Current Work on the Distributional Analysis of Household Income Resulting From Policy Changes

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Abstract

The Congressional Budget Office developed a framework to further standardize analyses of the distribution of household income and to complement analyses of policy changes' budgetary and economic effects. This paper introduces that analytical framework and describes the agency's current methods, along with examples.

This paper discusses the analytical choices that CBO plans to make in its distributional analyses of policy changes and notes how different choices could affect the analysis. Also discussed are the inherently difficult choices associated with conducting such analyses. Finally, the paper highlights areas where additional research would be useful and where lack of available data presents challenges for distributional analysis.

Keywords: income distribution, federal taxes, means-tested transfers

JEL Classification: C81, D31, H20, H50, I38

Notes

Numbers in the text, tables, and exhibits may not sum to totals because of rounding.

Unless indicated otherwise, all years referred to are calendar years.

All dollar amounts are in 2022 dollars rounded to the nearest hundred. To convert dollar amounts, the Congressional Budget Office used the price index for personal consumption expenditures from the Bureau of Economic Analysis.

CBO uses estimates of the revenue effects of tax legislation provided by the staff of the Joint Committee on Taxation (JCT). Unless otherwise noted, the estimated distributional effects of tax legislation are consistent with estimates provided by JCT.

The income concept in this work (defined in the "Analytic Method" section) is income after taxes and transfers. Other concepts of income that define eligibility for some policies include adjusted gross income (AGI) and modified adjusted gross income (MAGI). AGI is gross income minus adjustments to income. Gross income includes wages, dividends, capital gains, business income, retirement distributions, and other income. Adjustments to income include such items as educator expenses, student loan interest, alimony payments, and retirement account contributions. MAGI is AGI plus untaxed foreign income, nontaxable Social Security benefits, and tax-exempt interest.

A household consists of all people who occupy a housing unit, regardless of their relationship to one another. This paper's analyses exclude members of the armed forces on active duty and people in institutions such as prisons or nursing homes. Such people are excluded partly because many are not included in the underlying data and partly because they often do not share resources in the way that people living in a household typically do.

Contents

Summary

Policymakers regularly express interest in how policy changes affect different groups of people. In response, the Congressional Budget Office has expanded its capacity to allocate the budgetary effects of those changes across the income distribution.

This paper describes both the method CBO uses to analyze the distributional effects of policy changes and the modeling choices the agency makes—for example, when estimating how much of corporate taxes should be allocated to a corporation's owners or workers. Also described are the types of policy changes the framework is well suited to analyze and those that would require further work to make more suitable.

To show the results from its policy distribution method, the agency examined the distributional effects of six illustrative policy changes. Two policy changes are examples from CBO's most recent list of large budget options, whereas others are variations of policy changes enacted in recent years.[1] Finally, the paper describes possible directions for future refinements for such analysis.

Motivation

Many policy changes, particularly those related to federal spending or taxes, are designed to assist specific activities, entities, or groups of people. How a policy change affected or is likely to affect certain groups of people across the income scale—that is, the distributional effects—can be important information for the policymaker.[2]

CBO regularly publishes reports on how proposed policy changes affect the federal budget. To complement those estimates, CBO recently developed a modeling framework that could allow the agency to analyze how certain policy changes' budgetary effects are distributed among U.S. households.

This paper describes the methods in CBO's current framework and shows how they can be applied to analyze the distributional effects of certain illustrative policy changes. Building on CBO's existing methods for analyzing the distribution of household income, the framework is designed to estimate changes in the distribution of income after transfers and taxes. As a result, cash and near-cash transfers are most easily modeled within the framework, but other types of policy changes also can be modeled, including in-kind transfers. However, policy changes that

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[1] See Congressional Budget Office, *Options for Reducing the Deficit, 2023 to 2032—Volume I: Larger Reductions* (December 2022), www.cbo.gov/publication/58164.

[2] Other dimensions of distributional analysis, such as how the effects of policy changes are distributed by demographic characteristics, are not captured in the framework but are instead part of CBO's ongoing research agenda. See the "Further Research and Development" section on p. 22.

affect households indirectly, such as tariffs and other trade restrictions that could affect households through the price of intermediate goods, would require more model development.

The methods described here reflect CBO's current approach to the distributional analysis of household income resulting from policy changes. Other choices of analytic method could reasonably be made, possibly with different outcomes. Although the agency has tried to develop a framework applicable across many types of policy changes, CBO will refine its methods to incorporate future policy changes as they are proposed. The agency also will continue to analyze related issues, such as the allocation of in-kind transfers, applying insights from those future analyses to its distributional framework as appropriate. In addition, changes in the availability of and access to additional data sources may change how the agency applies the method in the future.

How This Analysis Differs From Similar Types of Work

CBO has previously analyzed the distributional effects of policy changes.[3,4] However, those analyses used disparate frameworks, making the results hard to compare. For example, the studies used different measures of income to rank households and used units of analysis other than households. Moreover, because those analyses were typically developed specifically to study certain policy changes, they often took a long time to complete. This paper describes a framework for distributional analysis that is common across a variety of policy types and compatible with CBO's budget and economic baseline. CBO expects that the framework's standardized nature will make results of different analyses easier to compare and will make the analyses easier to produce.

The analytical framework described in this paper is designed to measure the effects of a policy change on household income after transfers and taxes across the income scale. In CBO's analyses, the total effects of a policy change reflect changes in federal spending or revenues—

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[3] For example, see Congressional Budget Office, *The Effects of Potential Cuts in SNAP Spending on Households With Different Amounts of Income* (March 2015), www.cbo.gov/publication/49978; Congressional Budget Office, "How Increasing the Federal Minimum Wage Could Affect Employment and Family Income" (updated August 2022), www.cbo.gov/publication/55681; and Congressional Budget Office, letter to the Honorable Orrin Hatch, *Distributional Analysis of the Tax Cuts and Jobs Act, as Ordered Reported by the Senate Committee on Finance on November 16, 2017, Excluding the Effects of Eliminating the Individual Mandate Penalty* (November 27, 2017), www.cbo.gov/publication/53349. Those analyses used different concepts of income, as does this analysis. All three cited analyses exclude in-kind transfers in their income measure, but the second includes means-tested cash or near-cash transfers, such as the Supplemental Nutrition Assistance Program (SNAP).

[4] Other agencies have long analyzed the distributional effects of tax policy changes. See Joint Committee on Taxation, "Distributional Effects of Selected Provisions From Subtitle A, Subtitle C, and Subtitle D of Title I— Committee on Finance of an Amendment in the Nature of a Substitute to H.R. 5376, 'An Act to Provide for Reconciliation Pursuant to Title II of S. Con. Res. 14,' as Passed by the Senate on August 7, 2022," JCX-19-22R (August 9, 2022), www.jct.gov/publications/2022/jcx-19-22r; and Department of the Treasury Office of Tax Analysis, "Distributional Analysis of the U.S. Tax System" (accessed October 25, 2022), https://tinyurl.com/DoTOTA2022.

that is, the total net resource cost—attributable to that policy change. After determining net resource costs, CBO allocates them to households across the income scale to estimate the policy change's distributional effects.

Other researchers have taken a different approach, typically known as a welfare analysis, by trying to estimate how well-off a person or household is after a policy change, usually measured in a welfare-equivalent dollar amount.[5] Such an analysis would set the value of any noncash benefits at the estimated amount the person or household would have been willing to pay for the good or service without government provision. A welfare analysis also would include any costs incurred by lost efficiency (known as deadweight losses) or the value of its effects on others (externalities). In a welfare analysis, the value to households of a government-supplied good or service may be higher or lower than the government's cost of providing that good or service.

How This Analysis Will Complement Other CBO Work

When CBO produces estimates of policy changes' budgetary effects (such as in its total estimates of options for reducing the deficit), they are relative to the agency's "baseline"—which typically reflects current law.[6] Similarly, in analyzing policy changes' distributional effects, CBO will first estimate the distribution of household income consistent with the baseline as presented in the most recent *Budget and Economic Outlook*.[7] The agency will then simulate the policy change's effects on household income relative to that initial distribution along the distribution. The difference in the distribution of household income between the baseline and alternate scenario will yield the estimated distributional effects that would occur if the policy change was implemented. The agency would also estimate the distributional effects of already enacted legislation by comparing the distribution of household income "with" and "without" the legislation.

Although a distributional analysis could be applied to any total estimate of a policy change's net resource costs, the agency will continue to refine its analytic method and to evaluate how and when it would be applied to actual future policy changes. For example, the following limitations would apply to the use of such an analysis:

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[5] For example, see Nathaniel Hendren and Ben Sprung-Keyser, "A Unified Welfare Analysis of Government Policies," *Quarterly Journal of Economics*, vol. 135, no. 3, pp. 1209–1318 (August 2020), https://doi.org/10.1093/qje/qjaa006.

[6] CBO's baseline typically reflects current law and is constructed in accordance with provisions set forth in the Balanced Budget and Emergency Deficit Control Act of 1985 (Deficit Control Act; Public Law 99-177) and the Congressional Budget and Impoundment Control Act of 1974 (P.L. 93-344).

[7] CBO's most recent *Budget and Economic Outlook*, which aligns with the baseline for this work and is updated regularly, is available at www.cbo.gov/publication/57950.

■ CBO would allocate only estimates that hold total output constant in the economy. That is, the agency would not estimate the distributional effects of dynamic estimates (instances in which CBO accounts for behavioral changes that would affect total economic output).

