THE TCJA: WHAT MIGHT HAVE BEEN

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The Tax Cuts and Jobs Act was passed into law on a dramatically accelerated schedule. That speed and the enormous scope of the TJCA and its individual elements suggests that preferable alternatives may have been overlooked. The consequences of a proposed change in tax law are usually estimated with a microsimulation model, but analyzing the large number of possible alternatives to each of the many interconnected elements of the TCJA requires numerous separate estimates. We accomplish this with the Tax Policy Center's cloud-based microsimulation model, examining over nine thousand alternative changes to the deductions, credits, and tax rates changed under the TCJA. We determine both the trade-offs among the plans and those plans satisfying various criteria, such as minimum revenue loss conditional on a distribution of taxes and flattest distribution of taxes conditional on a given revenue loss.

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I. INTRODUCTION

In late 2017, P.L. 115–97, commonly known as the Tax Cuts and Jobs Act, or TCJA, was signed into law. The largest change in tax law since the 1986 tax act (TRA86), it adjusted numerous aspects of corporate and individual tax provisions, including the corporate income tax rate, individual income tax rates and the individual standard deduction. It also eliminated the personal exemption, and the state and local tax deduction (SALT) was capped at $10,000.

However, the TCJA differs in many ways from the TRA86. The TRA86 was designed to neither raise nor lose revenue while the Joint Committee on Taxation (JCT) estimated the cost of the TCJA as nearly $1.5 trillion over 10 years[1]. The TRA86 was also designed to be distributionally neutral while the TCJA distributed 65.3 percent of the cuts to the top 20 percent of the income distribution (Tax Policy Center 2017).[2]

Finally, the TRA86 was subject to extensive discussion and debate. An October 23, 1986 article in the *New York Times* describes the timeline.[3] An early version of reform, which included eliminating the SALT deduction, was released by the Treasury Department on November 27, 1984. The administration's plan was released by president Reagan in May 1985. The House Ways and Means committee began hearings began in June 1985, ultimately questioning 450 witnesses, and the Senate Finance committee held 66 days of hearings. The Ways and Means committee approved legislation in November 1985 but it was rejected by the House of Representatives in December. It was accepted in a voice vote that same month after the president lobbied for the legislation. The Senate Finance committee met in March through May of 1986 to hammer out another version of the bill. In June, the Senate required that the bill be revenue neutral and subsequently the bill was approved. The bill was in conference July through September, and the House and Senate approved the bill in September. President Reagan signed the bill on October 22, 1986.

[1] Joint Committee on Taxation (2017)
[2] Tax Policy Center (2017)
[3] Rosenbaum (1986)

The TCJA, in contrast, was released by the House of Representatives on November 2, 2017 and signed into law by president Trump on December 22, 2017.[4]

The speed with which the TCJA became law sharply limited the potential to discuss alternatives and tradeoffs. This leaves open the possibility that other, similar, plans may have been closer to revenue neutral or distribute the effects more evenly. Yet with so many provisions changed so dramatically—JCT estimated that the change in individual income tax rates reduces federal revenues by $1.2 trillion over ten years and capping the SALT deduction at $10,000 raises $668 billion over that same period—it is difficult to uniquely identity alternative plans.

Here we address this problem using a novel approach. Rather than identify single alternative plans that satisfy specific goals, we use the Tax Policy Center's new ability to repeatedly run its microsimulation model to calculate the change in total taxes and distributional effects of 9,216 separate plans. Each of these plans changes parts of the tax code changed by the TCJA. These include changes to the standard deduction, tax rates, the child tax credit, the personal exemption, the alternative minimum tax (AMT), and the maximum SALT deduction. Some changes are those in the TCJA, others move back to pre-TCJA values. Some changes represent intermediate values between the two, and some, such as full repeal of the SALT deduction, go further than the TCJA.

For each plan, we calculate the change in adjusted revenue, the percent change of average after-tax income of each income quintile, top income groups such as the top 5 percent, and groups such as married couples with children.[5] Seventy-three percent of these plans result in smaller declines in adjusted revenue than the TCJA, of which 14 percent actually increase adjusted revenue.

We then identify patterns in the data such as plans that increase the after-tax income of the average taxpayer in each income quintile and the cost of plans compared to the TCJA. Comparing and contrasting plans that benefit one quintile with those that benefit others allows us to locate both overlapping interests and tradeoffs among taxpayers in different quintiles. We also describe which plans benefit each quintile and how those plans affect the remaining quintiles.

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[4] A simple two-page summary of principles for tax changes was released by the administration on April 26, 2017, https://taxprof.typepad.com/files/trump-tax-plan.pdf and a 'unified framework' was released by congressional Republican leadership on September 27, 2017.

[5] As we explain below, adjusted revenue smooths certain corporate and individual provisions to limit year-to-year fluctuations in distributional changes.

As expected, we find that the after-tax income over all quintiles increases only when total adjusted revenue falls. But within each quintile, many plans benefit the average taxpayer and are less expensive than the TCJA. In fact, for each quintile at least 55 percent of the plans we consider increase the average after-tax income compared to prior tax law and reduce adjusted revenue by less than the TCJA. In addition, for each quintile there are plans that both raise average after-tax income above the TCJA level and reduce adjusted revenue by a smaller amount.

Although there are plans that benefit each quintile more than the TCJA while costing less, successive quintiles have successively smaller shares of plans that accomplish both goals. In the bottom quintile, nearly half of the plans both benefit the average taxpayer and reduce the loss in adjusted revenue. In the second quintile, about one third of the plans accomplish it, but in the top quintile less than one percent do. Top percentiles, such as the top 10 and one percent, have even fewer plans. This reflects both the tax parameters changed by the TCJA and the degree to which the changes benefit upper income taxpayers.

For any given level of adjusted revenue, there is a natural tension between plans that benefit taxpayers in one quintile and those that benefit taxpayers in other quintiles. The stark nature of this tradeoff in the TCJA is evident when considering plans that reduce adjusted revenue by less than the TCJA. Most of the plans raising the average after-tax income of taxpayers in the second through fourth quintiles also raise the average after-tax income of taxpayers in the bottom quintile. In contrast, none of the plans raising the average after-tax income of taxpayers in the top quintile also raise the average after-tax income of those in the bottom quintile or even the fourth quintile. Many of those plans result in reducing average after-tax income of the bottom quintile below that of prior law.

We also search for optimal plans using three criteria. First, we minimize total tax decreases conditional on at least a one percent increase in average after-tax income for each income quintile. The plan satisfying this condition is about $70 billion less costly than the TCJA and raises the average after-tax income in each quintile by 1.02 to 1.98 percent. Second, we maximize the minimum increase in average after-tax income across the quintiles, conditional on not decreasing adjusted revenue below the level of the TCJA. This plan reduces adjusted revenue by nearly as much as the TCJA, but raises average after-tax income by at least 1.12 percent, with and more than 2.7 percent for taxpayers in the third quintile. Finally, we eliminate the SALT deduction and calculate the least expensive plan that raises the average after-tax income of all five quintiles. This plan would reduce adjusted revenue by about one-eighth of the reduction cause by the TCJA and raise average after-tax incomes in the quintiles by 0.12 to 0.58

percent. In essence, we eliminate an economically inefficient provision of the tax code and distribute the revenues raised among the quintiles.

The remainder of the paper is organized as follows. Section II describes the prior law and the Tax Cuts and Jobs Act. Section III describes the Tax Policy Center's microsimulation model, and recent the improvements that allow for the estimation of large numbers of models with alternative tax parameters. Section IV describes our results, including plans that satisfy the optimality criteria described above. Section V concludes.

II. The Tax Cuts and Jobs Act

This paper focuses on the major changes the TCJA made to individual income taxes, most of which take effect for 2018 and expire after 2025. The TCJA maintains seven income tax brackets but temporarily lowers the tax rates. The top marginal rate falls from 39.6 to 37 percent and kicks in at $500,000 for singles and $600,000 for joint filers. The TCJA almost doubles the standard deduction, from $6,500 to $12,000 for singles and separate filers, $9,500 to $18,000 for heads of households, and $13,000 to $24,000 for joint filers in 2018. The personal exemption, which would have worth $4,500 for each taxpayer, spouse and eligible dependent, is repealed under the TCJA.

The individual alternative minimum tax (AMT) operates alongside the regular income tax. It requires many taxpayers to calculate their liability twice—once under the rules for the regular income tax and once under the AMT rules—and then pay the higher amount. The TCJA reduces the number of taxpayers who will need to pay the AMT by increasing both the AMT exemption amount (to $70,300 for singles and heads of households, $109,400 for joint filers, and $54,700 for separate filers) and the AMT exemption phase-out thresholds (to $1 million for joint filers and $500,000 for singles and other filers). The Urban-Brookings Tax Policy Center (TPC) estimates that the percent of taxpayers affected by AMT would reduce from 5.2 percent in 2017 to 0.2 percent in 2018[6].

The TCJA expands the child tax credit (CTC) in several ways. The CTC now provides up to $2,000 (doubles from $1,000 prior to TCJA) for each child younger than age 17. The child must have a valid SSN to qualify for the CTC. The refundable amount is calculated as 15 percent of wages over $2,500 but is limited to $1,400 per child. This maximum refundable amount is adjusted for inflation after 2018. The phase-out

[6]Tax Policy Center (2017)

income threshold is $200,000 for single parents and $400,000 for joint filers (up from the prior-law amounts of $75,000 and $110,000, respectively). The thresholds are not indexed for inflation, so the credit will lose value over time. The TCJA also includes a $500 nonrefundable credit for qualifying dependents other than qualifying children[7]. TPC estimates that the percent of taxpayers with CTC benefit would increase from 21 percent in 2017 to 29 percent in 2018[8].

