income tax			State without income tax		
AGI ($000s)	No leverage	Below median leverage	Above median leverage	No leverage	Below median leverage	Above median leverage
Panel A: Median $ Change						
0–10	0	0	0	0	0	0
10–30	−120	−20	−8	−79	−61	−7
30–50	−482	−320	−99	−539	−438	−320
50–75	−1056	−798	−477	−1177	−1053	−626
75–100	−1698	−1242	−1112	−1690	−1687	−1441
100–150	−2705	−1734	−1348	−3113	−2641	−2174
150–200	−3540	−2176	−2350	−5232	−4006	−3170
200–400	−5430	−7416	−4871	−8216	−7452	−6420
400–1100	−15,126	−15,129	−16,598	−17,667	−18,506	−19,478
All	−207	−708	−790	−165	−955	−753
Panel B: Median % Change						
0–10	0	0	0	0	0	0
10–30	−5	0	2	0	0	1
30–50	−19	−5	3	−20	−12	−4
50–75	−20	−14	−7	−20	−20	−10
75–100	−20	−14	−14	−20	−20	−20
100–150	−18	−11	−10	−18	−17	−15
150–200	−13	−8	−10	−17	−14	−13
200–400	−12	−14	−10	−18	−16	−15
400–1100	−12	−14	−15	−14	−14	−18
All	−7	−8	−8	−3	−13	−9

Source: AHS data and authors' calculations. Values in columns for above and below median leverage are conditional on households reporting having leverage.

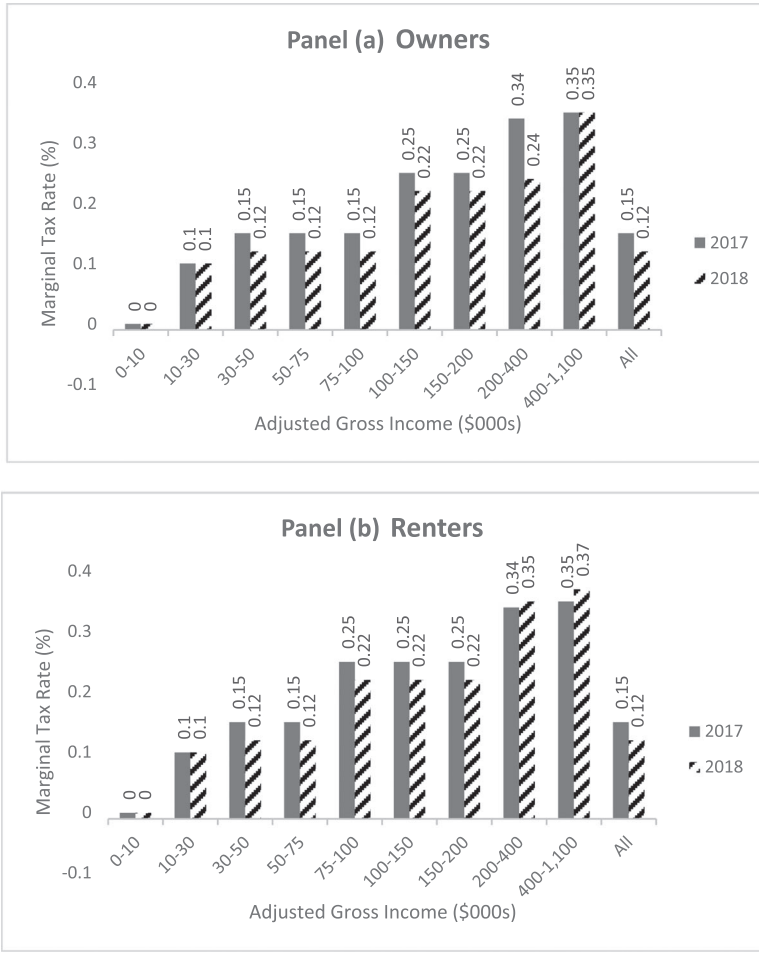

FIGURE 1 Median marginal tax rates in 2017 and 2018 for owners and renters. *Source*: AHS data and authors' calculations

subject to a state income tax. This reflects the reduced ability among many households to fully deduct state income tax obligations in the calculation of federal income taxes as a result of the SALT limitation. Greater use of leverage continues to reduce TCJA-induced tax savings except among the highest income households.