■ A policy change's effects may extend beyond those included in the estimated net resource cost, and those effects may be hard to fully quantify. For example, if a subsidy for a particular good increased the good's price even for households not eligible for the subsidy, those households would be worse off even though their income after transfers and taxes would be unaffected. Those effects would often not be included in the underlying total estimate, and the agency may describe them qualitatively rather than include them in its quantitative estimate of the subsidy's effects on average household income by decile.

■ The agency would not produce a distributional analysis for policy changes estimated to have relatively small total effects. The framework described here accounts for nearly all types of income across nearly all U.S. households rather than just those households that would bear the costs or reap the benefits of a given policy change. Thus, a policy change's effects on a household's average income within each decile would have to be large enough for an analysis using the framework to yield meaningful results.

Analytic Method

To analyze policy changes' distributional effects, the agency builds on the framework for its annual reports on the historical distribution of income.[8] Those reports show the distribution of household income before and after transfers and taxes in the latest year for which comprehensive income data are available. The agency has used that framework to model household income's projected distribution in future years, consistent with the agency's current baseline economic forecast and projections for revenue and spending.

To determine how a policy change affects household income, CBO uses two key inputs: the total estimate of the policy change's net resource costs in a given year and that year's projected "baseline" household-level data set. The agency then produces a "simulated" household-level data set reflecting those net resource costs' allocation to households. The policy change's distributional effects are estimated by comparing the baseline and simulated data sets—specifically, each decile's average household income. The deciles' composition is held constant for comparison, and income's baseline distribution is used to calculate percentage changes in income. Moreover, the analysis includes all households, even those that the policy change would not affect. As a result, the average changes in income are smaller than they would be if distributional changes were estimated only for households affected by the policy change.

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[8] Congressional Budget Office, *The Distribution of Household Income, 2019* (November 2022), www.cbo.gov/publication/58353.

Data

The data set used for CBO's historical distributional analyses is constructed by statistically matching two primary sources: a nationally representative sample of households from the Census Bureau's Current Population Survey Annual Social and Economic Supplement (CPS ASEC) and a nationally representative sample of individual income tax returns from the Internal Revenue Service's (IRS) Statistics of Income (SOI).[9] The CPS ASEC has detailed demographic and income information and is the main source of information on household demographics, means-tested transfers, and income for tax units whose income is below the threshold necessary to file taxes. The SOI data are the main source of data on income for tax-filing units.

To analyze the distribution of policy changes, the agency uses public-use SOI data that are statistically altered to protect individual taxpayers' confidentiality; those data typically become available several years after the pertinent period.[10] For the analysis here, CBO used a sample of income tax returns filed for 2014, the most recent public-use tax data set that was available from SOI when the analysis began. CBO then matched that data set with the CPS ASEC and used its microsimulation tax model to adjust the data to account for changes in the population and the economy between 2014 and 2022. Those projected data form the basis of the analysis presented.[11] Those data differ from those used in CBO's regular reports on the distribution of household income.[12] Those reports use a restricted and more recent version of the SOI data. However, current agreements do not allow using those restricted data for the distributional analysis of policy changes.

CBO forms tax units from households in the CPS ASEC for the statistical matching process. Income is totaled over all tax units in the household, using information from the SOI when

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[9] For more about CBO's statistical matching method, see Kevin Perese, Congressional Budget Office, "Statistically Matching Administrative Tax Data With Household Survey Data" (presentation, July 2017), www.cbo.gov/publication/52914. Both the CPS ASEC and the SOI are representative samples of their respective populations for a single year. Other data supplement the main data as well, including information about total spending on programs and Consumer Expenditure Survey data from the Bureau of Labor Statistics about household spending on different goods.

[10] For a discussion of the Public Use File, see Victoria L. Bryant and colleagues, *Design Changes to the SOI Public Use File (PUF)* (November 2014), https://tinyurl.com/UrbanPUF (PDF, 191 KB).

[11] Congressional Budget Office, *Projected Changes in the Distribution of Household Income, 2016 to 2021* (December 2019), www.cbo.gov/publication/55941. For that report, CBO used a confidential sample of income tax returns that yielded more detailed information than the public-use data used here.

[12] See Congressional Budget Office, *The Distribution of Household Income, 2019* (November 2022), www.cbo.gov/publication/58353.

available. Because some tax units do not file taxes, the CPS ASEC has tax units that are not in the SOI. The income for those tax units is drawn from the CPS ASEC.[13]

Income

In this analysis, income after transfers and taxes is the main income measure, which the agency uses as the baseline to rank households into income groups and to calculate percentage changes in household income.[14] That income measure consists of market income plus social insurance benefits and means-tested transfers minus federal taxes:

■ Market income includes labor, business, capital, and other income.

■ Social insurance benefits include Social Security, Medicare, unemployment insurance, and worker's compensation benefits.[15]

■ Means-tested transfers consist of cash and in-kind benefits through Medicaid, the Children's Health Insurance Program, the Supplemental Nutrition Assistance Program (SNAP), housing assistance programs, Supplemental Security Income, Temporary Assistance for Needy Families, child nutrition programs, the Low Income Home Energy Assistance Program (LIHEAP), and state and local government general assistance programs.

■ Federal taxes include individual income taxes, payroll taxes, corporate income taxes, and excise taxes. Refundable tax credits such as premium tax credits and earned income tax credits are included with income taxes.[16]

Income after transfers and taxes is modeled by using the statistically matched data set to group people into tax units and then computing each unit's income and payroll taxes on the basis of its income. After tax units are combined into households, corporate and excise taxes are allocated to

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[13] The statistical matching method described here yields results broadly similar to those of some researchers who create households out of tax units in a data set that contains the entire tax-filing population and nonfilers who receive an information return from the IRS (such as a W-2 form). For example, see Jeff Larrimore, Jacob Mortenson, and David Splinter, "Household Incomes in Tax Data: Using Addresses to Move From Tax Unit to Household Income Distributions," *Journal of Human Resources*, vol. 56, no. 2, pp. 600–631 (Spring 2021), https://doi.org/10.3368/jhr.56.2.0718-9647R1.

[14] For a discussion of how households are ranked for division into groups, see Kevin Perese, *CBO's New Framework for Analyzing the Effects of Means-Tested Transfers and Federal Taxes on the Distribution of Household Income*, Working Paper 2017-09 (Congressional Budget Office, December 2017), www.cbo.gov/publication/53345. Alternatives may be considered in future work. For example, when measuring the distribution of household income and analyzing transfers and taxes overall, the agency typically considers quintiles instead of deciles and uses income before taxes as the baseline measure.

[15] The average value of Medicare benefits net of premiums is allocated to all enrollees.

[16] In total, the federal taxes included accounted for about 93 percent of total federal revenues in 2019. The remaining federal revenue sources not allocated to U.S. households include states' deposits for unemployment insurance, estate and gift taxes, net income earned by the Federal Reserve, customs duties, and miscellaneous fees and fines.

each household on the basis of its income.[17] Means-tested transfers are assigned to people or households on the basis of the information in the CPS ASEC. Transfer receipt and amounts are adjusted to account for underreporting of certain types of income in the CPS to better align with administrative totals.[18] The agency then calculates the distribution of household income after transfers and taxes under current law or by applying the policy change as a counterfactual.

Creating Deciles of Household Income

Income is not a complete measure of well-being. However, incorporating the idea that people have needs that vary with their living situation is still important when sorting households into deciles on the basis of their income.[19] CBO groups people into households and adjusts income for household size when sorting them into deciles. The agency adjusts the income measure, dividing household income by an adjustment factor known as an equivalence scale.[20] Specifically, CBO uses the square root scale, dividing household income by the square root of the number of people in the household. That size adjustment is used only for ranking households to group them into deciles. All household income amounts reported here are unadjusted.

Households are ranked by size-adjusted income after transfers and taxes and then sorted into ascending deciles. Each decile is constructed to contain the same number of people and therefore roughly equal numbers of households (although because lower-income households tend to be smaller than higher-income households, lower-income deciles have more households).[21] The household grouping is held constant when baseline average household income is compared with average household income after the policy change.

Allocating Changes in Income Attributable to Policy Changes

To estimate the effects of policy changes on households along the income distribution, CBO allocates to households the net dollar value of the resource costs incurred by the federal

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[17] For more on how the agency allocates individual income and payroll taxes, see Congressional Budget Office, *The Distribution of Household Income, 2019* (November 2022), www.cbo.gov/publication/58353.

[18] For more on how CBO adjusts for underreporting, see Bilal Habib, *How CBO Adjusts for Survey Underreporting of Transfer Income in Its Distributional Analyses*, Working Paper 2018-07 (Congressional Budget Office, July 2018), www.cbo.gov/publication/54234.

[19] For a discussion of the unit of analysis, see Congressional Budget Office, *Effective Federal Tax Rates, 1979–1997* (October 2001), www.cbo.gov/publication/42875, pp. 19–20.

[20] For more on why CBO uses an equivalence scale to group households, see Congressional Budget Office, *The Distribution of Household Income, 2019* (November 2022), www.cbo.gov/publication/58353. For discussion of alternative equivalence scales, see Cody Kallen and Aparna Mathur, *Estimating the Distributional Implications of the Tax Cuts and Jobs Act*, Working Paper 2019-07 (American Enterprise Institute, February 2019), https://tinyurl.com/bdafrjwv (PDF, 970 KB), or Organisation for Economic Co-operation and Development, "What Are Equivalence Scales?" (accessed December 9, 2022), https://tinyurl.com/mr36ps7w (PDF, 397 KB).