The TCJA limits or suspends some major itemized deductions, including the deduction on state and local taxes (SALT) and the mortgage interest deduction. The itemized deduction for state and local taxes, which had been unlimited, is now limited to $10,000 annually, for both single and joint filers. TPC estimates that the percent of taxpayers with a benefit from SALT deduction would reduce from 25 percent in 2017 to about 10 percent in 2018.[9] For taxpayers taking new mortgages, the TCJA limits the deductibility to the interest on the first $750,000 of debt, and disallows deductibility for the home equity line of credit not used to buy, build, or improve one's home. The TCJA repeals the phase-out of the amount of allowable itemized deductions (known as the Pease limitation) because it has already limited many itemized deductions. These individual income tax provisions all expire after 2025.

TCJA makes other changes such as the taxations on capital gains, pass-throughs, and estates. These changes are included in all of our simulations, but discussion on possible reforms on these provisions are beyond the scope of this paper.

III. Microsimulation Modeling

Standard Modeling

TPC uses a microsimulation tax model to estimate the revenue and distributional effects of the U.S. tax system. This model is similar to those used by both the Congressional Budget Office and the Joint Committee on Taxation (JCT). The purpose of these models is to estimate the effects of changes to the U.S. tax code. TPC does this by using tax unit level data, which can roughly be understood to be

[7] Qualifying dependents include 17- to 18-year-old children, 19- to 23-year-old students, and adult dependents (Maag 2018).
[8] Tax Policy Center, Table T18-0193 and Table-0195.
[9] Tax Policy Center, Table T18-0161 and Table T18-0163.

household level tax data.[10] Based on the tax unit's economic, tax and demographic characteristics, the microsimulation model estimates the total taxes paid by the tax unit, both before and after a tax proposal. Each execution of the model is comprised of a current law run and a run after changes to tax law are made. Changes in individual tax liability are determined by taking the difference in the two runs. After weighting and aggregating each tax unit's tax liability under both current and proposed law, TPC can estimate the total revenue change and distributional outcomes of a tax proposal.

The primary data source used by TPC's model is the Public Use File (PUF), created by the IRS Statistics of Income (SOI) division. The PUF used by TPC is a stratified random sample of roughly 150,000 tax units, which provides detailed information from federal tax returns. The data is adjusted with a constrained optimization algorithm to match an extensive list of national targets, and is statistically matched to numerous other data sets to provide demographic, wealth, educational and other information. As the PUF requires significant programming resources to generate valid statistical information, it is primarily used by government organizations, research institutions and large accounting firms.[11]

To run the microsimulation model, the model code must be compiled and a parameter file specified. The parameter file is a CSV file, which holds a list of logical and continuous tax variable values that gets read into the model. A change to the parameter file generally reflects a change in tax law. For example, if the indicator variable for the personal exemption is turned to FALSE, the tax model would calculate taxes as if the personal exemption was repealed.

A standard model run reads in one parameter file, and produce one set of revenue and distributional results. Model runs can also be run in batches, with multiple parameter files being used to produce multiple sets of results. However, using the standard model it is too time consuming to run large batches because the parameter files must be manually updated and the models run sequentially. Moreover, because the files are created manually, they would be prone to error.

[10] Taxpayers are more formally identified as tax units, which are defined as an individual or married couple filing a tax return. A cohabitating unmarried couple would be one household, but two separate tax units.
[11] For more detailed information on TPC's tax model please see Tax Policy Center "Brief Description of the Tax Model"

New Modeling

More recently, the model has been moved to the cloud, in principle allowing models to run simultaneously. An updated model leverages a cloud based infrastructure to solve the logistical problems associated with doing large scale model runs. This infrastructure can queue and submit thousands of model-runs, and along with the standard model output, produces condensed distributional and revenue results for all the model runs submitted. The cloud version of the model is version controlled and stored in a GitHub repository. This repository also contains a "Dockerfile", which is used to define and compile the model into a "container," which can then be run on both local machines and cloud servers. Using these containers, we can run the model on a fleet of Amazon Web Services (AWS) Elastic Cloud Compute (EC2) instances. The cloud infrastructure allows us to reduce run speeds to a small fraction of the time it takes to run models sequentially, making it feasible to execute thousands of model runs in a relatively small amount of time. For an in-depth and technical explanation of TPC's cloud model infrastructure please see the forthcoming paper Kelly et. al (2018).

Manually creating thousands of parameter files would be extremely slow and error prone. We solve this problem in the new infrastructure by creating parameter files programmatically. A Python module was developed to automatically update specified parameters, and to save the files to AWS Simple Storage Service (S3), where at run time they are read directly into the containerized model.

Such large numbers of model runs can produce over a terabyte of data, which would be effectively impossible to organize and analyze using traditional methods. The cloud model infrastructure handles this problem with a backend Python script that iterates over the results for each run and produces a unified analysis dataset. The dataset includes distributional and revenue results, as well as all the input parameters changed in each run, which can be used to catalogue the run. This dataset is a fraction of the size of all the output produced by standard model runs and allows researchers to analyze a summarized version of the data.

Output

Our analysis examines the adjusted revenue change resulting in changes to the TCJA, rather than changes in revenue. Our adjusted revenue measure differs from a traditional revenue score from the Joint Committee on Taxation (JCT) because we smooth results to avoid short-term fluctuations in income distributions caused by the timing of tax provisions. For example, we address the year-to-year

fluctuations in distributions created by the timing of repatriation taxes by smoothing the effects of the provisions over eight years. For other corporate provisions we reduce fluctuations in distributions by using the net present value of the change rather than the cash flow value. Although these methods provide a more consistent estimate of distributional effects, they distort the year-to-year changes in revenue. Additionally, our revenue estimates are based on a calendar year while revenue estimates produced by JCT are produced in fiscal years.

Our distributional analysis examines the effect of plans on tax units categorized by income quantiles, measured as expanded cash income (ECI).[12] This is a constructed measure of pre-tax income that includes adjusted gross income (AGI), above the line deductions (student loan interest, IRA deductions, etc.), employer paid health insurance, cash and cash like government transfers, and a variety of other sources. This broad measure of income is used to rank tax units in their respective income quantiles, and provides better estimates of overall burden compared to narrower measures of income.[13] The breaks for these quintiles in 2018 dollars are: lowest $25,100, second $49,3000, middle $85,900 and fourth $153,300.

We measure the distributional effect of plans by the average change in after-tax income for tax units in each income quantile. As discussed by William Gale, other measures are problematic.[14] Measuring the share of taxes paid can show misleading burden results. For example, an across-the-board tax cut could result in a specific quintile (or quintiles) share of tax increasing. While this measure would imply an increase in burden for that quintile, taxes are going down for all groups. Similarly, using the percentage change in taxes paid causes problems for comparisons among high and low quintiles. Consider a case where a tax proposal lowers the tax bill from a low-income person from $10 to $0. This would imply a 100% reduction in tax. In the same plan a high-income person that paid $20 million in tax, has their tax liability reduced by $10 million. This person would see a 50 percent reduction in tax. This misleadingly suggests that the low-income person receiving a 100 percent tax reduction fares better than the high-income person receiving a 50 percent tax reduction. He also points out that these problems are particularly troublesome for refundable credits, such as the Child Tax Credit (CTC) analyzed in this paper. They can cause problems because taxes paid can drop below zero, complicating the analysis. Indeed, supplying net refunds is one of the stated purposes of the CTC and the Earned Income Tax Credit.

[13] See Rosenberg (2013)
[14] See Gale (2017)

IV. ANALYSIS

As mentioned, the TCJA was passed more quickly than previous tax changes of this magnitude, limiting the depth and number of analyses at the time. Later analyses have focused on the effects and implications of the law, rather than considering alternatives or possible trade-offs among groups.[15] In this section, we analyze the results from simulating thousands of alternatives to the TCJA. We explore the trade-offs implied by these plans, both in terms of benefits to tax units in different income groups and in terms of benefits to tax units versus adjusted revenue. To accomplish this, our study focuses on two model outputs for 2018, the change in adjusted revenue and the average change in after-tax income. In the second part of this section we locate among our plans several alternatives that satisfy some optimality criteria.

We tweak many of the parameters changed in the individual income tax system, but we do not consider changes in corporate taxes, estate taxes or other changes. Instead, we assume in our model estimates that all other aspects of the TCJA were implemented. Table 1 describes the parameters and their alternative values used in our model.

Some, but not all, of our options include both TCJA and prior law values. For the CTC, we consider changes to the income threshold and the refundable amount but not the amount of the credit itself. In some simulations we go further, such as eliminating the SALT deduction entirely. We also raise the cap on SALT deductions to $20,000 rather than eliminating it, which exceeds the SALT deduction for about 97 percent of tax units in our model. In others, we reverse direction. For example, we consider tax rates at both the TCJA and pre-TCJA level, but we also consider a 10 and 20 percent increase in all individual marginal rates.

In each simulation, one value was selected for each parameter. The model was estimated under prior year's law and under the TCJA for calendar year 2018. The difference in after-tax income before and after the law changes is used to calculate the average percent change in after-tax incomes for each quantile. Similarly, the difference in adjusted revenue under the two regimes is used to calculate the change in adjusted revenue.