6 | AVERAGE AND MARGINAL TAX RATES

Figure 1 provides estimates of marginal tax rates by income bracket for both owners (panel A) and renters (panel B) and the average and marginal rates at which owners deduct mortgage interest. We also indicate how these rates were changed by passage of the TCJA. The current (2018) marginal tax rates for homeowners are lower than under the prior code for all but the lower two and highest income ranges that experienced no change. All other households experienced declines, especially households in the $200,000–$400,000 range. The changes are similar for renters except for those with income over $200,000. Instead of a decline, their rates increased

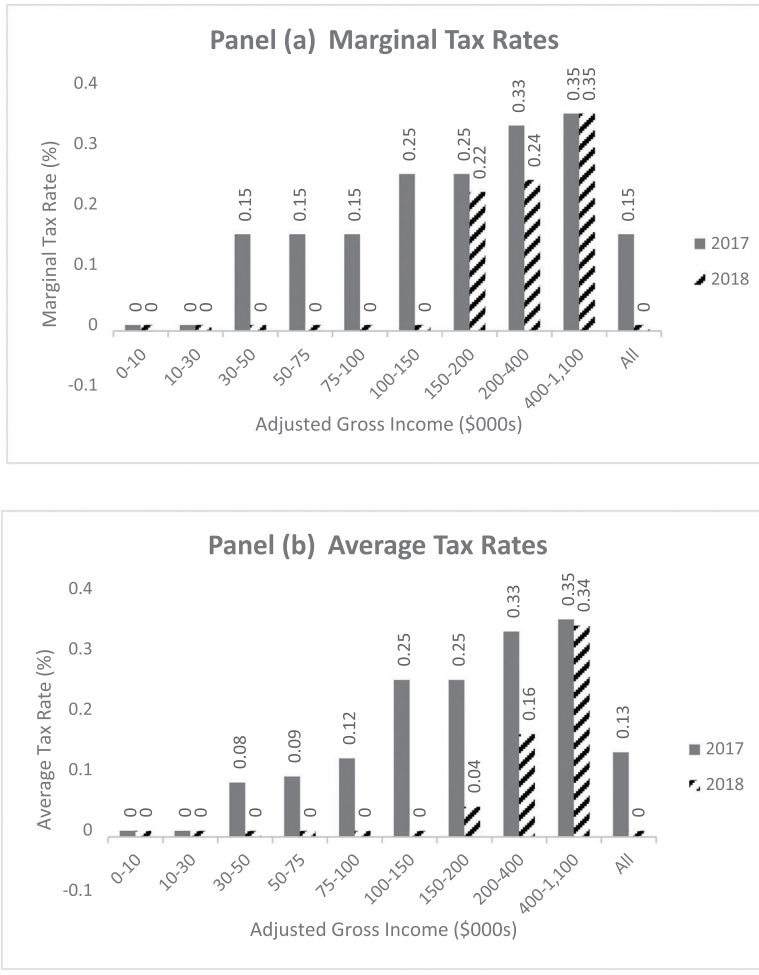

FIGURE 2 Marginal and average tax rates at which mortgage interest is deductible. *Source*: AHS data and authors' calculations

marginally. This increase in marginal rates reflects their lack of mortgage interest and property tax deductions.

Figure 2 contains the average and marginal tax rates at which mortgage interest expenses are deducted under prior and current tax law. Here we see the significant reduction in the value of the MID under the current tax code. Turning first to the marginal tax rate associated with mortgage interest expenses (panel A) under the prior tax code, we see that the median owner in all income ranges starting at $30,000–$50,000 were able to deduct mortgage interest expenses at their marginal tax rate. However, under the new law the median tax savings associated with interest deductions is zero for homeowners with incomes below $150,000. That is, 87% of all owning households (Table 2) receive *no* tax benefit from their mortgage interest payment. Holding the level of interest rates, expected price appreciation, and other variables constant, this change has increased the marginal after-tax user cost of capital for all but the highest income households.