[21] Households with negative incomes are included in the lowest decile to construct the deciles but are removed for reporting that decile's income or changes in income. As a result, the lowest decile includes fewer people than the other deciles.

government. For cash transfers and taxes, CBO generally allocates the amounts to the household that receives the transfer or pays the tax. In other cases, including when a firm interacts with the government, CBO relies on evidence in the economic literature. For some programs, such as SNAP, economics researchers broadly agree that the program has little effect on food prices, and CBO allocates the expenditures by the federal government on SNAP to households. For other cases, such as corporate taxes, less agreement exists (see the appendix). And for other programs, including many spending programs, little research has been done into how the resource costs could be allocated.[22] CBO allocates taxes and spending on the basis of an assessment of the available evidence and tries to follow consensus views that are supported by the literature.

CBO allocates individual income taxes and the employee's share of payroll taxes to the households directly paying those taxes. CBO also allocates the employer's share of payroll taxes to the employees' households; in CBO's assessment, employers pass the cost of their share of payroll taxes to employees by paying lower wages than they otherwise would.[23] CBO allocates excise taxes to households according to their consumption of taxed goods and services. Excise taxes on intermediate goods, which businesses pay, are allocated to households in proportion to their overall consumption.

In general, less research has been carried out on how government-provided resources could be allocated. For cash and in-kind transfer programs, CBO assigns the government's cost of the benefit to the program participant. For public goods and other broad-based government spending, CBO has previously allocated the resources by using a combination of two methods: half allocated in proportion to each household's share of the population and half allocated in proportion to each household's share of total income.[24] The agency also has presented the effect of using each method alone.[25] The exact allocation method used in future analyses would depend on the nature of the spending program and the policy change being analyzed.

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[22] For example, some researchers have examined the incidence of Medicaid spending, but a consensus has not yet emerged in the literature. CBO allocates the full government cost of public spending programs such as Medicaid, Medicare, and SNAP to those programs' beneficiaries.

[23] This treatment matches the approach used by other researchers. For example, see Joint Committee on Taxation, *The Income and Payroll Tax Offset to Changes in Payroll Tax Revenues*, JCX-89-16 (November 18, 2016), www.jct.gov/publications/2016/jcx-89-16.

[24] For example, when allocating changes for Medicare spending for hospitals serving low-income patients, the agency used a combination of those two methods. See Congressional Budget Office, letter to the Honorable Ron Wyden, *Distributional Effects of Changes in Spending Under the Tax Cuts and Jobs Act as of November 15, 2017* (November 17, 2017), www.cbo.gov/publication/53333.

[25] See Congressional Budget Office, *The Distribution of Federal Spending and Taxes in 2006* (November 2013), www.cbo.gov/publication/44698.

How CBO's Distributional Allocation Is Related to Economic Incidence

CBO's distributional allocation is related to economic incidence. In general, the agency allocates the resource cost of federal revenues and spending, and of changes in federal revenues and spending, to the households that pay a tax or receive a government benefit. Sometimes a tax is not paid by a household or a federal outlay is not made to a household. CBO continually evaluates how it allocates those amounts. For example, the agency allocates corporate taxes to households in proportion to their capital income (75 percent) and labor income (25 percent), and allocates the resource costs attributable to other revenues and spending to involved households (100 percent). CBO uses that approach for simplicity, on the basis of evidence in the relevant literature about the long-run incidence (see the appendix).

Unlike the agency's distributional allocation, which is an extension of budgetary accounting that focuses on resource costs, an analysis of economic incidence focuses on how prices and quantities of goods and services change when government revenue or spending changes, to assess who is affected by those changes. For example, employer-paid payroll taxes are offset by roughly equal long-term reductions in wages paid by employers to employees and by smaller short-term reductions in wages.[26] That incidence analysis provides part of the basis for allocating those taxes between employees and the owners of a firm. However, CBO's allocations are not estimates of economic incidence but rather accounting simplifications.

Moreover, CBO's allocations generally do not account for differences in incidence over time. For the payroll tax, for example, the agency has not estimated how long employers take to make the adjustment from the short term to the long term. Also, to allow estimates of policy changes' distributional effects to be compared consistently with the baseline distribution of household income, CBO uses the same approach for all years after a policy change, even when the economic incidence clearly differs between the short and long term. In other words, CBO's distributional analysis of all household income, which includes market income and government transfers and taxes across many years, makes all allocations on the basis of expectations about the long-term effects of policy changes for simplicity and tractability.

Similarly, the agency does not account for the incidence related to how a given policy change is financed—that is, the debt the government may incur to increase spending or what the government may choose to do with increased revenues. Accounting for the incidence of financing would require making assumptions about unspecified future policy changes or directly assessing the long-term consequences of potentially unsustainable changes in deficits and debt, an endeavor beyond the scope of this work.

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[26] Dorian Carloni, *Revisiting the Extent to Which Payroll Taxes Are Passed Through to Employees*, Working Paper 2021-06 (Congressional Budget Office, June 2021), www.cbo.gov/publication/57089.

CBO's allocation rules are designed to capture a given policy change's main effects, but some second-order effects may fall outside the scope of those rules. For example, changes in the SNAP program may result in different types of food bought with SNAP benefits. In an analysis of economic incidence, those changes in consumption patterns would affect entities other than the SNAP recipient—for example, producers of food now purchased at different rates. In CBO's assessment, those effects would be small and would not alter the policy change's overall distributional effects. For simplicity in CBO's allocations, the entire amount of SNAP benefits is allocated to households that receive them.

CBO's allocations aim to focus on the dollar value of the resources that people and households receive, not the subjective value that each recipient may place on those resources. For example, a low-income household may place greater subjective value on receiving an additional $500 in cash transfers than would a high-income household—perhaps because the low-income household might use the money to immediately buy food, whereas the high-income household might save the money. CBO's allocation does not incorporate such differences in valuation among recipients. Similarly, CBO allocates the amount that a benefit costs the government to provide, regardless of how much a household would be willing to pay for that benefit if it received a cash amount equal to the cost of the benefit. That allocation method is particularly important for in-kind benefits such as those provided by Medicare and Medicaid. For such benefits, the full cost of provision is allocated to all program recipients, regardless of the value that those recipients may place on the benefits.

Uncertainty

Many sources of uncertainty exist when distributing the budgetary estimate of a policy change. This paper considers both uncertainty related to available data and uncertainty in projections.

Uncertainty Related to Available Data. Some uncertainty is related to the data used to estimate household income after transfers and taxes and to combine individuals and tax units into households. The SOI contains no information on the income of tax units that do not file taxes—typically because their taxable income falls beneath the tax-filing threshold—and contains limited demographic information on tax units that do file taxes. As a result, the agency uses a statistical match between the SOI and the CPS ASEC for its distributional analysis. Doing so adds uncertainty to the analysis, in part because people tend to report income differently to surveys such as the CPS ASEC than to the IRS.[27] The statistical match also may not preserve the relationships between characteristics important for identifying which households a policy change would affect. The agency also adjusts the underlying CPS ASEC to account for people's tendency to underreport certain income sources—particularly means-tested transfers, for which

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[27] See Shannon Mok, *An Evaluation of Using Linked Survey and Administrative Data to Impute Nonfilers to the Population of Tax Return Filers*, Working Paper 2017-06 (September 2017), www.cbo.gov/publication/53125.

the SOI contains no information. That process also introduces uncertainty to the overall analysis, but on net the agency believes that the adjustment improves the quality of the analysis.

For some policy changes, CBO will need to apply information from other sources to the statistically matched CPS and SOI, potentially adding more sources of uncertainty.

Uncertainty in Projections. All projections are uncertain. CBO generally tries to develop projections that fall in the middle of the range of potential outcomes with respect to changes in the population and the economy. However, actual changes in the distribution of household income could differ from CBO's projections because of unanticipated changes in the economy, population, or policy. Moreover, the primary data used in this analysis are from 2014, and so they predate major tax legislation and the economic disruption caused by the coronavirus pandemic. CBO adjusts those data for consistency with the most recent projected baseline, but access to more recent data could help mitigate some uncertainty attributable to that adjustment process. The agency regularly analyzes the errors of projections of the economy, revenues, and spending.[28]

Insofar as behavioral responses are incorporated in an estimate of a policy change's distributional effects, an additional source of uncertainty will be present, largely because people may respond to policy changes in ways that differ from CBO's projections.

Scope of Policy Changes Suitable for Analysis in the Framework

Many policy changes that affect household income and economic well-being will fit well into CBO's framework for distributional analysis. Broadly, the framework's suitability to model the distribution of policy changes can be classified on the basis of two criteria:

■ How the policy change's budgetary or economic effects were modeled and

■ How to allocate the policy change's net resource costs.

Some policy changes may not be well suited for distributional analysis because of the types of services provided, CBO's methods for estimating budgetary or economic effects, or significant uncertainty regarding the allocation of the policy.

How the Policy Change Is Modeled
When budgetary and economic effects are evaluated, a policy change may be modeled at the unit level (for example, individual or household) or at a broader level.

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[28] For example, see Congressional Budget Office, *The Accuracy of CBO's Budget Projections for Fiscal Year 2021*, (January 2022), www.cbo.gov/publication/57614.