[15] See for example, Gale, et al. (2018)

Numeric Analysis of Trade-offs

Figure 1 describes the relationship between reduction in adjusted revenue and the percent change in after-tax income for all tax units. At (0,0) lies Point A, which represents prior law. At the intersection of the dotted lines lies Point B, which represents the TCJA. We estimate that in 2018, average after-tax income increased by 2.21 percent, while adjusted revenue is reduced by $242.96 billion. The vertical thickness of the point cloud demonstrates that different plans may lead to the same change in after-tax income but impose different costs to adjusted revenue. For example, the cost of plans that cut tax rates is partially offset by an increase in taxable income. Plans that increase the standard deduction, on the other hand, do not create a strong incentive to increase taxable income and so are more costly.

Point C represents another alternative: raise tax rates by 20 percent above those in the TCJA but otherwise keep its provisions.[16] Instead of a loss, adjusted revenue is increased by $36 billion. If the standard deduction is increased by 10 percent above the TCJA level and the CTC income threshold is lowered to zero, we return to the pre-TCJA level of after-tax income and adjusted revenue.

An important aspect of these simulations is the wide variation in their estimated impact of federal adjusted revenue in 2018. Of the 9,216 alternative plans we consider, 2,511 (27 percent) are more costly to the federal treasury than the TCJA while also increasing average after-tax income. 919 (10 percent) increase adjusted revenue and reduce after-tax income. But 5,662 plans (61 percent) cost less than the TCJA while still reducing federal adjusted revenue and increasing after-tax income for some groups. These plans are less costly and some may be less regressive than the TCJA.

As widely discussed, the TCJA was a regressive tax plan in which tax units with larger incomes tend to receive larger increases in after-tax income. Table 2 describes the change in after-tax income for various income groups, as defined by ECI. Panel A describes average change in the five quintiles. Among tax units in the bottom quintile, we estimate that after-tax incomes increased by less than 0.5 percent. Tax units in progressively higher quintiles saw progressively larger increases, with tax units in the top quintile increasing by an average of about 3 percent. Panel B describes additional quantiles. The top 10 and top five percent saw larger increases, although the increase in average after-tax income for tax units in the top 1 percent of ECI is lower than the average across the top five percent.

[16] We use the income brackets defined by the TCJA.

The alternative plans shown in Figure 1 also generate alternative distributions. We start with Point C, in which the tax rates increase from the TCJA by 10 percent, in Figure 1. The average change in after-tax income for tax units in each quintile are listed in Panel A of Table 3. The first four quintiles see gains, albeit smaller than under the TCJA. Since adjusted revenue increase and the bottom average after-tax incomes in the four quintiles increase, after-tax incomes in the top quintile almost certainly decline. They do, by about 0.8 percent. Panel B adds an increase in the standard deduction by 10 percent above the increase in the TCJA. Adjusted revenue increase by only $2 billion in 2018. Average after-tax incomes increase in the bottom four quintiles, and the loss among tax units in the top quintile is reduced to 0.66 percent. Panel C lowers the income threshold for receiving the CTC to zero, returning adjusted revenue to approximately the pre-TCJA level.

This illustrates one of the benefits of our approach. Except for the changes just mentioned, the plan in Panel C is identical to the TCJA. Yet the plan does not increase the deficit, and the distribution of changes is more progressive than the TCJA. Of course, this is simply one possible alternative, and it is equally easy to locate other plans.

The variety of alternative distributions available in these plans are summarized in Table 4, in which we present the mean, maximum and minimum changes in average after-tax income for each quintile and the top 10, 5 and 1 percent. The mean change in the first four quintiles is roughly similar to the change calculated for the TCJA. But the mean change for the top quintile is well below the quintile's change under the TCJA. This reflects the decision to focus on parameter changes that include prior law and intermediate steps, as well as the design of the TCJA, which allocated about two-thirds of the benefits to the top quintile.[17] Note that there is more variability in after-tax income changes among higher quantiles. For example, changes in after-tax income vary between -.872 and 1.166 in the bottom quintile but -1.906 to 4.169 in the top quintile. This occurs because tax units in progressively higher quantiles pay larger shares of their income in taxes.

Because changes in tax provisions tend to help all groups, or at least benefit some and hold others harmless, the fortunes of the groups are connected. We describe this connection in Table 5, where we show the correlations of after-tax income among the quantiles. While all of the correlations are positive, they are strongest between adjacent quantiles. But the top quintile is much less correlated with any of

[17] See Sammartino, et al (2018), Table 1.

the bottom four quintiles than they are correlated with each other. For example, the correlation between the fourth and top quintile (0.781) is about the same as the correlation between the fourth and first (0.742). Correlations between first four quintiles and the top 10th, fifth and first quantiles are even weaker.

We can also view how changes in tax provisions affect more than one group by considering the plan that maximizes the benefit of the top quintile. It has the greatest reduction in adjusted revenue: about $455 billion. Because each tax provision is set to minimize adjusted revenue under this plan, it is also the plan that maximizes the benefits to each quantile.

But if the TCJA's reduction represents an informed estimate of the maximum then we should not consider plans with greater reductions in adjusted revenue. In Table 6 we re-calculate Table 2, limiting ourselves to plans that reduce adjusted revenue by no more than the TCJA. The minimums remain unchanged because they are always associated with increased adjusted revenue. Notice also that imposing this constraint leaves the maximum benefit to the bottom quintile unchanged and the mean from 0.485 to 0.402. This indicates that the most expensive plans do not provide much benefit to tax units in the bottom quintile. The third through top quintiles face larger reductions in the means, and maximums are also lower. Surprisingly, the maximum gain for tax units in the top quantiles remain nearly the same. But note that the maximum gain under all plans we consider is close to the gain under the TCJA. This reflects the difficulty in locating any trade-offs among tax parameters that can increase the after-tax income of those quantiles without further reducing adjusted revenue.

Imposing the constraint also allows us to better understand the tradeoffs among the quantiles. In Table 7 we show the partial correlations of changes in average after-tax incomes, but controlling for adjusted revenue. As before, the correlations among the first four quintiles are positive, although they are lower than those in Table 5. This reflects the fact that imposing a budget constraint forces tradeoffs among benefits to the different quantiles. More strikingly, each of the first four quintiles are negatively correlated with the top quintile and even the correlation coefficient between the fourth quintile and the top quintile is -0.94. The correlation between the first four quintiles and the top quantiles is even more negative. We therefore conclude that within our constraint, plans benefitting both the top quintile and other quintiles are rare.

Examining the plans that maximize the benefit to the top quintile in Table 6 also shows this trade-off. Under this plan, average after-tax incomes in the top quintile increase by 3.38 percent. Rather than

maximizing the benefits to each quantile, this plan keeps the income threshold of the CTC at $2,500 and restores the standard deduction to its pre-TCJA level. In addition, the personal exemption is reduced to $2,500, but not eliminated, or restored to its pre-TCJA value. Consequently, the average change in after-tax income for the bottom quintile is only 0.06 percent. The next three quintiles see average increases of 0.66 percent, 1.07 percent and 1.65 percent, respectively. All of these are below the actual TCJA value.

Maximizing the benefit to the bottom quintile while constraining losses to no more than the TCJA creates a different tradeoff. Here, average after-tax income of the bottom quintile increases by 1.16 percent. To accomplish this the personal exemption is fully restored, the standard deduction is raised by 10 percent above the TCJA level, and the CTC refund amount is set to its maximum. To pay for this increase, tax rates revert to their pre-TCJA level, as does the AMT. The SALT cap is raised to $15,000, which benefits most tax units but not those facing very high state and local tax bills. As a result, after-tax incomes of the second quintile increase by 2.6 percent, incomes in the third quintile increase by 3.08 percent and those in the fourth increase by 2.84 percent. The average after-tax income in the top quintile increases by 1.71 percent and those with incomes in the top five percent see an increase of 1.16 percent.

Graphical Analysis of Trade-offs

In this section, we explore more deeply both how plans affect tax units in each income group and the trade-offs among these groups. Highlighting plans that cost less than the TCJA displays a clear pattern: many plans benefit each of the first four quintiles. In particular, many of the plans that benefit the second through fourth quintiles also benefit the first. But plans that benefit the top quintile do not benefit the other four, and vice versa.

In Figure 1 we saw that there is a roughly linear relationship between adjusted revenue loss and the after-tax income of all tax units, but this relationship does not hold for tax units in each quantile. So, there are plans that both reduce revenue loss and improve average after-tax income for tax units in each quantile. In Figure 2 we plot the percent change in average after-tax income for tax units in the bottom quintile against the change in adjusted revenue. As in Figure 1, the dotted lines represent TCJA levels for adjusted revenue and percent change in after-tax incomes and they intersect at the TCJA plan. The vertical groupings of points in the scatterplot represent plans that change adjusted revenue but have little effect on the after-tax income of tax units in the bottom quintile. For example, variation in the ceiling on SALT deduction has little effect on these tax units. Marked in red are the plans (about 45

percent of all plans) which lose less revenue than the TCJA and increase the average after-tax of tax units in the bottom quintile. There are also a small number of plans that increase adjusted revenue above prior law and benefit tax units in the bottom quintile. A few plans actually increase after-tax income beyond the TCJA. But clearly, it is difficult to reduce the loss of adjusted revenue below the TCJA level without reducing the after-tax income of some tax units below the TCJA.