The average tax rate that homeowners deduct mortgage interest expense (Figure 2, Panel B) provides an even clearer picture of the extent to which the deductibility of mortgage interest is

no longer of value to most households. Under prior tax law, the median household with income greater than $100,000 was able to deduct mortgage interest expenses at an average tax rate equal to the household's marginal rate. That is, every dollar of mortgage interest could be deducted at the rate at which the median household deducted its last dollar of mortgage interest expense.[26] This is because property taxes and nonhousing itemized deductions exceeded the SD. However, under current law the median household with income below $150,000 deducts mortgage interest at a zero rate. Furthermore, the median household in the $150,000–$200,000 bracket can deduct its mortgage interest expense at an average tax rate of just 4%, while the median household in the $200,000–$400,000 income bracket deducts at an average tax rate of 16%. Thus, even for the median household in this high-income range, property taxes and nonhousing itemized deductions are less than the SD. As a result, a portion of mortgage interest is written off at a 0% rate. These declines in the average rate at which mortgage interest is deducted increases the after-tax cost of owning relative to renting and will lower homeownership rates, all else equal.

7 | A BROADER LOOK AT OWNER TAX SAVINGS

To this point we have not discussed the most important tax preference of homeownership, the nontaxation of the net implicit income generated by the homeowner's equity investment. We define the following variables:

AGI^R is the adjusted gross income as a renter; e is the before-tax rate of return on nonhousing assets of equal risk to the housing investment; d is the before-tax cost of mortgage debt; δ is the loan-to-market-value ratio (leverage rate); P is the market value of the house; ρ is the property tax rate; NII is the expected annual net rental income produced by housing equity, including price appreciation (capital gains).

If the household is consuming an optimal amount of housing, NII equals the income that would be generated by investments in nonhousing assets of equal risk. Therefore, $\text{NII} = e[(1-\delta)P]$, and NII rises with lower leverage and higher prices.

A neutral tax system would treat owners and renters alike. Homeowner tax savings can therefore be measured as the taxes the household would pay if it rented its residence minus the taxes it pays as an owner. As a renter, the household would not have mortgage interest and property tax expenses to deduct.[27] In addition, its AGI would be greater because the equity that would be invested in the housing asset as an owner would instead be invested in nonhousing assets producing taxable annual income of NII. In other words, the renter AGI equals the owner AGI plus expected income from housing equity ($\text{AGI}^R = \text{AGI}^O + \text{NII}$). If NHE > *SD*, the renter would itemize with taxable income of $\text{TI}^R = \text{AGI}^R - \text{NHE}$.

If the household with NHE > SD instead owned the home, its taxable income (TI^O) would equal

$$\text{TI}^O = \text{TI}^R - [\text{NII} + \alpha d\delta P + \beta\rho P]. \tag{1}$$

[26] For some households, the rate of tax savings on their last dollar of mortgage interest expense could decline if deductions are large enough to push them across income tax brackets. This is not the case with the median households in our sample.

[27] The TCJA did not alter the treatment of property taxes and interest as business expenses in determining taxable income for landlords.

The second and third terms in Equation (1) represent *allowable* mortgage interest (αMIE) and property tax (βPT) deductions, where α and β are the percentage of annual mortgage interest and property taxes allowed under current law.[28]

The homeowner's tax savings relative to renting (TS) equals $t(\mathrm{TI}^R - \mathrm{TI}^O)$, where t is the average rate at which the homeowner benefits from housing-related deductions. That is,

$$\mathrm{TS} = t\left[\mathrm{NII} + \alpha\mathrm{MIE} + \beta\mathrm{PT}\right] \tag{2}$$

If the before-tax cost of debt and invested equity capital are equal (i.e., d = e = i), then NII + αMIE = iP and therefore, TS = t(iP + PT) and $\partial \mathrm{TS}/\partial\delta = 0$. Thus, even if there are no unused housing deductions (i.e., NHE > *SD*), interest deductibility does not produce a preference for debt financing, as is often argued. As Ling and McGill (2007) emphasize, if interest deductibility were eliminated, then TS = t(NII + PT) and $\partial \mathrm{TS}/\partial\delta = -tiP$. That is, increased leverage would decrease homeowner tax savings.