Policy changes modeled at the unit level—especially those whose effects have been modeled using microsimulation methods or can be estimated using the CPS or the SOI—are typically straightforward to include within CBO's framework for distributional analysis. If those units can be mapped to the data set described in this paper for a given estimate of a policy change's effects, CBO can usually apply its framework to examine that policy change's distributional effects. However, that mapping may require more work. But if a policy change affects only a few households, the framework may not be well suited to show the effect because the framework is designed to show the distribution among all households, not just those affected by a given policy change.

More modeling capabilities may sometimes need to be developed to estimate a policy change's distributional effects, even if those capabilities are not necessary to estimate the budgetary cost of the policy change. For example, CBO can estimate the total budgetary cost of additional child care subsidies to providers or through block grants. However, the agency would need to develop more capabilities to estimate which households along the income scale would be likely to benefit from those subsidies and the extent to which those subsidies increase those households' income. The analysis also would need to consider, at least qualitatively, the effects on households that do not directly receive subsidies. For example, the provision of subsidies to some households would probably increase the price of child care, affecting both the providers and all consumers of child care, even those who did not receive subsidies.

For policy changes not modeled at the unit level, such as some discretionary spending programs, the agency will need to determine how to allocate the associated resource costs, which can sometimes be hard to ascertain.

Policy Changes That Can Be Directly Modeled Within the Framework. The framework most naturally accommodates policy changes that directly affect individual or household income. Policy changes in which eligibility is contingent upon income also are particularly well suited for the framework.

This paper discusses four illustrative policy changes that fit within the modeling infrastructure:

■ Provide direct payments of $500 for each person, with income limits.

■ Create a 1 percent payroll tax on earnings.

■ Increase Medicare Part B basic premiums to cover 35 percent of the programs' expected costs.

■ Decrease SNAP benefits by 30 percent for all recipients.

Policy Changes That Require More Modeling Infrastructure. The total estimates of some policy changes' effects may be modeled with different methods or data, so CBO would need to adapt the results and estimation methods to fit within the described framework. The need to

model the policy separately will depend on the policy change's complexity and the existing infrastructure's capabilities. Sometimes CBO will already have an infrastructure to model behavioral responses of a type of policy change, whereas in other cases new modeling capabilities may need to be developed. Estimating the effects of a particular type of policy may require different data from those available in this infrastructure. For example, CBO uses a separate infrastructure, the Health Insurance Simulation Model (HISIM2), to model health insurance coverage for people under age 65.[29] As a result, the agency would use that model to estimate how many people would gain or lose insurance, their income, and changes to income (through premium subsidies, price changes, or other provisions).[30] The agency would then map those outputs to its statistically matched SOI and CPS data set to estimate which households would be affected along the scale of household income after transfers and taxes.

Policy changes that would alter people's consumption by changing the prices of goods, such as excise taxes, also would require more modeling infrastructure to analyze in the framework. In the short run, excise taxes would be allocated to consumers, but the agency would need to use external data to identify those consumers in its data set. In the longer run, the allocation may fall partially on consumers and partially on producers, who also would need to be identified in CBO's data set. The agency has discussed the distributional effects of carbon taxes in a similar framework.[31] Other policy changes, such as tariffs, would be modeled similarly, although only effects on U.S. household income would be in scope for such an analysis.

Repealing the expanded premium tax credits in 2022 instead of in 2025, when they are scheduled to expire, is an illustrative policy change shown in this paper that would require a separate modeling infrastructure.

Allocation of Effects

For some policy changes, which people would be affected by the change or how much benefit or cost would accrue to one person versus another is uncertain. Some government programs do not directly affect people, but rather businesses, state and local governments, or organizations. For its distributional analyses, CBO allocates the effects to households affected by the actions of the entity interacting with the federal government.

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[29] For more details, see Congressional Budget Office, "HISIM2: The Health Insurance Simulation Model Used in Preparing CBO's July 2021 Budget Baseline Projections" (July 2021), www.cbo.gov/publication/57205.

[30] The income measures that HISIM uses differ from income after transfers and taxes as described here.

[31] See Dorian Carloni and Terry Dinan, *Distributional Effects of Reducing Carbon Dioxide Emissions With a Carbon Tax,* Working Paper 2021-11 (Congressional Budget Office, September 2021), www.cbo.gov/publication/57399.

An illustrative policy change shown in this paper for which the agency has made modeling choices to allocate effects is to increase corporate taxes by $50 billion.

In-kind transfers and public goods are two other examples of policy areas in which the allocation of the effects of the policy change is not always clear. The distributional effects of policy changes in those areas may be more uncertain than those more similar to direct transfers or taxes on household income.

In-Kind Transfers. CBO allocates in-kind transfer benefits, including Medicare and Medicaid, directly to people enrolled in the relevant programs to receive those benefits. Each enrollee is assigned the average benefit for enrollees. For some programs, the average is computed separately for each group of enrollees. For Medicaid enrollees, averages are computed within four groups: children, seniors, nondisabled adults under 65, and disabled adults under 65.

A transfer program's benefits also can accrue to people other than direct recipients of transfer benefits. For example, a policy change that altered spending on government-provided health insurance also could accrue to providers of medical services, or a policy change that altered subsidized expenditures on child care could accrue to child care providers. In those instances, the benefits of in-kind transfer programs would not accrue entirely to program enrollees. CBO plans to research further whether other rules could be used to allocate the benefits of in-kind transfer programs to households across the income scale.

Public Goods and Other Broad-Based Government Spending. The budgetary costs of public goods and other broad-based government spending are hard to allocate.[32] In general, excluding anyone from benefiting from such spending is difficult, so distributing the spending equally among people may be reasonable. However, people's ability to access those benefits may vary because of differences in income or place of residence.[33]

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[32] Public goods are those that users cannot be barred from use (nonexcludable) and for which one person's use does not prevent access by another person (nonrival). National defense, for example, provides benefits to all U.S. residents equally, without exclusion. Thus, it is widely considered a public good. Other programs or activities included in this category may not satisfy the narrow definition of a public good, but many resemble public goods in that they benefit much of the population, if not all. Examples include federal spending on education, transportation, international relations, environmental protection, and basic scientific research.

[33] For more on the treatment of public goods in distributional analyses, see Andrew Chamberlin and Gerald Prante, *Who Pays Taxes and Who Receives Government Spending? An Analysis of Federal, State, and Local Tax and Spending Distributions, 1991–2004*, Working Paper 1 (Tax Foundation, March 2007), http://tinyurl.com/lxzt6x6; or Lukas Riedel and Holger Stichnoth, *Government Expenditure in the DINA Framework: Allocation Methods and Consequences for Post-Tax Income Inequality*, Working Paper 22-004 (Leibniz Centre for European Economic Research, February 2022), https://tinyurl.com/3u66bcxm.

Policy Changes Less Well Suited for Distributional Analysis

Some policy changes do not lend themselves to a distributional analysis in the described framework. Generally, policies for which total budgetary costs are highly uncertain would be hard to account for in the distributional framework. In addition, significant uncertainty in how some new policies would be administered can hinder allocating their effects. For example, for a new program in which state or local governments have discretion or authority about how policies are administered, the effects on particular types of households may not be predictable. In other cases, the incidence of policy changes may be so uncertain that the agency cannot reliably allocate the resource costs associated with the policy change to particular households for this type of analysis. Those policy changes would be out of scope for such work.

The described framework analyzes policy changes that would take effect in the near term and would affect annual income or otherwise alter the resources available to a household. Policy changes that would affect the timing of income across the life cycle or that would alter lifetime income may not be well suited for such an analytical framework, which looks only at a single year. First, the ranking based on annual income may be an inappropriate reference for measuring such a policy change's effects. Further, if a policy change would affect income across the life cycle, the benefits and the costs would be hard to measure in an annual income measure. For example, graduate students may have low current income but high lifetime income. A distributional analysis of policy changes that affect student loan repayment on the basis of current income would affect different parts of the distribution if lifetime income—rather than annual income—was used as the income measure to rank households into deciles.[34]

A policy change that has significant effects on people who live outside households, such as those in nursing homes, would not work well in the distributional framework. Such people are not fully represented in the data used for the framework, making a different framework necessary.

Applying the Analytic Method

To demonstrate the framework, CBO analyzed the six illustrative policy changes described above. This section first presents the baseline distribution for income after transfers and taxes in 2022, showing the average income, share of income, and demographic characteristics for each household income decile. Next are the distributional effects of the examples of policy changes. The examples show the changes in income with respect to the baseline distribution as though the policy would be fully enacted in 2022, with no phase-in period.

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[34] For an example of an analysis that compares current-year income with the present value of resources available across the life cycle within age cohorts, see Alan J. Auerbach, Laurence J. Kotlikoff, and Darryl Koehler, "U.S. Inequality and Fiscal Progressivity: An Intragenerational Accounting," *Journal of Political Economy* (forthcoming), https://doi.org/10.1086/722394.

The selected policy changes also reflect a variety of legislative priorities and policy areas. The changes also affect different sources of income, transfers, and taxes and produce a range of distributional outcomes—that is, they affect households in different parts of the distribution or households with particular characteristics. The distributional estimates of each provision shown here represent the changes in household income that would occur if a policy was implemented in isolation.

Projected Baseline Distribution of Income

To understand how income is distributed and the demographics of households within each decile, CBO first computes the projected baseline distribution of income in 2022.

In 2022, household income is projected to be unevenly distributed among the roughly 132 million U.S. households (see Table 1). Projected income after transfers and taxes is distributed more evenly than is projected income before transfers and taxes.