Moreover, in the upper right-hand corner there is a concave frontier between adjusted revenue and after-tax income. The plans along the frontier alternately increase the standard deduction and the personal exemption. The furthest point to the right on the frontier has the highest standard deduction ($26,400 for married couples), personal exemption ($5,500), a fully refundable child tax credit and a child tax credit refundability threshold starting at $0. The next point lowers the personal exemption to $4,150. This point is slightly to the left and substantially above the prior point, indicating a small loss in after-tax income but a large increase in adjusted revenue. Moving upwards along the frontier to the next point, the personal exemption is lowered to next highest level ($4,150). The next point going up the frontier maintains the same personal exemption, but lowers the standard deduction to the next highest level ($24,000 for married couples). This pattern of trading off lower personal exemptions and standard deductions continues along the frontier. As the frontier flattens, each change represents a smaller increase in adjusted revenue and a larger loss in after-tax incomes of tax units in the bottom quintile.

The effect of individual provisions is even more stark when considering sub-populations. Figure 3 repeats the plot in Figure 2, but limits the sample to tax units married filing jointly with child dependents. The striking vertical lines are formed by the Child Tax Credit. The vertical lines represent changes in revenue, but with no horizontal movement, so that plans on the same line have no bearing on the group's after-tax income. The plans either form vertical lines or cluster around these vertical lines, which illustrates that out of the many provisions we changed, the child tax credit threshold and refundability level have the greatest effect on the after-tax income of low income married tax filers with children. The chart is broken into three groups of three lines. The lines are bunched together by the refundability amount of the child tax credit. Moving from left to right, the first group of three lines has a child tax credit refundability of $1,000, the middle group $1,400, and the right most group has a fully refundable tax credit of $2,000. Each of the three groups is made up of three child tax credit refundability thresholds. Again, moving from left to right within each grouping, the left most line in each group has a refundability threshold of $2,500, the middle group $1,250 and the right most line $0.

As we move to higher quintiles, there are increasingly few plans that both increase their after-tax income and reduce the loss in adjusted revenue. In Figure 4 we plot the percent change in average after-tax income for the second through top quintiles. In the second quintile 11 percent of plans increase adjusted revenue above prior law and 10 plans also increase average after-tax income above the TCJA level. For the third through top quintile, there are no plans that both increase adjusted revenue above prior law and increase and increase after-tax income beyond the TCJA. As before, plans marked in red are less costly than the TCJA while increasing after-tax income for tax units in that quintile beyond the TCJA. In the second quintile, about one third of plans are less expensive to the federal government while raising average after-tax income above the TCJA level. In the third quintile, the share is about 27 percent, and in the fourth quintile it is 21 percent. For the top quintile, less than one percent of plans are less costly and benefit tax units beyond the TCJA level. The small number of plans that reduce adjusted revenue loss and benefit the top quintile occurs because it is difficult locate any policy values that benefits the top quintile that do not cost more money.

The top quintile also stands apart in that plans that raise average after-tax incomes of the bottom four quintiles do not raise average after-tax incomes of the other quintiles. This can be seen in Figure 5, in which we plot the change in after-tax income for tax units in the top quintile against the change in adjusted revenue. Plotted in red are plans that are less costly than the TCJA and raise average after-tax incomes of the fourth quintile above the level found in the TCJA. It is clear that none of the plans plotted in red raise average after-tax incomes in the top quintile above the TCJA level. Plans that raise incomes in the first three quintiles above the TCJA level also have no overlap with incomes in the top quintile.

The reverse is also true: among plans that are less costly than the TCJA, those that raise the after-tax incomes of tax units in the top quintile more than the TCJA do not similarly benefit tax units in any of the bottom four quartiles. In Figure 6 we plot the change in average after-tax incomes of the fourth quintile against adjusted revenue. Plans in red raise after-tax incomes of tax units in the bottom quintile above the TCJA, while plans in black circles similarly benefit tax units in the top quintile. It is clear that there is a strong overlap in plans benefitting both the first and fourth quintiles while there is no overlap at all between plans benefitting the fourth and top quintiles.

Figure 7 further explores the trade-off between after-tax incomes in the top quintile and those in the bottom four quintiles. Each plan is represented by the average percent change in after-tax income of tax units in the bottom 80 percent and the top 20 percent. The contour lines separate the plans into ten

equal-sized bins with approximately the same change in adjusted revenue. The TCJA, with a change in adjusted revenue of -$242 billion in 2018, is in the bin of adjusted revenue changes ranging from $233 billion to -$271 billion. From the figure, it is clear that a plan that increases the after-tax income of the top quintile by about one percent could cost from $59 billion to $100 billion in foregone adjusted revenue. Under those plans, tax units in the bottom 80 percent would have an average increase in after-tax income of no more than 0.8 percent. Plans that provide the TCJA-level increase to tax units in the bottom 80 percent could cost between $100 billion and $138 billion in adjusted revenue if incomes in the top quintile remain at about their pre-TCJA level. Finally, for about the same cost as the TCJA (between $233 billion and $271 billion in lost adjusted revenue), incomes in the bottom 80 percent and the top 20 percent could have been increased by an average of two percent each.

Preferable Alternatives to the TCJA

We now consider possible alternatives that preferable to the TCJA according to one of three criteria. First we consider plans that may be more economically efficient, which we explore by searching over plans that repeal the SALT deduction. Second, we locate the least costly plan that raises average after-tax incomes of each quintile by at least one percent. Finally, we locate the plan that maximizes the smallest percent increase among the quintiles.

Repealing the SALT Deduction

The TCJA put a cap of $10,000 on the SALT deduction. Over the years, outright repeal has been widely discussed in political debates, and it was included in the initial version of TRA86. Some have argued that repealing the SALT deduction harms state and local government budgets over time. But proponents of a repeal argue that deduction is economically inefficient because it provides an incentive for state and local governments increase spending. The deduction is also regressive because most of the benefit of the current SALT deduction benefits higher-income tax units.

Here we consider plans that repeal the SALT deduction and therefore tend to be more economically efficient and more progressive than other plans. Because this leaves us with a large number of plans, we consider three alternatives within this set. First, we locate the plan with the largest increase in after-tax income. Second, we locate the plan that raises the most adjusted revenue. Finally, we locate the least expensive plan that raises average after-tax incomes of all five quintiles above prior law. In other words,

we locate a plan that is the least costly while still providing a broad cut in taxes, paid for by repealing the deduction for state and local taxes.

Under a repeal of the SALT deduction, the change in adjusted revenue varies between -$421 billion and $195 billion. In comparison, under the TCJA cap of $10,000 the range is -$440 billion to $137 billion.

Naturally, the plan that raises the most revenue would reduce tax units' after-tax income the most, and vice versa. Under the plan that raises $195 billion, the average decrease in after-tax income for all would be 1.8 percent, with the bottom quintile losing 0.87 percent and the top quintile losing 1.95 percent. This plan, shown in plan 1 of Table 8 has the highest tax rates, the lowest standard deduction, the lower AMT exemption and CTC phase-out threshold, no personal exemption, and a $1,000 refundable amount out of the $2,000 maximum amount of CTC.

Under the plan that loses $421 billion, the increase in after-tax income would be 3.7 percent for all, with the bottom quintile increasing by 1.16 percent and the fourth and top quintiles increasing by almost 4 percent. This is plan 2 of Table 8, and it has the TCJA tax rates, the highest standard deduction and personal exemption, the higher AMT exemption and phase-out threshold, and a fully refundable CTC of $2,000 at maximum without income threshold.

With the SALT deduction repealed, the most affordable plan that raises the average after-tax income of all five quintiles cost about $30 billion. This plan would reduce adjusted revenue by about one tenth of the reduction cause by the TCJA and raise average after-tax incomes by 0.22 percent, ranging from 0.12 to 0.58 percent in the quintiles. This plan, listed as plan 3 of Table 8, keeps the prior-law tax rates, increases the standard deduction to the TCJA level, repeals personal exemption and SALT deduction, imposes the lower AMT exemption and phase-out threshold, and a $1,000 refundable amount out of the $2,000 maximum amount of CTC.

Minimum revenue loss while raising each quintile by at least 1 percent

We identify a plan that has the minimum revenue loss and raises the after-tax income of each quintile at least by 1 percent from the prior-law distribution. The plan would lose approximately $174 billion and increase the average after-tax income for all tax units by 1.4 percent, benefiting both the top and bottom quintiles by just above 1 percent, the second and middle quintiles by 2 percent, and the fourth quintile by 1.6 percent. This plan has the statutory tax rates, personal exemption, and AMT exemption

and threshold at the prior-law level. But it has the highest standard deduction, and a fully refundable CTC of $2,000 without an income threshold. (See plan 4 in Table 8)

Maximize the minimum gain without losing additional revenue

Among all the plans in our simulations, the plan that maximizes the minimum gain would raise incomes of the bottom quintile by 1.12 percent. After-tax incomes in the second quintile increase by an average of 2.4 percent, while those in the third quintile increase by slightly more than 2.7 percent on average. Incomes in the fourth quintile increase by about 2.5 percent and those in the top quintile increase by about 1.5 percent. The increases in the bottom four quintiles all exceed those of the TCJA, while the incomes in the top quintile rise by much less than under the TCJA. The plan would cost approximately $0.5 billion less than TCJA. It shares many similarities with the plan discussed above, except that it has a standard deduction at the TCJA levels, and a personal exemption of $5,500. (See plan 5 in Table 8.)