If the household does not itemize as a renter because NHE < SD, its tax saving as an owner would be

$$\mathrm{TS} = t\left[\mathrm{NII} + (1-f)\left(\alpha\mathrm{MIE} + \beta\mathrm{PT}\right)\right], \tag{3}$$

where f is the fraction of otherwise allowable MIE and PT deductions that do not reduce taxable income. If the addition of αMIE and βPT as an owner is still not sufficient to warrant itemization ($f = 1$), *TS* is equal to the nontaxed return on invested housing equity times the marginal tax rate. Thus, the tax system is not neutral for homeowners with NHE + βPT < SD—even if the before-tax cost of debt and equity capital are identical. This nonneutrality occurs because a portion of the household's MIE is effectively written off at a 0% tax rate.

A household's invested equity is equal to the current value of the property (including land) minus the book value of any outstanding mortgage debt, both of which we can observe in the AHS data. However, the perceived (before-tax) opportunity cost of invested equity, and therefore NII, is not observable and varies across households because it depends upon household preferences (including risk aversion), whether the household is currently consuming an equilibrium quantity of housing, and the price appreciation expected on the home. As suggested by Hendershott (1988) and Ling and McGill (2007), the before-tax interest rate on long-term fixed-rate mortgages is a reasonable proxy of the (before-tax) opportunity cost of invested equity capital for owner households.[29] We therefore assume for all households that the expected before-tax return on housing equity in 2018 is equal to the average rate on a 30-year fixed rate mortgage in 2018 (4.54%). Therefore, NII in 2018 for each household is set equal to housing equity times 4.54%.

Table 9 displays median 2018 NIIs, unused housing deductions, and net tax savings (TS) across income brackets for homeowning households. The values in Table 9 reflect the complex tax calculations associated with each household as well as their endogenous choices regarding housing consumption and mortgage indebtedness. As a result, making comparisons across leverage amounts is not a partial equilibrium analysis because the many factors associated with individual

[28] The TCJA-induced $750,000 limit on the amount of mortgage indebtedness on new or refinanced mortgages that can be deducted and limitations on SALT deductions may cause allowable MIE and PT deductions to be less than the actual expenditures.

[29] Arguments can be made as to why before-tax housing returns could be greater than or less than a household's perceived opportunity cost of invested equity. See Ling and McGill (2007) for a detailed discussion.

TABLE 9 Median net implicit income, unused housing deductions, and tax savings for owners in 2018, in dollars

Panel A: nonhigh price MSAs									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No leverage			Below median leverage			Above median leverage		
AGI ($000s)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)
0–10	5448	1350	0	4116	3542	0	1005	6945	0
10–30	5312	1350	431	3771	3743	328	469	5923	19
30–50	4903	1750	671	3852	4338	551	465	6267	111
50–75	5993	2050	935	4426	5164	698	645	6747	138
75–100	7591	2450	1118	5174	5689	804	874	7961	181
100–150	8145	2550	1870	5495	6515	1348	1101	10,572	411
150–200	10,624	3150	2484	7878	6667	2151	1534	9182	1088
200–400	11,041	2042	3458	10,044	3318	4280	1956	4066	3114
400–1100	15,436	0	4940	12,352	0	7908	3394	0	5311
All	6129	1650	479	5010	4929	765	796	6987	182
Panel B: high price MSAs									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No leverage			Below median leverage			Above median leverage		
AGI ($000s)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)
0–10	14,982	2150	2	12,221	5891	0	3507	9762	0
10–30	14,982	2050	1534	11,637	5750	1305	1470	10,149	197
30–50	12,258	2450	1678	8912	6492	1446	930	10,042	327
50–75	11,986	3250	1918	10,872	6323	1689	985	9219	505
75–100	15,935	2850	2567	10,283	7508	1888	1875	12,211	640

(Continues)

TABLE 9 (Continued)

Panel B: high price MSAs									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No leverage			Below median leverage			Above median leverage		
AGI ($000s)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)	NII ($)[a]	Unused housing deductions ($)[b]	Net tax savings ($)
100–150	17,706	3550	3895	10,731	9634	2948	2424	12,636	1404
150–200	18,977	4350	4555	15,406	8425	3911	3299	9286	2641
200–400	17,252	1084	5275	15,399	3330	6562	4051	5788	3894
400–1100	23,608	0	8263	23,986	0	14,490	4890	0	10,463
All	15,527	2450	1609	11,581	6626	2089	2097	9828	894

Source: AHS data and authors' calculations.