Projected household income after transfers and taxes totals about $16 trillion. Although each decile has roughly the same number of people, the share of total income is not distributed equally. CBO projects that for 2022, households in the lowest three deciles receive about 9 percent of income before transfers and taxes and about 12 percent of income after transfers and taxes. By contrast, the highest decile receives roughly 41 percent of income before transfers and taxes and 35 percent of income after transfers and taxes.

Although each decile is constructed to contain about the same number of people, the number of households in each decile varies, as do the demographics of households within each decile. For example, CBO estimates that about half of children live in households in the four lowest deciles, but less than one-third live in households in the four highest deciles. Conversely, about 36 percent of people age 65 or older live in households in the four lowest deciles (see Table 2), compared with 43 percent living in the four highest deciles. That difference occurs largely because income before transfers and taxes includes social insurance benefits such as Social Security and Medicare, which moves elderly-headed households further up the income scale than where they might fall were households ranked by market income alone.

The composition of households also can vary across the distribution. For example, lower-income households tend to contain fewer people—in particular, more single people and single-parent households.

Provide Direct Payments

The illustrative policy modeled here would send direct payments of $500 per person to people with incomes up to certain thresholds. Such payments could be administered as either a tax credit or a transfer program with similar effects. Recent legislation provided direct payments in the

form of tax credits.[35] In this hypothetical scenario, the full payments would be distributed to people on the basis of their adjusted gross income (AGI) in 2022.[36] The full payment would be available for people with AGI up to $50,000 for people filing as single, up to $75,000 for people filing as head of household, and up to $100,000 for married people filing jointly. The benefits would be phased out up to thresholds of $75,000 for people filing as single, $112,500 for people filing as head of household, and $150,000 for married people filing jointly. Benefit amounts would be the same for dependents as for the primary filer(s), and people who did not have enough income to require filing taxes also would be eligible to apply for the benefits.

Those direct payments would increase total income after transfers and taxes by about $116 billion (or less than 1 percent of total household income after transfers and taxes).[37] Variation in the average direct payment amounts, and therefore the average changes in income from the policy, stem from differences in eligibility and size among tax units within households across the income scale (see Table 3). The average increase would vary from about $100 per household in the highest income decile to $1,200 in the second through fourth deciles. The average change in income is slightly smaller for the first decile ($1,000), largely because households in that decile tend to contain fewer people. The average change is lower in the fifth and higher deciles because those households are more likely to contain tax units that are not eligible because their income is too high (see Figure 1). The percentage change in income after transfers and taxes is highest among households in the lowest decile, largely because the baseline income of those households is significantly lower than that of households in other deciles (see Figure 2).

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[35] Although eligibility varied, three direct payments were made in 2020 and 2021: The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) made economic impact payments of up to $1,200 per adult and $500 per child in March 2020; the COVID-Related Tax Relief Act of 2020 paid up to $600 per person in December 2020; and the American Rescue Plan Act of 2021 paid up to $1,400 per person in March 2021.

[36] This example does not consider the administrative choices that would accompany such a policy, which could alter the estimate of the total cost or the distribution of that cost. For example, recent legislation has used prior-year income from tax returns to determine who receives direct payments, but this illustrative policy change uses current-year (2022) income and abstracts away from the mechanism by which eligible people would be identified. As a result, this analysis does not account for any adjustments in payments that could result from differences between prior-year and current-year income. Moreover, in this analysis, anyone who files taxes and meets the income thresholds receives a payment (including non-U.S. citizens and people without Social Security numbers), dependent filers are not eligible to receive separate payments, and all eligible nonfilers are estimated to sign up to receive payments. For a discussion of those topics in the context of recent stimulus policy, see David Splinter, "Stimulus Checks: True-Up and Safe Harbor Costs" (draft, Joint Committee on Taxation, November 2022), www.davidsplinter.com/Splinter-StimulusChecks.pdf (338 KB).

[37] If this policy change was implemented through the tax system, JCT would estimate the budgetary effects. If it was implemented as a spending program, CBO would estimate them.

CBO allocated the payments according to the statutory incidence for direct payments. Because the eligibility rules for the policy rely on income measures available in the data used, little uncertainty is present in how to attribute the budgetary cost to individuals and households.

Impose a New Payroll Tax

Under current law, most earnings are subject to payroll taxes, which then finance Social Security and Medicare benefits. In this illustrative policy, an additional payroll tax of 1 percent would be assessed on all earnings. Similar to the Medicare payroll tax, no threshold of earnings would exist beyond which the tax does not apply. Employees would pay the entire tax, and self-employed people would face the same tax rates as people working for an employer. Unlike existing payroll taxes, the tax would not finance a specific social insurance program.[38]

CBO estimates that the policy would decrease total household income after transfers and taxes by $101 billion.[39] Higher earners would pay more payroll tax than would lower earners, and people who earn more from work typically live in higher-income households. Households in the highest income decile would see their income decrease by nearly $2,700, compared with a decrease of $1,200 or less for households in every other decile (see Table 4 and Figure 1). However, the percentage change in income after transfers and taxes is roughly equal across the deciles, varying from 0.5 percent in the lowest four deciles to 0.7 percent in the eighth and ninth decile (see Figure 2). Those variations in the percentage change in income after transfers and taxes are attributable to changes in the share of total income after transfers and taxes that is composed of labor income. In general, a large share of the total income of households in the lower income deciles comprises social insurance benefits and means-tested transfers, whereas that of households in the highest decile comprises capital income. As a result, households in the fifth through tenth deciles experience the largest percentage changes in income attributable to the policy change, and households in the highest decile experiences a slightly lower percentage change than do households in the eighth and ninth deciles.

In its analysis, CBO allocated the new payroll tax entirely to employees, consistent with the way payroll taxes are allocated in CBO's distributional analysis framework.

Increase Corporate Taxes

CBO modeled the effects of increasing corporate taxes by $50 billion. The analysis abstracts away from the mechanism of the increase in the corporate taxes. For this analysis, CBO also allocated the budget effects to reflect the agency's practice of reflecting the long-term

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[38] This illustrative policy shows the distributional effects in 2022 for the same policy as the one presented in Congressional Budget Office, *Options for Reducing the Deficit, 2023 to 2032—Volume I: Larger Reductions* (December 2022), www.cbo.gov/publication/58164.

[39] The revenue impact and distributional analysis of this illustrative policy change are calibrated to be consistent with estimates from the Joint Committee on Taxation.

distribution of the corporate tax where higher corporate taxes affect both the capital and labor income of households (see the appendix).[40]

The decrease in household income attributable to the tax increase would be greater in higher-income households because owners of capital are highly concentrated in those deciles. The average decrease in income would be about $2,700 for households in the highest decile, about $400 for households in the ninth decile, and about $100 or less for households in the lowest through sixth deciles (see Table 5 and Figure 1). The percentage change in income also is larger for households in the highest income decile than for households in all other deciles, and about 69 percent of the total change in income accrues to households in the highest decile (see Figure 2). About 1 percent of the decrease in income after transfers and taxes accrues to households in the lowest decile, mainly because some corporate tax is allocated to households in proportion to their labor income.

As discussed in the appendix, CBO allocates 75 percent of corporate taxes to households in proportion to their capital income observed on individual tax returns and the other 25 percent to households in proportion to their labor income. The tax on capital affects capital accumulation and thus productivity and wages over time. Alternative allocation rules would produce different results, both for the policy change's effects and for the baseline distribution of household income after transfers and taxes.

Households with high proportions of capital income are highly concentrated in the highest decile. As a result, changes in the allocation rule would affect both the total share of income after transfers and taxes accruing to those households and their share of the decrease in total income attributable to a corporate tax increase. Specifically, allocating more than 75 percent of corporate taxes to households in proportion to their capital income would decrease the total share of baseline income in the highest decile and would increase their share of the decrease in income arising from the policy change. Conversely, allocating a lower percentage of corporate taxes to capital income would increase their share of total baseline income and decrease their share of the change in income arising from the policy change.

Increase Premiums Paid for Medicare Part B

Under current law, Medicare's basic premium for Part B covers about 25 percent of expected Part B costs per enrollee age 65 or older. Medicare Part B enrollees with modified adjusted gross income (MAGI) below certain thresholds—$91,000 for single filers and $182,000 for married people filing jointly in 2022—must pay the basic premium. Enrollees with MAGI above those

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[40] JCT typically reflects that the incidence of corporate tax changes differ in the short run than in the long run. For a description of how JCT models the distribution of corporate tax changes, see Joint Committee on Taxation, *Modeling the Distribution of Taxes on Business Income*, JCX-14-13 (October 16, 2013), www.jct.gov/publications/2013/jcx-14-13.

thresholds pay a larger premium, known as an income-related premium, which covers at least 35 percent and up to 85 percent of the expected cost. In this illustrative policy, the basic Medicare premium would increase to also cover 35 percent of the program's expected cost.[41,42] Because Medicaid covers the cost of premiums for people who qualify for both Medicare and Medicaid, a change in premiums would not affect the income after transfers and taxes of people with that coverage.

Higher-income households would be less likely to be affected by the policy change because they include more Medicare enrollees whose incomes are above the thresholds required to pay the basic premium. As a result, those enrollees would pay income-related premiums and would not see their premiums change under the illustrative policy.

CBO estimates that such an increase in Medicare premiums would reduce total income after transfers and taxes by $39 billion. The average decrease in household income after transfers and taxes is roughly even (about $300) in most deciles, but it is larger (about $400) in the sixth and seventh deciles and smaller (about $100) in the highest decile (see Table 6 and Figure 1). The percentage decrease is largest among households in the lowest income decile because those households have much lower income after transfers and taxes in the baseline distribution (see Figure 2).