V. CONCLUSION

In this paper we consider alternatives to the TCJA using the Tax Policy Center's new ability to rapidly and repeatedly run its microsimulation models in the cloud. We calculate the change in adjusted revenue and distributional effects of 9,216 separate plans. For each plan, we calculate the change in adjusted revenue, the percent change of average after-tax income of each income quintile, top income groups such as the top 5 percent, and groups such as married couples with children.

We find numerous plans that are less costly to the budget deficit yet provide greater average after-tax increases to tax units in the bottom four quintiles. For each quintile there are plans that both raise average after-tax income above the TCJA level and reduce adjusted revenue by a smaller amount. However, while there are many plans are no more costly than the TCJA that so benefit tax units in each of the bottom four quintiles, we find no plan that benefits the top quintile while benefitting any of the bottom four. Moreover, there are few plans that benefits the top quintile while also reducing the loss of adjusted revenue.

We also identify plans that satisfy various criteria. Eliminating the SALT deduction, we find that it is possible to raise the average after-tax incomes of all five quintiles by reducing adjusted revenue by only $29 billion. We find that the least expensive plan to raise after-tax incomes by at least one percent costs $180 billion, as compared to the $243 billion of the TCJA. Finally, we find a plan that, for the same cost in adjusted revenue as the TCJA, raises average after-tax income in each quintile by at least 1.2 percent.

Future use of the Tax Policy Center's new capacity includes analyzing the effect of changes to interacting provisions of the tax code, such as the earned income tax credit and the CTC. We will also be able to rapidly respond to broad changes in the tax by estimating numerous alternatives, as we have done in this paper.

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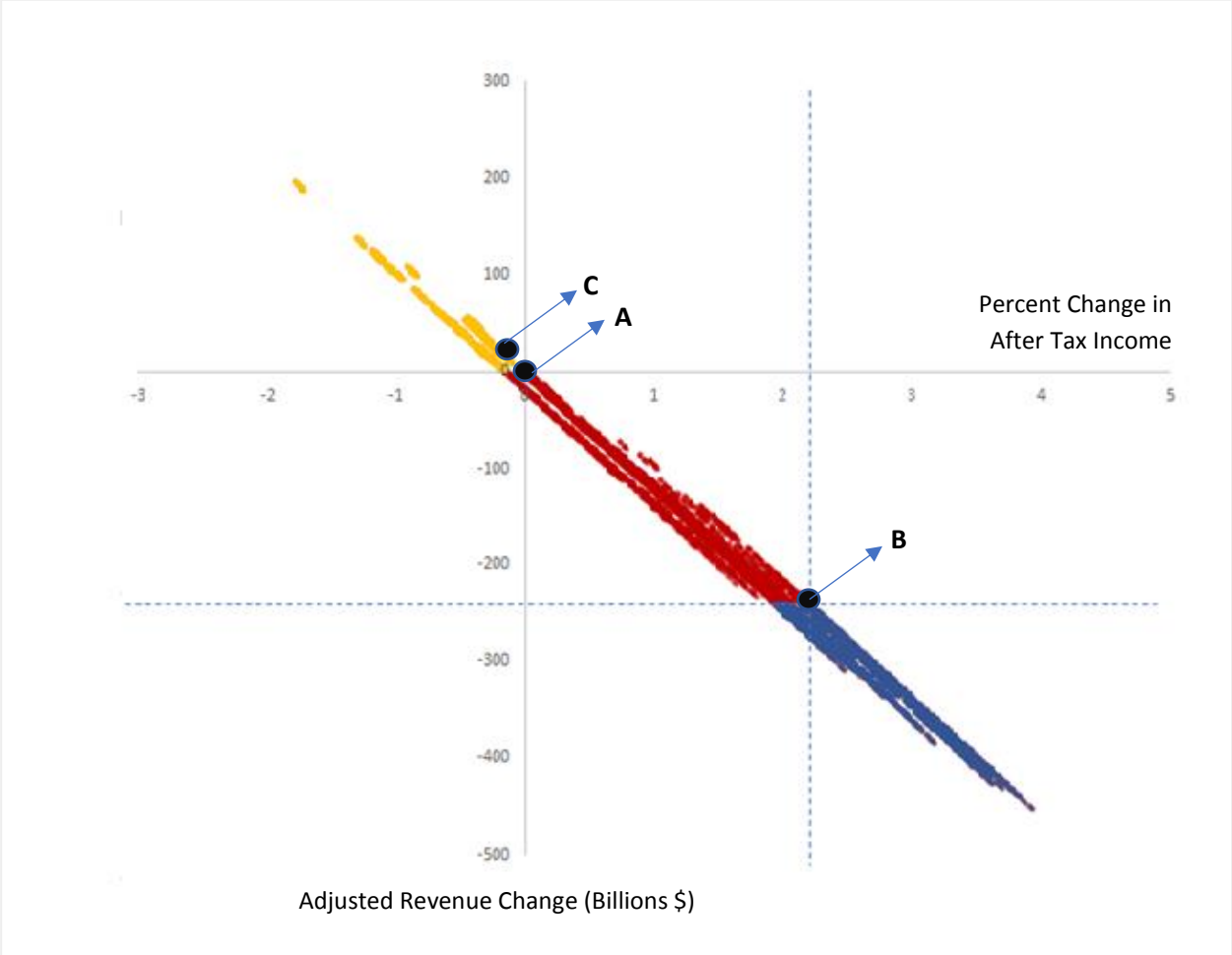
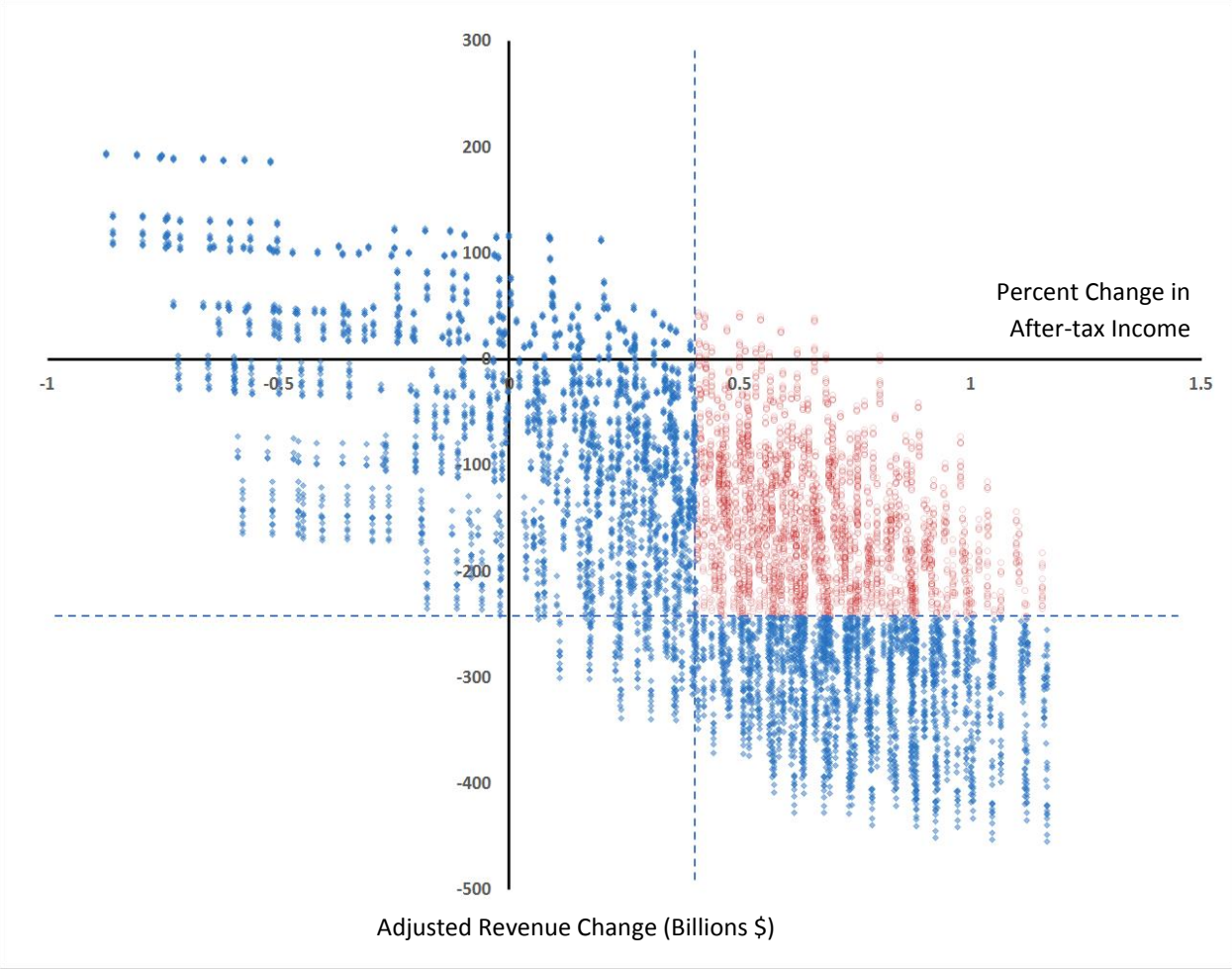
FIGURES

Figure 1: Percent Change in After-tax Income Versus Adjusted Revenue Change
Calendar Year, 2018