[a]Net implicit income (NII) is expected annual net rental income produced by housing equity, including price appreciation.

[b]Housing-related deductions are unused if they do not reduce taxable income below what it would have been had the household claimed the allowable standard deduction, after consideration of nonhousing expenses.

Source: AHS data and authors' calculations.

household tax situations are not held constant (e.g., number of dependents, charitable contributions, medical expenses, etc.) The results in Table 9 are disaggregated by income, choice of leverage (above or below the median), and home value or location (nonhigh versus high house price MSA) and thus provide a comprehensive view of how the tax code treats housing based on individual choices regarding leverage and location.

Focusing first on housing tax effects across income brackets, we note that NII increases with income, as expected, regardless of location (high price or nonhigh price markets). For example, the median dollar magnitude of NII ranges from $5448 to $15,436 for households with no leverage living in nonhigh price markets. This overall trend reflects the simple fact that higher income homeowners consume more expensive homes than lower income households. As a result, unused housing deductions at first increase with income (e.g., going from $1350 for households with income under $10,000 to $3150 for households with income between $150,000 and $200,000 and no leverage) and then decline to $0 for households with incomes between $400,000 and $1,100,000 in nonhigh house price areas. This pattern holds regardless of leverage, but the inflection point moves from the $150,000–$200,000 bracket to the $100,000–$150,000 bracket for households with high amounts of leverage. The change in the inflection point is consistent with high leverage households having greater mortgage interest and thus being able to take greater advantage of the mortgage interest deduction. We see similar trends for households located in high-house price MSAs.

Turning to the effects of leverage, regardless of location (high house price or nonhigh house price markets) or income bracket, NII declines with the use of leverage. For example, in Panel A we see that for households with incomes between $150,000 and $200,000, NII declines from $10,624 in the no leverage case to $1534 for households using high leverage. For households using no leverage (Columns (1)–(3)), the magnitudes of NII are substantially greater than the corresponding median dollar amount of unused housing deductions (in this case, property tax expenses). In contrast, among households that use above median leverage (Columns (7)–(9)), median NIIs are typically far less than unused housing deductions. Interestingly, we see a hump pattern in the net tax savings across leverage usage for households with incomes above $200,000. For these households, those having below median leverage have the greatest amount of net tax savings. In contrast, for households with incomes below $200,000, the trend in net tax savings across leverage use follows that of NII and unused housing deductions.

Last, we consider the differences across location as reflected in whether the household resides in a high-price housing market or a nonhigh house price market. As expected, NIIs are much larger, both in absolute terms and relative to unused housing deductions, in high-priced markets. In contrast to the calls from politicians in high-cost areas about the unfairness of the SALT deduction limitation, this demonstrates the substantial tax benefit accruing to homeowners in high house price locations. Turning to the impact of leverage, we also see that the use of below-median debt financing in nonhigh price markets is associated with lower median NIIs (Column (4)) and larger amounts of unused housing deductions (Column (5)) across all income ranges than for similar households in high-price markets. For households in nonhigh house price areas with incomes between $30,000 and $150,000 and below median leverage, NII is less than unused housing deductions. In contrast, regardless of income low-leverage households living in high-price markets have median NIIs that exceed median unused housing deductions. Among households that use above median leverage (Columns (7)–(9)), median NIIs are typically far less than unused housing deductions except for households with income between $400,000 and $1,100,000. Finally, we note that tax savings also vary based on location. The annual homeowner tax savings among households with no mortgage debt increase with income and range from 0 to $4940 in nonhigh price

markets. In contrast, in high price markets, annual tax savings reach $8263 among the highest income households. Finally, regardless of location the increased use of leverage tends to decrease tax savings except among high income households who fully benefit from their housing-related deductions.