The increase in Medicare premiums reduces the net value of Medicare benefits relative to the net value in the baseline distribution of household income. The full reduction in net Medicare benefits resulting from the policy change is allocated to Medicare beneficiaries who are estimated to see their premiums increase.

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[41] Any policy that increased the basic Medicare Part B premium also would increase the income-related premium, unless the policy specifies otherwise. The illustrative policy change analyzed here is drawn from CBO's most recent volume on options to reduce the deficit (Congressional Budget Office, *Options for Reducing the Deficit, 2023 to 2032—Volume I: Larger Reductions* (December 2022), www.cbo.gov/publication/58164), and the text of the policy specifies that the income-related premium would be held constant despite the increase to the basic premium. One key difference between the illustrative policy presented here and the one described in that report is that the change to premiums is enacted entirely in 2022 rather than being phased in.

[42] The hold-harmless provision ensures that if in a given year the increase in the standard Part B premium would cause a beneficiary's Social Security check to be less than it was the year before, the Part B premium is reduced so that the amount of the person's Social Security check does not decrease. For this illustrative policy, the premium increase is assumed to pass through to the enrolled population paying the basic premium. The illustrative policy suspends the hold-harmless provision.

Decrease SNAP Benefits

In this illustrative policy change, CBO estimated the distributional effects of reducing SNAP benefits by 30 percent for all current recipients.[43] About 22 million households are estimated to receive SNAP benefits at some point during 2022.[44] In CBO's projections, average benefits amount to $2,900 per individual recipient in 2022.[45] In this example, eligibility for the program would not change, but average benefits would fall to about $2,000. In CBO's analysis, the change in government spending attributable to the policy change is allocated entirely to households that receive SNAP benefits.

CBO estimates that such a decrease in SNAP benefits would decrease total income after transfers and taxes by about $35 billion. More than three-quarters of that decrease would occur in the lower half of the income distribution (when households are ranked by annual income after transfers and taxes). Households in that half of the distribution would experience a decline in income of $300 to $500, on average (see Table 7 and Figure 1). The average income of households in higher deciles would decrease by much less, mainly because a relatively small number of households in those deciles receive SNAP benefits.[46] Households in the lowest two deciles would experience the largest percentage decrease in income after transfers and taxes (see Figure 2).

Decrease Premium Tax Credits

One way the federal government subsidizes health insurance for people under 65 is by offering tax credits to eligible people who buy coverage through the health insurance marketplaces established by the Affordable Care Act. The American Rescue Plan expanded the tax credits in

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[43] CBO has previously analyzed a policy change that was similar, but the decrease was smaller and the analysis used a different distributional framework. See Congressional Budget Office, *The Effects of Potential Cuts in SNAP on Households With Different Amounts of Income* (March 2015), www.cbo.gov/publication/49978.

[44] CBO's published baseline estimates report the number of individual SNAP recipients on the basis of average monthly participation in the program. To match the sampling frame of the Current Population Survey (CPS), the number of households used in this analysis reflects "ever on" participation in SNAP—that is, the number of households enrolled in SNAP at any point during the year. That figure is calculated using a version of the 2014 CPS that is projected to 2022 by using CBO's projections of population growth and individual SNAP participation.

[45] CBO's baseline estimates for 2022 include additional SNAP benefits provided in response to the economic disruption caused by the coronavirus pandemic. Those additional benefits are set to expire in later years.

[46] Although means-tested transfers such as SNAP are designed to assist people below certain monthly income thresholds, the annual survey data on which this analysis is based indicate that some households with higher annual incomes also receive benefits from SNAP and other transfer programs. That may occur for several reasons. One, the income of some households varies during the year, perhaps because of changes in employment or household composition. Two, misreporting of income, program participation, and benefit amounts in the survey data that are the basis for CBO's estimates may contribute to the estimate of the number of households with higher annual income receiving benefits from SNAP. Finally, because households in CBO's analysis are ranked on the basis of their income after transfers and taxes (including benefits from Medicare and Medicaid), households that receive means-tested benefits may appear higher in the income distribution than they would if they were ranked on the basis of income before transfers and taxes.

two ways. First, eligibility for premium tax credits was expanded to taxpayers with incomes above 400 percent of the federal poverty guidelines. Second, the plan also lowered the upper limit on premium contribution for 2021 and 2022. Those increased subsidies were further extended through 2025 by the 2022 reconciliation act. The illustrative policy examines the effect of never having implemented those expansions.[47] The total change in income after transfers and taxes would be about $12 billion, CBO estimates. The average change in income would be roughly equal (about $100) in the second through ninth income deciles (see Table 8 and Figure 1), and less than $100 in the lowest and highest deciles. Households in the second and third income deciles would see the largest percentage decreases in their income after transfers and taxes (see Figure 2).

The premium tax credit is available to people who buy health insurance through the federal Health Insurance Marketplace. Many people and households at the bottom of the income distribution would qualify for Medicaid or would not file taxes and so would not be eligible for the tax credit. Similarly, more people in higher income households have employment-based health insurance and would not be eligible for the tax credit.

Estimating the take-up of marketplace health insurance is complex. Eligibility for and amount of the credit depend on income, state of residence, and availability of insurance through other sources such as an employer or spouse's employer.[48] CBO uses HISIM2 to estimate both the baseline and the policy change.[49] Those results are then used as inputs into the framework to estimate the policy's effect for households across the income distribution. The amount of the decrease in the credit is allocated entirely to recipients of the credit, and effects on the price of insurance or corporate income are not considered.

Further Research and Development

Developing a framework for distributional analysis that will allow for greater consistency across policy changes is a new undertaking for CBO. The agency will therefore continue to refine its analytic method. In particular, some policy changes may require using different choices about how to allocate changes in government spending or revenues.

The agency also is considering what additional measures may be useful for describing redistributive effects of policy changes. When the agency has analyzed changes in the

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[47] For more information about the behavioral responses, see Congressional Budget Office, letter to the Honorable Mike Crapo, *Health Insurance Policies* (July 21, 2022), www.cbo.gov/publication/58313.

[48] More information on eligibility is available at Internal Revenue Service, "Eligibility for the Premium Tax Credit" (accessed December 6, 2022), https://tinyurl.com/IRS-PTCelig.

[49] Congressional Budget Office, "HISIM2: The Health Insurance Simulation Model Used in Preparing CBO's July 2021 Budget Baseline" (July 2021), www.cbo.gov/publication/57205.

distribution of household income over time, it has summarized those changes by reporting the Gini index. Such index measures may be helpful complements to the reporting of changes by income decile.

CBO intends to continue exploring areas of allocation of in-kind transfers such as publicly provided health care, distribution by demographic characteristics, analysis of outcomes other than income, and analysis of lifetime income. Further, the agency strives to improve estimation by securing access to better data and improving imputation methods.

Allocation of In-Kind Transfers

CBO allocates the average cost of benefits of in-kind transfers to the direct beneficiaries of those transfers. The most salient example in CBO's distributional framework is that of publicly provided health care programs, in part because their associated resource costs are large and grow quickly. For example, one report suggests not fully allocating some benefits attributable to Medicaid to enrollees of that program because some benefits constitute a transfer to health care providers who would have provided care at lower costs without publicly provided health care and who could fall at different points along the income scale.[50]

The literature does not yet show a consensus about how to allocate the benefits of public insurance, but CBO continues to assess the efficacy of its allocation rule.

Distribution by Other Characteristics

The distribution of spending along dimensions other than income, or in conjunction with income, is of interest to policymakers, who have expressed interest in the distribution among characteristics such as sex, age, race, and ethnicity.

Another consideration for analyzing the distributional effect of policy changes by certain demographic characteristics is that those characteristics may differ among people in the same household. For example, race and sex cannot be summed across members of a household in the way that income can.

Characteristics in Both Tax and Survey Data. Because sex and age are collected in tax return data, those characteristics can be analyzed. CBO has previously evaluated the distributions of the earned income tax credit and the child tax credit by sex in the CPS, the SOI, and the merged data, reporting that the results differ by data source.[51]

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[50] Amy Finkelstein, Nathaniel Hendren, and Erzo F. P. Luttmer, "The Value of Medicaid: Interpreting Results From the Oregon Health Insurance Experiment," *Journal of Political Economy*, vol. 127, no. 6 (2019), pp. 2836–2874, https://doi.org/10.1086/702238.

[51] Congressional Budget Office, "Using Survey Data for Tax Analysis" (December 2021), www.cbo.gov/publication/57540.

An important consideration for analyzing by characteristics with this framework is that it is designed for household-level analysis, whereas sex and age are both individual characteristics. To estimate a policy change's distributional effects on household income, CBO divided tax units into unmarried men, unmarried women, and married couples. The way households may be grouped by age for an analysis of policy may depend in part on the specifics of the policy being analyzed.

Characteristics Available Only From Survey Data. The statistically matched data set used for illustrative policy examples includes individual characteristics from the CPS that are not collected in tax data. However, CBO has yet to determine whether the matching process preserves the relationship between the distribution of income and that of other demographic characteristics. The IRS collects limited demographic information with tax returns, including sex and date of birth. Ongoing collaborative work is under review for approval to use survey data—in which race and education are reported—that are linked to tax data at the individual level to study whether CBO's statistical matching process maintains the distribution of those characteristics.