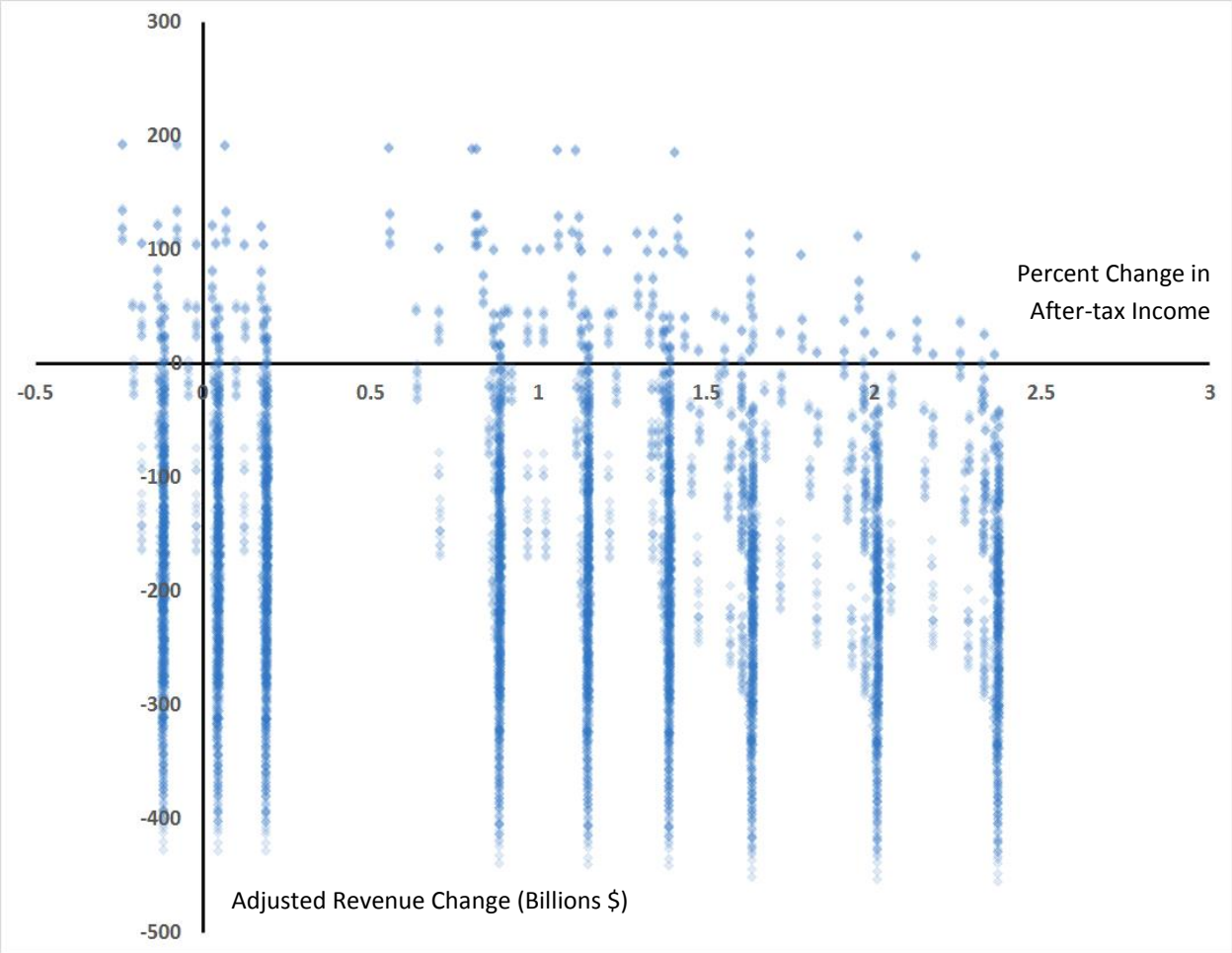
Source: Urban Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The intersection of the horizontal and vertical dotted lines represents the overall adjusted revenue change and percent change in after-tax income of the tax of the TCJA. Point A, B and C representrepresentthe Pre-TCJA, the TCJA, and the TCJA with the rates changed to the highest set of rates, respectively. The lightest (yellow) section represents plans with higher adjusted revenue than Pre-TCJA baseline. The darkest (blue)

Figure 2: Percent Change in After-tax Income for Bottom ECI Quintile Versus Adjusted Revenue Change Calendar Year Estimates, 2018



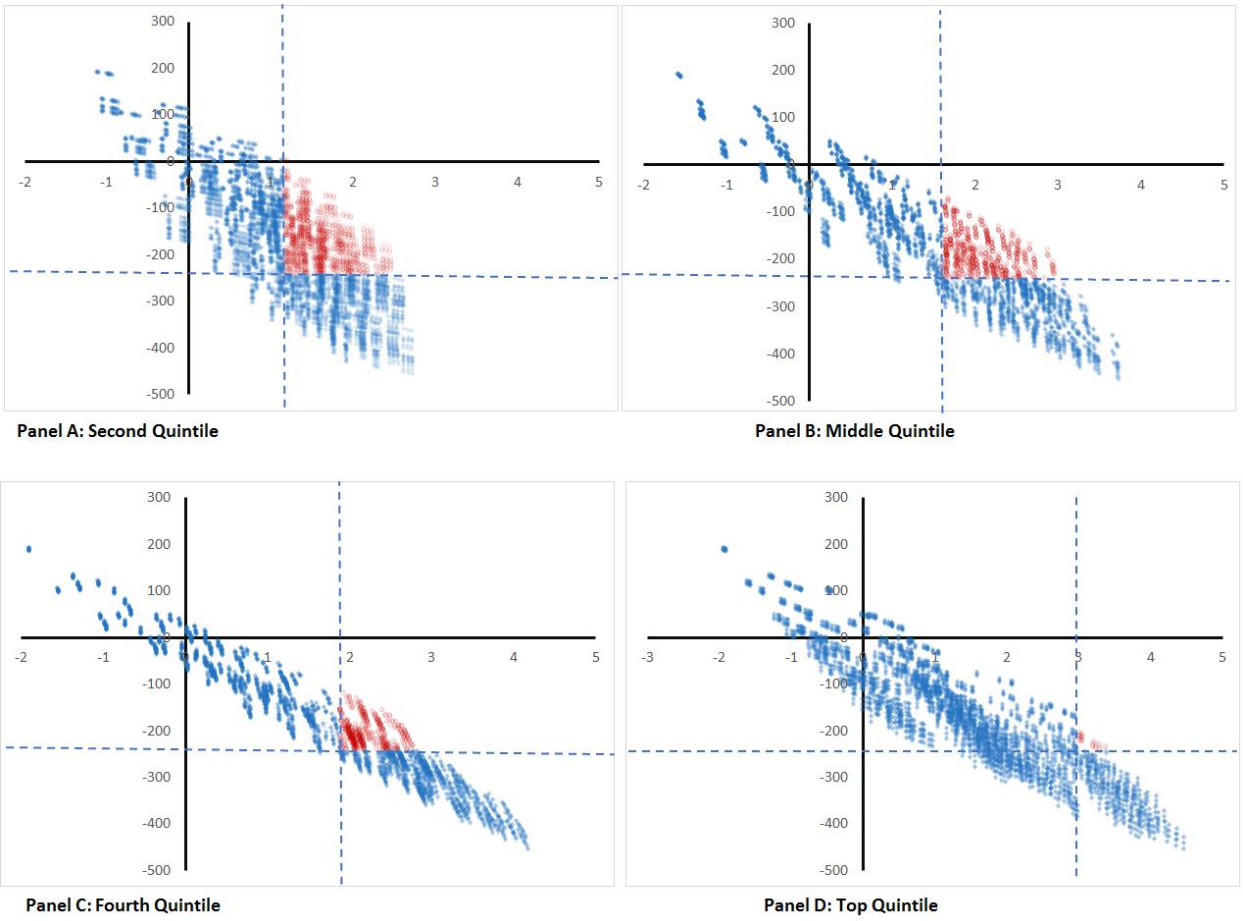
Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The intersection of the horizontal and vertical dotted lines represents the overall adjusted revenue change and percent change in after-tax income of the TCJA. The lighter (red) section represents plans that both increase adjusted revenue and percent change in after-tax income above TCJA levels for tax units

Figure 3: Percent Change in After-tax Income for Bottom ECI Quintile Married Tax Units with Children Versus Adjusted Revenue Change
Calendar Year Estimates, 2018