The calculations presented in Table 9 reveal two important findings. First, although many households do not fully benefit from their mortgage interest and property tax deductions, the lost tax savings are often small relative to the primary tax benefit these owners still enjoy: the nontaxation of the return on equity invested in the home. Second, greater use of leverage is a disadvantage for many nonwealthy households for two reasons. First, they receive little or no tax benefit from their mortgage interest expenditures, a conclusion reached by other researchers and commenters (e.g., Sommer & Sullivan, 2018; Viard, 2019). Second, and perhaps more importantly, increased leverage reduces, on a dollar for dollar basis, the amount of nontaxed income generated by invested housing equity. This additional disadvantage of leverage has not received attention by researchers.

Turning to the rational of a MID, we conclude that the ability to fully deduct mortgage interest at one's marginal tax rate would allow households who are not able to finance home acquisitions with 100% equity to receive the same tax benefits as those who are able to finance entirely with equity. Said differently, full mortgage interest deductibility at households' marginal rates would allow nonwealthy households to fully enjoy the tax benefits of homeownership currently enjoyed primarily by higher-income households. In the absence of a change in tax law that moves the system back toward a more neutral treatment of mortgage debt and equity financing of housing purchases, we expect homeownership rates to eventually fall and the use of debt by homeowners to decline, especially among low- and moderate-income households.

8 | CONCLUSIONS

We provide an in-depth, microlevel analysis of the impact of the TCJA 2017 on the treatment of homeownership. Our analysis relies on household level survey data from the American Housing Survey, which provide the detailed income and expense data from owners and renters necessary to accurately estimate household tax positions. Thus, our analysis captures the complex interaction involving the SD, number of dependents, itemizable personal expenses, household mortgage debt, property taxes, SALT, use of credits, and the AMT. We compute results for nine AGI household ranges from less than $10,000 to over $400,000.

Our emphasis is on the various housing-related provisions embedded in the US federal income tax code. We document the extent to which the TCJA magnified the nonneutrality of mortgage debt versus equity financing of housing purchases. Under TCJA, 87% of all owning households receive *no* tax benefit from their mortgage interest payment and that only the median household with AGI greater than $400,000 can fully benefit from its mortgage interest deduction. The reduction in this tax benefit most adversely affects low and moderate-income households. The disadvantage of leverage has not received the attention of researchers or policy analysts that it deserves. Further, we show that the limit on the deduction of state and local taxes falls heavily on households in high tax and house price geographic areas. And, of course, on higher income households that pay most of the income taxes.

Our analysis reveals that while many owning households no longer benefit from their mortgage interest and property tax deductions, these estimated lost tax savings are generally small relative to the large tax benefit arising from the nontaxation of (1) net rental implicit income (the rent

one saves by living in one's own home) and (2) most capital gains on owner-occupied homes. We further show that these benefits especially favor wealthier owners living in high house price locations and who can use less leverage.

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APPENDIX

Data sources and tax calculations

Data sources

We use three data sources. The primary data are from the American Housing Survey (AHS) 2013 public use file. To impute household-level state income tax and sales tax amounts, we use NBER's TAXSIM model, with variable inputs from the AHS data. We use the 2013 IRS *Statistics of Income* data on averages by income range to estimate household-level charitable contribution and miscellaneous itemized deductions for each household in the AHS data. More detail on these calculations is provided below.

American housing survey

The primary data we use is obtained from the 2013 AHS public use file (https://www.census.gov/programs-urveys/ahs/data.2013.List_1739896299.html).

The AHS data provides more useful data for our purpose than actual, nonpublic IRS tax return data. Actual IRS data only contain information on mortgage interest deductions, state income and sales taxes, real property taxes, and other itemized deductions if the taxpayer itemizes rather than uses the SD. Consequently, for nonitemizing households, the IRS data contain no housing information. In contrast, AHS data provide information on housing costs for all homeowners, regardless of their income tax itemization status. More specifically, the AHS contains household level microdata that includes geographic location, the number, age, relationship, and marital status of occupants, income type and level, tenure status, detailed mortgage information (for up to three mortgages), property tax payments, and original and current home values.