The agency has completed work that describes distributional effects by other demographic characteristics and has done so by using a single data source or by not including all types of income.[52] For example, the agency has discussed how the COVID-19 pandemic affected employment and wages by race by using just the CPS and limiting the analysis to wages, not total annual income.[53]

Analyzing the effects of policy changes by certain demographic characteristics introduces additional complexities. In this paper, CBO makes projections of the distribution of household income and some, but not all, demographic characteristics. For example, in CBO's baseline estimates, the agency does not make projections of income on the basis of race and ethnicity or education.[54]

Life-Cycle Analysis

The analytical framework presented here considers only income in a single year. However, because people's income naturally fluctuates throughout their lives, households can move up or

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[52] For a list of CBO's work on distributional analysis, see www.cbo.gov/about/distributional-analysis.

[53] Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032*, www.cbo.gov/publication/57950.

[54] Although the baseline does not include the distribution of income projected by characteristics such as race or education, other CBO models may incorporate such projections. For example, when projecting the effects of an increase in the minimum wage, CBO projects individual and family income by education. See Congressional Budget Office, *The Effects on Employment and Family Income of Increasing the Federal Minimum Wage* (July 2019), www.cbo.gov/publication/55410.

down in the income distribution from year to year.[55] Policies may have different effects on people who fall in different parts of the income distribution over their lifetime in comparison with where they fall in a single year. For example, federal policies may benefit a person in a household that is now in a lower income decile to encourage a particular behavior—such as buying a first home or attending college—even if that person may later be in a higher income decile. Policymakers may have different preferences about program eligibility for a given person depending on that person's likelihood of staying in a lower income decile or if the person is likely to have high income later in life. However, the distribution of income in a given year indicates the economic resources available to people at that point in time. Future work by the agency may consider the lifetime income effects of policy changes, particularly for policy changes that may affect people and their behavior differently across the life cycle.

Addressing Data Challenges

CBO uses data from many sources, particularly from other federal agencies.[56] Here the agency relied on publicly available data from the IRS and the Census Bureau. Although the Distribution of Household Income reports are based on restricted tax data, the analysis here does not fall under the umbrella of allowed uses for those restricted data. However, those more detailed data support the development of CBO's baseline projections and are therefore likely to produce results that naturally align more closely with the baseline. When this analysis began, the most current SOI data publicly available covered income from 2014, whereas the most current restricted SOI data covered income from 2019. As a result, the restricted data would require less adjustment to account for recent changes in population, the economy, and policy, thereby reducing the uncertainty of the results. Further, the publicly available SOI data are undergoing changes and may not be available with the same properties as in previous years.[57]

Further, the CPS ASEC is a survey that suffers from underreporting of income and transfer benefits. Accurately measuring transfer income is particularly important for this work. The agency adjusts for underreporting, but improvements in the method or additional data would be

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[55] See Molly Dahl, Thomas DeLeire, and Jonathan A. Schwabish, "Estimates of Year-to-Year Volatility in Earnings and in Household Incomes From Administrative, Survey, and Matched Data," *Journal of Human Resources*, vol. 46, no. 4 (Fall 2011), https://doi.org/10.3368/jhr.46.4.750; and Jeff Larrimore, Jacob Mortenson, and David Splinter, "Income and Earnings Mobility in U.S. Tax Data," in Alexandra Brown, David Buchholz, Daniel Davis, and Arturo Gonzalez, eds., *Economic Mobility: Research and Ideas on Strengthening Families, Communities, and the Economy* (Federal Reserve Bank of St. Louis, 2016), pp. 481–516, https://tinyurl.com/5btkut9d.

[56] See Congressional Budget Office, *The Congressional Budget Office's Access to Data From Federal Agencies* (June 2021), www.cbo.gov/publication/57150.

[57] See Len Burman and the Advisory Committee on Data for Evidence Building, "Synthetic Data and Validation Server: Safely Expanding Research Access to Sensitive Data" (February 19, 2021), https://tinyurl.com/3ej47abm (PDF, 430 KB).

helpful for increasing accuracy.[58] That is especially true for households toward the bottom of the income distribution, many of whom do not file taxes and are therefore not represented in the SOI data. As a result, the CPS ASEC is the primary source for income information for those households.

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[58] Other researchers also consider underreporting of transfer income in surveys and how to correct for it. See Jonathan Rothbaum, Liana Fox, and Kathryn Shantz, *Fixing Errors in a SNAP: Addressing SNAP Under-Reporting to Evaluate Poverty* (2021), https://tinyurl.com/3au75xvd (PDF, 1.1 MB); Bruce D. Meyer, Wallace K. C. Mok, and James X. Sullivan, "Household Surveys in Crisis," *Journal of Economic Perspectives*, vol. 29, no. 4 (Fall 2015), pp. 199–226, http://doi.org/10.1257/jep.29.4.199; and Jeff Larrimore, Jacob Mortenson, and David Splinter, "Unemployment Insurance in Survey and Administrative Data," *Journal of Policy Analysis and Management* (forthcoming), www.davidsplinter.com/LMS-UI.pdf (250 KB).

Appendix: How CBO Allocates the Burden of Corporate Taxes to Households

Taxes on corporations can affect household income in two ways. First, for owners of capital assets, taxes can reduce after-tax profits. Those profits would show up in household income as lower income from sources such as dividends and capital gains. Second, corporate taxes affect wages to the extent that they affect investment (and thereby labor productivity). The estimation of the relative size of those two effects can affect the distribution of after-tax and transfer income and the tax system's estimated progressivity or regressivity—that is, the degree to which high-income households pay a larger share of their income in federal taxes than low-income households do.

Since 2012, the Congressional Budget Office has allocated 75 percent of the burden of corporate income taxes to owners of capital in proportion to their income from interest, dividends, rents, and adjusted realized capital gains.[1] That measure excludes some forms of capital income that are harder to measure, such as investment earnings in tax-preferred retirement accounts and capital gains until they are realized.[2]

Moreover, the agency adjusts realized capital gains by scaling them to their long-term historical level given the economy's size and the applicable tax rate; that method reduces the effects of large year-to-year variations in the total amount of gains realized. The remaining 25 percent of the corporate income tax is allocated to workers in proportion to their labor income.

That allocation is intended to reflect the long-term distribution of the corporate tax system's burden as a whole. The burden of a specific provision of the corporate tax system can differ from that of the corporate tax system as a whole. The economy takes time to reach a new general equilibrium after a change to the corporate tax system, and so such a change's short-term burden can differ from the eventual long-run burden. In the immediate short term, corporate shareholders probably experience most of the benefit of a reduction in the corporate income tax. In the medium term, such a change affects a broader set of recipients of capital income because the reduction affects the return on all forms of capital. Finally, as shifts in investment affect the size of the capital stock, some benefit of the reduction will shift to a wider set of households as

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[1] For more on how CBO allocates corporate taxes, see Congressional Budget Office, *The Distribution of Household Income, 2019* (November 2022), www.cbo.gov/publication/58353; and Congressional Budget Office, *The Distribution of Household Income and Federal Taxes, 2008 and 2009* (July 2012), www.cbo.gov/publication/43373.

[2] Revenue estimates from JCT account for earnings in tax-preferred retirement accounts. See Joint Committee on Taxation, *Modeling the Distribution of Taxes on Business Income*, JCX-14-13 (October 16, 2013), www.jct.gov/publications/2013/jcx-14-13.

the change in capital stock affects workers' productivity and as changes in labor productivity translate to changes in workers' wages.[3]

How long the economy will take to adjust to the new general equilibrium is uncertain. However, most studies have shown that the burden of corporate income taxes is shared between owners of capital and workers. No consensus has emerged in the literature on the relative shares. Alternatives are considered in the "Applying the Analytic Method" section.

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[3] Revenue estimates of corporate tax changes from JCT account for phase-in effects. See Joint Committee on Taxation, *Modeling the Distribution of Taxes on Business Income*, JCX-14-13 (October 16, 2013), www.jct.gov/publications/2013/jcx-14-13.

Figures

Changes in Household Income After Transfers and Taxes, by Decile, 2022

Provide Direct Payments
(Total: $116 Billion)

Impose a New Payroll Tax
(Total: −$101 Billion)

Increase Corporate Taxes
(Total: −$50 Billion)

Increase Medicare Part B Premiums
(Total: −$39 Billion)

Decrease SNAP Benefits
(Total: −$35 Billion)