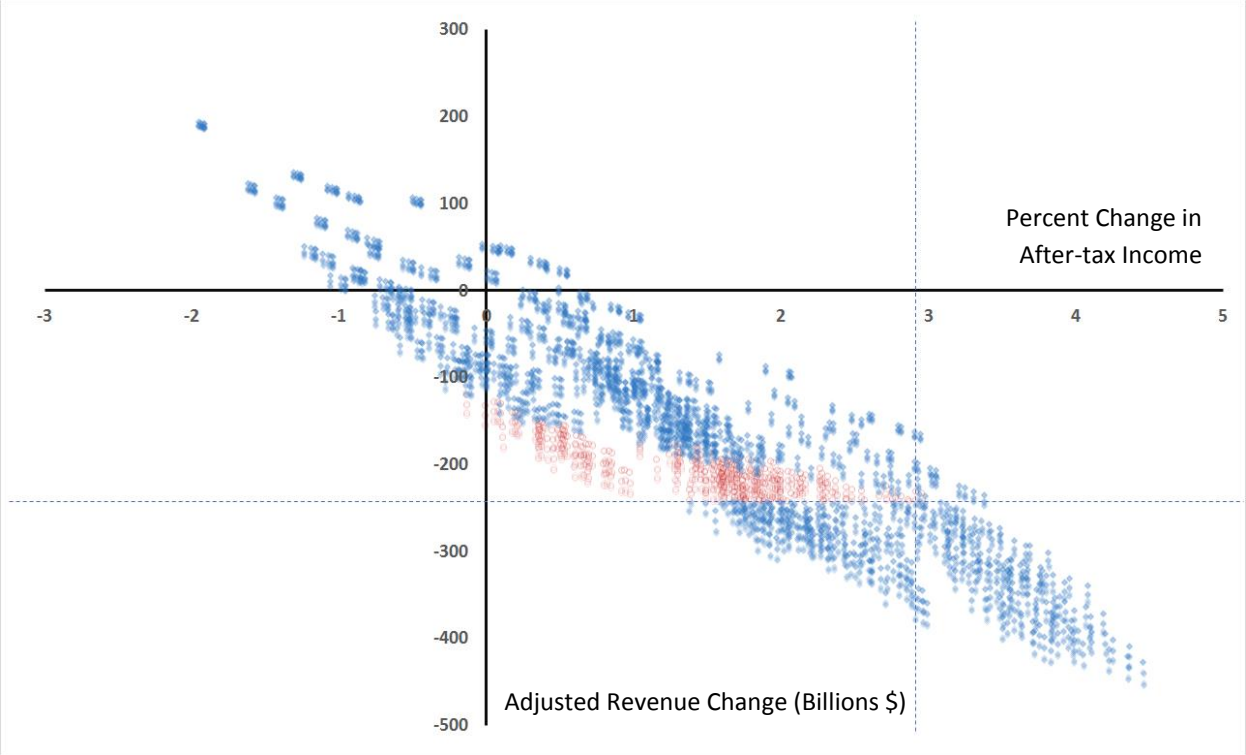
Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The figure charts the percent change in after-tax income and adjusted revenue change for only married tax units with children in the bottom ECI quintile.

Figure 4: Percent Change in After-tax Income for Second, Middle, Fourth and Top ECI Quintiles Versus Adjusted Revenue Change
Calendar Year, 2018



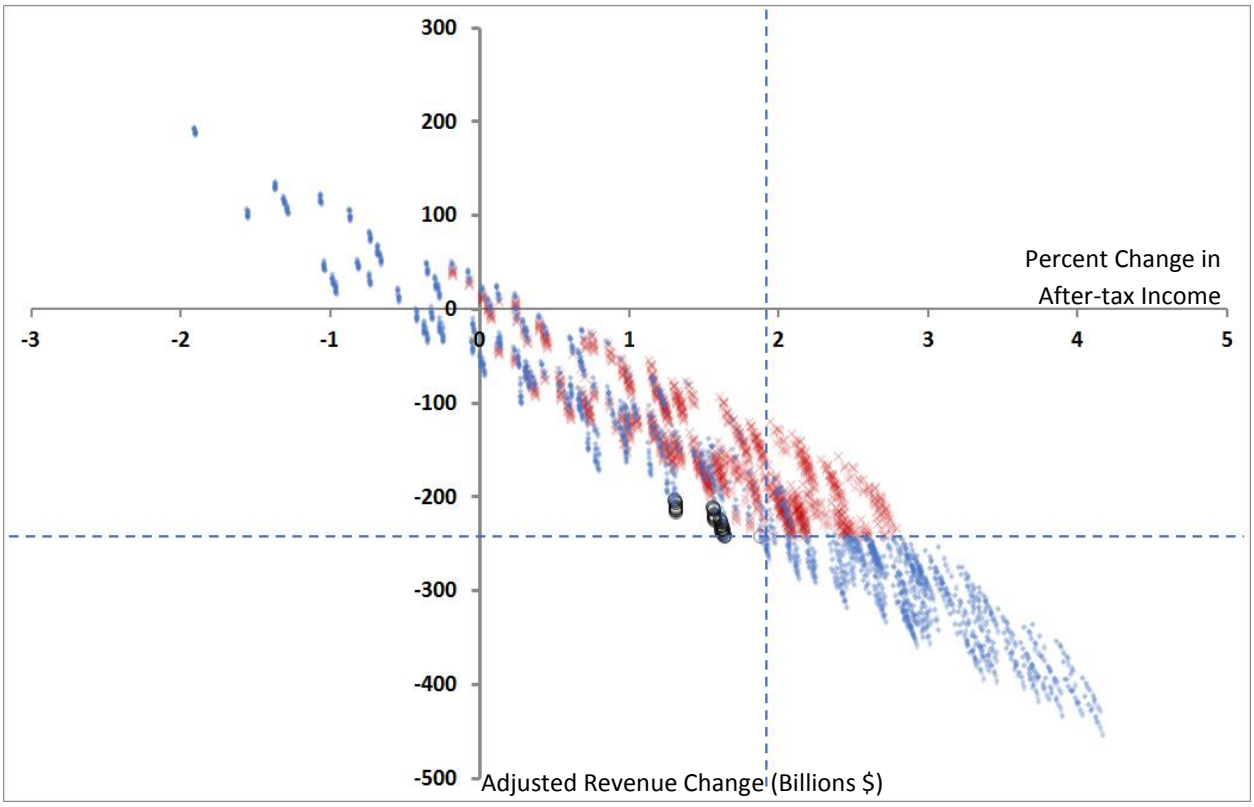
Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The x-axis is percent change in after tax income. The y-axis is adjusted revenue change. The intersection of the horizontal and vertical dotted lines represents the overall adjusted revenue change and percent change in after-tax income of the tax of the TCJA. The lighter (red) section represents plans that both increase adjusted revenue and percent change in after-tax income above TCJA levels for tax units within the specified quintile. Panel A, B, C and D represent the second, middle, fourth and top quintile, respectively.

Figure 5: Percent Change in After-tax Income for Tax Units in the Top 20 Percent of ECI Versus Adjusted Revenue Change
Calendar Year, 2018



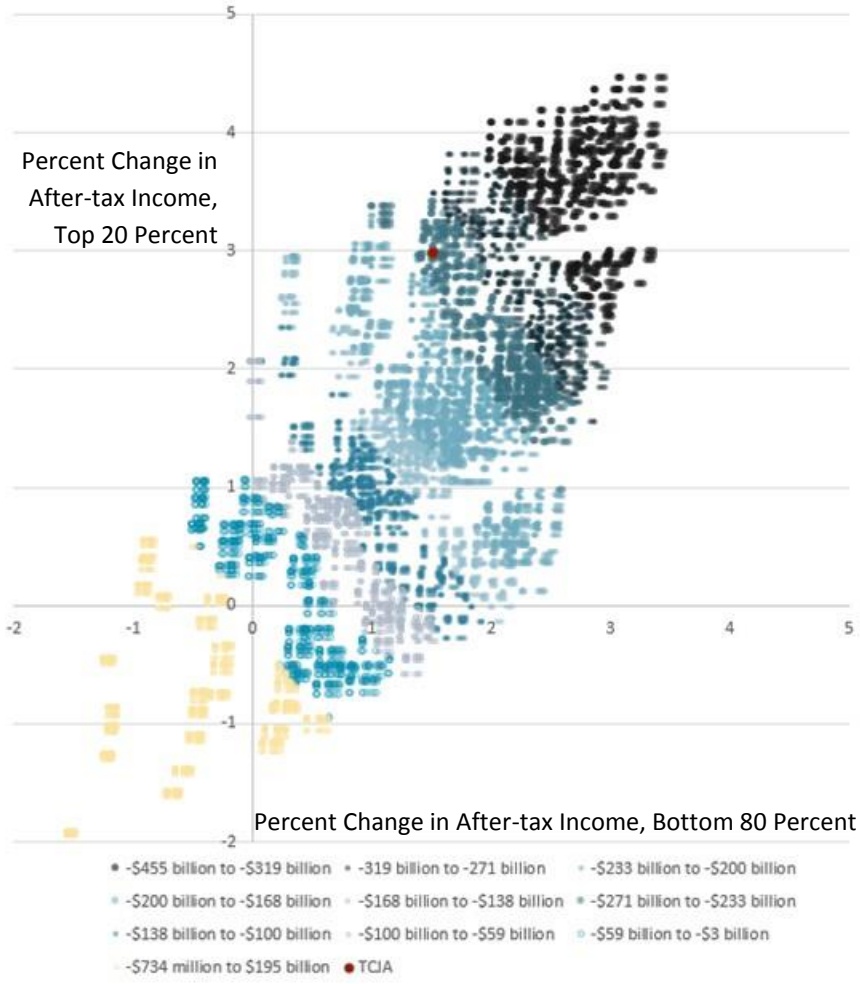
Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The intersection of the horizontal and vertical dotted lines represents the overall adjusted revenue change and percent change in after-tax income of the TCJA. The lighter (red) section represents plans that both increase adjusted revenue and percent change in after-tax income above TCJA levels for tax unit in the bottom quintile.

Figure 6: Percent Change in After-tax Income for the Fourth ECI Quintile Versus Adjusted Revenue Change
Calendar Year, 2018



Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The intersection of the horizontal and vertical dotted lines represents the overall adjusted revenue change and percent change in after-tax income of the TCJA. The lighter (red) section represents plans that lose less adjusted revenue than the TCJA, and increases percent change in after-tax income for the bottom quintile. The dark black circles represent plans that lose less adjusted revenue than the TCJA, and increases percent change in after-tax income for the top quintile.