We use the 2013 data because they contain detailed mortgage information, including the number, amount, and type of mortgages and mortgage interest rates and payments and the original and remaining terms. Unfortunately, these detailed mortgage data are not available in the 2015 and 2017 public use AHS files, which eliminates their usefulness in an analysis of homeowner tax burdens in this study.

To calculate how the use of 2013 data is still relevant to 2017, we compare the key variables in the 2013 and 2017 public use files for both owner and renter households. The percentage of households in each AGI range is very similar across 12 of the 14 income categories. As expected, slightly more owner households in 2017 have AGIs greater than $80,000 than in 2013 and those with AGI less than $80,000 have slightly less. The percentage of AGI derived from various sources (wages, social security, self-employment, etc.) are nearly identical across the 2 years, as are the percentages of households that reside in the eight different Census divisions. There is a slight (3% point) increase in the percentage of owner households with a college degree accompanied by slight decreases in the other educational attainment categories. As expected, given that the same homes are followed across time, we observe small increases in the percentage of household heads

over 65 years of age and corresponding decreases in the percentage of younger households. The data for renter households display similar patterns. Overall, these comparisons indicate that the use of the 2013 AHS data will not lead to materially different conclusions than analysis of the 2017 data would.

The owning and renting households in our data sample, as well as the number of households they represent using AHS household weights, are displayed in Table 1. We begin with the relevant households in the 2013 AHS and then exclude (1) units without a MSA and state identification, (2) units occupied by households with negative AGI, and (3) vacant and seasonal units in which households could not be identified as either owners or renters. The first exclusion is because MSA and state location is required for any geographical analysis. In addition, the AHS data top-codes several variables to protect the confidentiality of survey respondents. In the context of this analysis, the important top-coded variables are the salary of individual household members ($341,943), other income of individual household members ($628,670), the market value of the owned residences ($2,520,000), and the amount of the household's first mortgage at inception ($960,000).

These exclusions produce an adjusted sample size of 32,518 units that represents over 46 million households (30% of total US households). Of this adjusted sample, 14,464 households are identified as renters, which is representative of over 19 million households. The remainder, or 18,054 households, are identified as owners; however, 3652 of these are deleted because the owner did not provide an estimated house value and 124 are deleted because the reported current loan-to-market value ratio exceeded 250 percent. Our final owner sample therefore contains 14,278 homeowners that represent more than 26 million households.

NBER TAXSIM model

The NBER TAXSIM model and documentation can be found at this link: https://users.nber.org/~taxsim/. It is important to note that we only use the TAXSIM model to impute two variables: (1) household-level state income tax liability and (2) sales tax expense. We do not use TAXSIM to calculate a household's federal income tax liability. Our federal income tax calculation is based on our detailed tax calculations using data from AHS, as described in more detail in a later section of this appendix.

We use the following variables and associated household-level values from the AHS data as inputs into the TAXSIM model to estimate the state income tax liability of each household in our AHS sample (Feenberg & Coutts, 1993).

1. Tax year (2013 in our case in order to match the AHS data year)
2. State where household is located
3. Marital status of household occupants
4. Number of qualified tax dependents in the household
5. Age of household head
6. Household head salary income
7. Household head spouse salary income (if applicable)
8. Household other income
9. Household social security income
10. Annual property taxes
11. Annual mortgage interest expense
12. Total itemized deductions
13. Number of tax dependents under age 18

To estimate a household's sales tax deduction, we use regression equations that estimate the SD allowed by the IRS tables based on total household income, family size, and state location (see http://www.nber.org/~taxsim/sales-tax-irs-publication-600/ for information on obtaining these household-level sales tax estimates).

IRS statistics of income

The AHS data does not contain information on a household's charitable contributions, miscellaneous itemized deductions, or medical expenses. We use the 2013 IRS *Statistics of Income* data on averages by income range to estimate household-level charitable contribution and miscellaneous itemized deductions for each household in the AHS data. We do not impute medical expenses (assume 0) because most households cannot deduct any medical expenses due to the 7.5% of AGI threshold. The IRS data can be found here: https://www.irs.gov/pub/irs-soi/13in21id.xls.