Figure 7: Percent Change in After-tax Income the Top ECI Quintile Versus Percent Change in After-tax Income for the Bottom 80 Percent of ECI
Calendar Year, 2018



Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Notes: The figure plots the percent change in after-tax income for the top ECI quintile on the y-axis and the percent change in after-tax income for those in the bottom 80 percent of ECI on the x-axis. The chart is broken into ten groups based on revenue gain or loss. The groups are as follows (starting from the highest revenue gain to the highest loss in billions of dollars): 195 to -3, -3 to -59, -59 to -100, -100 to-138, -138 to -168, -168 to -200, -200 to -233, -233 to -271, -271 to -319, and -319 to -455. The red point represents the TCJA.

Table 1: **Key Parameters and The Alternative Values Used in The Simulations, Calendar Year 2018**

Statutory tax rates		I*	II**	III	IV
	Bracket 1	10%	10%	11.0%	12.0%
	Bracket 2	15%	12%	13.2%	14.4%
	Bracket 3	25%	22%	24.2%	26.4%
	Bracket 4	28%	24%	26.4%	28.8%
	Bracket 5	33%	32%	35.2%	38.4%
	Bracket 6	35%	35%	38.5%	42.0%
	Bracket 7	40%	37%	40.7%	44.4%
Standard deduction		I*	II	III**	IV
	Single	$6,500	$9,250	$12,000	$13,200
	Married filing jointly	$13,000	$18,500	$24,000	$26,400
	Head of household	$9,750	$13,875	$18,000	$19,800
	Married filing separately	$6,500	$9,250	$12,000	$13,200
Personal exemption		I**	II	III*	IV
		$0	$2,500	$4,150	$5,500
AMT exemption		I*	II**		
	Single	$55,400	$70,300		
	Married filing jointly	$86,300	$109,400		
	Head of household	$55,400	$70,300		
	Married filing separately	$41,350	$54,700		
AMT phase-out threshold		I*	II**		
	Single	$123,300	$500,000		
	Married filing jointly	$164,500	$1,000,000		
	Head of household	$123,300	$500,000		
	Married filing separately	$82,250	$500,000		
Limit on state and local taxes deduction		I	II**	III	IV
		$0	$10,000	$15,000	$20,000
CTC refundable amount		I**	II	III	
		$1,000	$1,400	$2,000	
Earned income threshold for refundable CTC		I	II	III**	
		$0	$1,250	$2,500	

* Prior-law tax parameters; ** TCJA tax parameters

Note A: This paper analyzes the results from 9216 simulations, which are combinations of all possible parameter options in the table, using Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1).

Note B: (1) The tax brackets for I follow the prior law, and the tax brackets for II to IV follow the TCJA. (2) Limit on state and local taxes deduction (SALT) being zero means the SALT deduction being repealed.

Table 2: **Percent Change in After-Tax Income for Income Groups under the Tax Cuts and Jobs Act, Calendar Year Estimates, 2018**

Panel A

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
0.404	1.154	1.607	1.886	2.98

Panel B

Top 10 Percent	Top 5 Percent	Top 1 Percent
3.36	3.77	3.48

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)

Table 3: **Percent Change in After-Tax Income for Income Groups under Alternative Plans, Calendar Year Estimates, 2018**

Panel A: **Raise tax rates from the TCJA by 10 percent**				
Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
0.315	0.625	0.398	0.021	-0.820
Panel B: **The above and increase standard deduction beyond TCJA by 10 percent**				
Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
0.439	0.956	0.833	0.403	-0.667
Panel C: **The above and lower the CTC threshold to 0**				
Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
0.625	1.007	0.840	0.403	-0.667

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)

Table 4: **Minimum, Mean, and Maximum Changes in After-Tax Income for Income Groups under Alternative Plans, Calendar Year Estimates, 2018**

Panel A

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Mean	0.485	1.195	1.564	1.637	1.411
Max	1.166	2.720	3.736	4.169	4.462
Min	-0.872	-1.125	-1.587	-1.906	-1.954

Panel B

	Top 10 Percent	Top 5 Percent	Top 1 Percent
Mean	1.333	1.330	0.760
Max	4.427	4.439	3.658
Min	-1.844	-1.699	-2.437

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)

Table 5: **Zero-order Correlations of Changes in After-Tax Income Among Income Groups**
Calendar Year Estimates, 2018

Quintile	1	2	3	4	5
1	1.000	*	*	*	*
2	0.957	1.000	*	*	*
3	0.858	0.957	1.000	*	*
4	0.742	0.872	0.972	1.000	*
5	0.350	0.502	0.653	0.781	1.000
Top Percentile					
10	0.222	0.366	0.514	0.655	*
5	0.139	0.274	0.414	0.557	*
1	0.088	0.212	0.338	0.473	*

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)

Table 6: **Percent Change in After-Tax Income under Alternative Policies in which Tax Revenue Exceeds That Under the TCJA, Calendar Year Estimates, 2018**

Panel A					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Mean	0.402	0.980	1.194	1.171	0.877
Max	1.165	2.602	3.261	3.137	3.379
Min	-0.872	-1.125	-1.587	-1.906	-1.954
Panel B					
	Top 10 Percent	Top 5 Percent	Top 1 Percent		
Mean	0.794	0.778	0.128		
Max	3.812	4.152	3.634		
Min	-1.844	-1.699	-2.437		

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)

Table 7: **Partial Correlations of Changes in After-Tax Income Among Income Groups, Calendar Year Estimates, 2018**

Quintile	1	2	3	4	5
1	1.000	*	*	*	*
2	0.953	1.000	*	*	*
3	0.837	0.930	1.000	*	*
4	0.622	0.734	0.922	1.000	*
5	-0.838	-0.923	-0.997	-0.938	1.000
Top Percentile					
10	-0.777	-0.870	-0.978	-0.972	*
5	-0.733	-0.826	-0.951	-0.977	*
1	-0.650	-0.732	-0.860	-0.910	*

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)
Note: The table shows the correlations of changes in after-tax income among income groups, controlling for the total revenue change.

Table 8: **Key Estimate Results and Parameters in Selected Plans, Calendar Year Estimates, 2018**

Panel A		**Plan 1**	**Plan 2**	**Plan 3**
Revenue change		*$195*	*-$421*	*-$30*
Percent change in after-tax income	All	*-1.78*	*3.66*	*0.22*
	Bottom quintile	*-0.87*	*1.16*	*0.24*
	Second quintile	*-1.12*	*2.71*	*0.58*
	Third quintile	*-1.59*	*3.68*	*0.49*
	Fourth quintile	*-1.91*	*4.01*	*0.12*
	Top quintile	*-1.95*	*3.99*	*0.16*
Statutory tax rates	Bracket 1	12.0%	10%	10%
	Bracket 2	14.4%	12%	15%
	Bracket 3	26.4%	22%	25%
	Bracket 4	28.8%	24%	28%
	Bracket 5	38.4%	32%	33%
	Bracket 6	42.0%	35%	35%
	Bracket 7	44.4%	37%	40%
Standard deduction	Single	$6,500	$13,200	$12,000
	Married filing jointly	$13,000	$26,400	$24,000
	Head of household	$9,750	$19,800	$18,000
	Married filing separately	$6,500	$13,200	$12,000
Personal exemption		$0	$5,500	$0
AMT exemption	Single	$55,400	$70,300	$55,400
	Married filing jointly	$86,300	$109,400	$86,300
	Head of household	$55,400	$70,300	$55,400
	Married filing separately	$41,350	$54,700	$41,350
AMT phase-out threshold	Single	$123,300	$500,000	$123,300
	Married filing jointly	$164,500	$1,000,000	$164,500
	Head of household	$123,300	$500,000	$123,300
	Married filing separately	$82,250	$500,000	$82,250
Limit on state and local taxes deduction		$0	$0	$0
CTC refundable amount		$1,000	$2,000	$1,000
Income threshold for refundable CTC		$2,500	$0	$2,500

Panel B		**Plan 4**	**Plan 5**
Revenue change		*-$174*	*-$242*
Percent change in after-tax income	All	*1.38*	*1.97*
	Bottom quintile	*1.02*	*1.12*
	Second quintile	*1.98*	*2.41*
	Third quintile	*1.98*	*2.74*
	Fourth quintile	*1.58*	*2.49*
	Top quintile	*1.06*	*1.54*
Statutory tax rates	Bracket 1	10%	10%
	Bracket 2	15%	15%
	Bracket 3	25%	25%
	Bracket 4	28%	28%
	Bracket 5	33%	33%
	Bracket 6	35%	35%
	Bracket 7	40%	40%
Standard deduction	Single	$13,200	$12,000
	Married filing jointly	$26,400	$24,000
	Head of household	$19,800	$18,000
	Married filing separately	$13,200	$12,000
Personal exemption		$2,050	$5,500
AMT exemption	Single	$55,400	$70,300
	Married filing jointly	$86,300	$109,400
	Head of household	$55,400	$70,300
	Married filing separately	$41,350	$54,700
AMT phase-out threshold	Single	$123,300	$123,300
	Married filing jointly	$164,500	$164,500
	Head of household	$123,300	$123,300
	Married filing separately	$82,250	$82,250
Limit on state and local taxes deduction		$10,000	$0
CTC refundable amount		$2,000	$2,000
Income threshold for refundable CTC		$0	$0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1)