Federal income tax calculations

The raw data required to compute each household's federal income tax liability are largely present in the AHS data. As noted above, we use only four household-level non-AHS raw data items in our calculations: (1) the imputed state income tax liability from TAXSIM, (2) the estimated state sales tax expense from TAXSIM, (3) the estimated charitable contribution deduction from IRS Statistics of Income, and (4) the estimated miscellaneous itemized deductions from IRS Statistics of Income.

Our federal income tax calculations are essentially a line-by-line replication of an individual tax return (Form 1040) leading to taxable income for each household in AHS, using the specific rules in place for 2017 and 2018. Our exact tax liability calculations use applicable filing status, tax tables/rates, allowable tax credits, and additional taxes (such as the Alternative Minimum Tax and the Net Investment Income Tax).

Step one—filing status

Households are classified as married filing a joint return, single or head of household (if not married and dependents are present in the household). Married households may choose to file as married or separate, but we did not allow for this option (as it is unobservable from the AHS data). The correct income thresholds and tax rates (i.e., the "tax table") are used for each of these three filing status categories.

Step two—household income

The AHS contains data on wages and other income (or losses). Information is also provided on whether anyone in the household receives Social Security income. The household's gross income includes the income of the household head and spouse (if any), including any taxable portion of Social Security income, following the complex calculations required to determine if any social security income is included in taxable income based on the level of the taxpayer's other income.

Step three—exemptions

Taxpayers received a 2017 personal exemption of $4050 for themselves, spouse, and any dependent children or other dependents. The number of allowable dependents is determined by applying the tax eligibility rules on reported family relationships, ages, and income of all household members. The allowed personal exemption amount is phased out for certain higher-income households under 2017 law based on income thresholds adjusted for inflation. TCJA eliminated all personal exemptions for years after 2017, thus no exemptions are used in the 2018 tax calculations.

Step four—deductions

All households are allowed a SD amount based on filing status. Households may deduct the larger of the SD or actual itemized deductions (from Form 1040, Schedule A). The SD for single (married) households in 2017 was $6500 ($12,700). The SD for single (married) households in 2018 was $12,000 ($24,000).

The AHS data contain detailed household-level information for homeowners on property tax payments and mortgage loans (including interest related to second and third mortgages and home equity loans). The AHS mortgage data contain information on all the relevant terms and whether the payment includes property taxes or other items, so that these items can be removed in determining the mortgage interest amount. We calculate the amount of the year's mortgage payments that are deductible interest as opposed to nondeductible principal payments using the mortgage interest rate, the outstanding balance of the mortgage, and the mortgage term. As a result, with AHS data alone, we can determine a household's housing-related itemized deductions.

For nonhousing itemized deductions, we use the four data items imputed from the TAXSIM program (state income taxes and sales taxes) and from the IRS Statistics of Income data (charitable contributions and miscellaneous itemized deductions).

Taxpayers may deduct the greater of state income taxes or state sales taxes. In 2018, the state tax deduction (aggregate of state income taxes (or sales taxes, if greater) and property taxes) is limited to a maximum deduction of $10,000. This limit was applied in determining the allowable state tax itemized deduction in the 2018 calculations.

Once the total allowable itemized deductions are determined, the total itemized deductions may be reduced by a phase-out based on the taxpayer's income and the nature of the itemized deductions. Such phase-outs are applied in our calculations. If allowable itemized deductions exceed the SD, the total allowable itemized deductions are deducted in arriving at taxable income. Otherwise, the SD is used.

Step five—tax calculations

Each household's tax liability is first calculated by applying the appropriate 2017 tax rate schedule to taxable income. The AMT is also calculated following its complex rules, with the household's final tax liability being the greater of the regular income tax or AMT. In addition to the above tax calculations, the Net Investment Income Tax (NIIT) is determined for each household following all the income threshold and investment income level rules. These calculations are repeated for each household following 2018 law.

The net tax liability of a household is after allowance for any tax credits for which the household is eligible. Credits considered include the earned income credit, the credit for the elderly, and the child credit. Each of these three credit amounts are determined following their complex rules regarding income phase-outs and eligibility requirements (taxpayer age, dependent age, and income level). The credits are determined under both 2017 and 2018 rules. The child credits were expanded (and made more complex) under 2018 rules.