Decrease Premium Tax Credits
(Total: −$12 Billion)
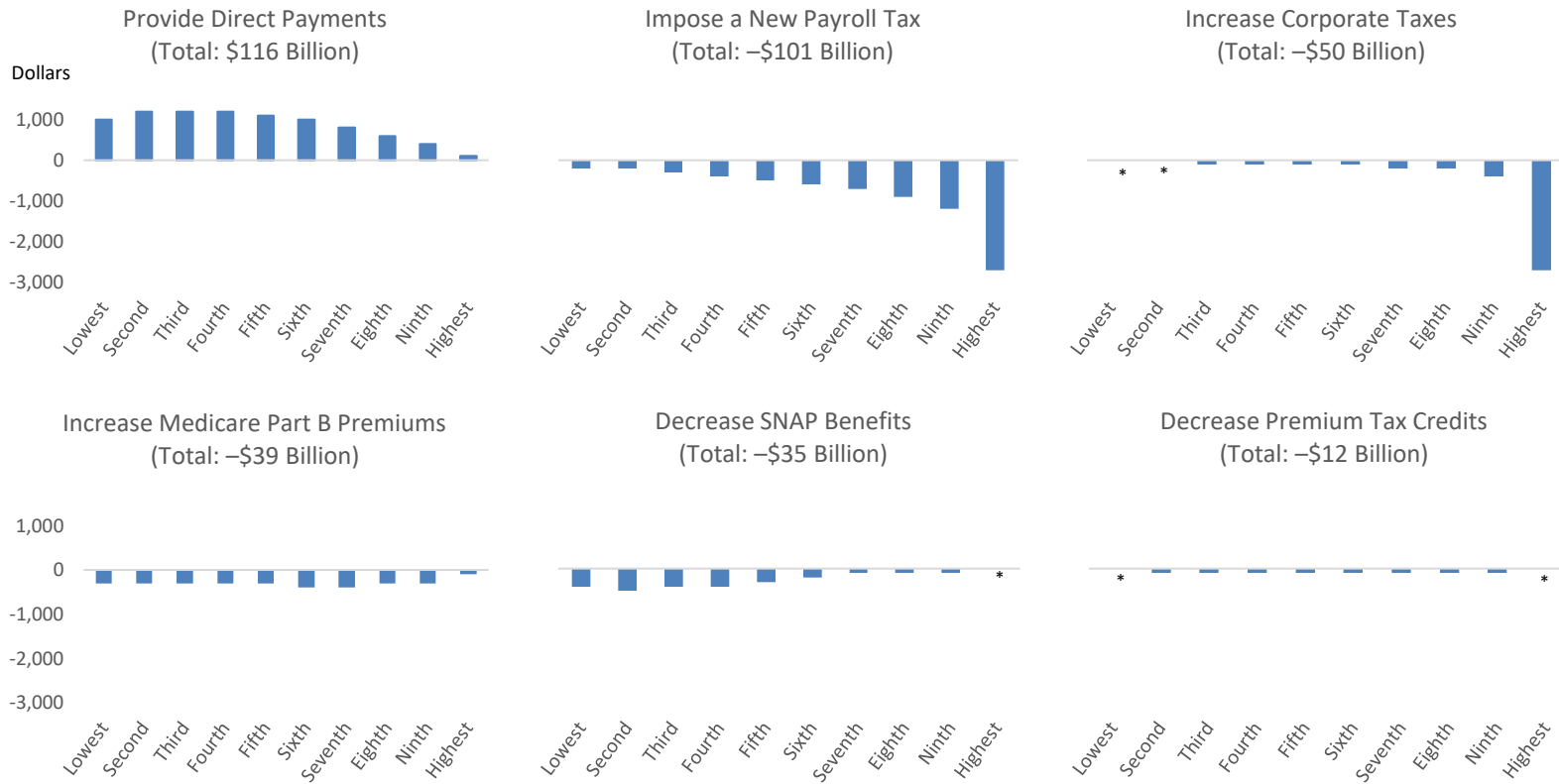
Data Source: Congressional Budget Office.

SNAP = Supplemental Nutrition Assistance Program; * = between −$50 and $50.

Figure 2.

Percentage Changes in Household Income After Transfers and Taxes, by Decile, 2022
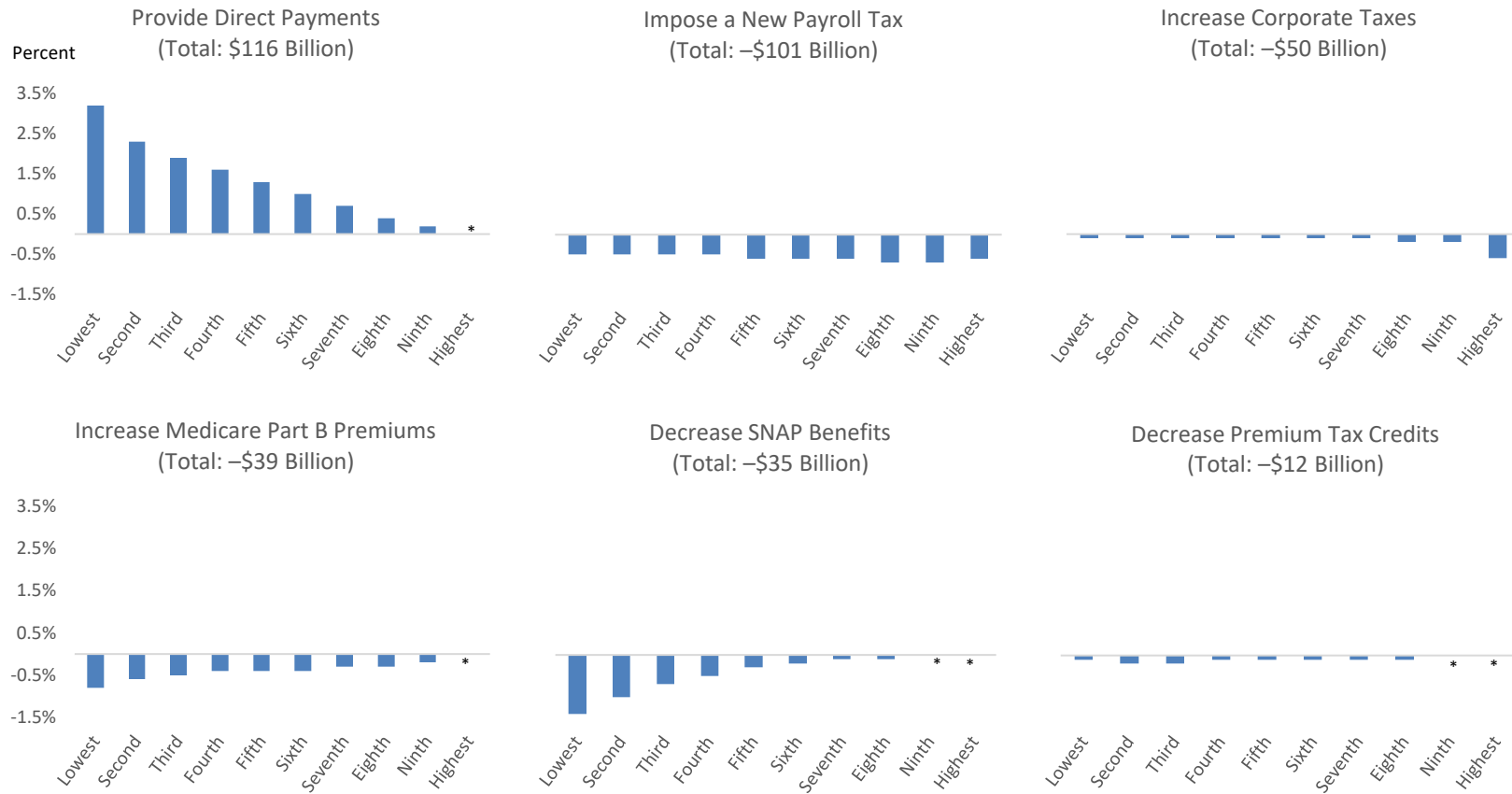
Data Source: Congressional Budget Office.

SNAP = Supplemental Nutrition Assistance Program; * = between −0.05 and 0.05 percent.

Tables

Baseline Household Income by Decile, 2022

	Average Income		Share of Income	
Decile(s)	Before Transfers and Taxes	After Transfers and Taxes	Before Transfers and Taxes	After Transfers and Taxes
All	145,800	123,700	100.0	100.0
Lowest	25,500	32,200	2.0	3.0
Second	44,000	52,400	3.1	4.3
Third	57,200	63,600	3.9	5.1
Fourth	70,700	74,400	4.8	6.0
Fifth	87,300	86,400	5.9	6.8
Sixth	106,800	99,900	7.1	7.8
Seventh	130,900	115,800	8.7	9.1
Eighth	163,300	137,800	10.8	10.7
Ninth	215,400	174,600	14.2	13.6
Highest	608,600	444,600	40.7	35.0

Data source: Congressional Budget Office.

Dollar amounts are rounded to the nearest hundred.

Table 2. [Return to Text]

Baseline Demographics by Decile, 2022

Millions of People/Households

Decile(s)	Adults (18–64)	Children (0–17)	Elderly (65+)	All People	Households
All	191	71	59	320	132
Lowest	18	8	5	31	15
Second	17	10	5	32	13
Third	18	9	5	32	13
Fourth	18	8	6	32	13
Fifth	19	7	6	32	13
Sixth	19	7	6	32	13
Seventh	20	6	6	32	13
Eighth	20	5	6	32	13
Ninth	20	5	7	32	13
Highest	21	5	6	32	13

Data source: Congressional Budget Office.

Table 3.

Changes in Income, After Transfers and Taxes, Attributable to Direct Payments, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	900	100	0.7
Lowest	32,200	1,000	13	3.2
Second	52,400	1,200	14	2.3
Third	63,600	1,200	14	1.9
Fourth	74,400	1,200	14	1.6
Fifth	86,400	1,100	13	1.3
Sixth	99,900	1,000	11	1.0
Seventh	115,800	800	9	0.7
Eighth	137,800	600	7	0.4
Ninth	174,600	400	4	0.2
Highest	444,600	100	2	**

Total change in income: $116 billion

Data source: Congressional Budget Office.

** = between –0.05 and 0.05 percent.

Dollar amounts are rounded to the nearest hundred.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.

Table 4.   [Return to Text]

Changes in Income, After Transfers and Taxes, Attributable to a New Payroll Tax, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	-800	100	–0.6
Lowest	32,200	-200	2	–0.5
Second	52,400	-200	3	–0.5
Third	63,600	-300	4	–0.5
Fourth	74,400	-400	5	–0.5
Fifth	86,400	-500	6	–0.6
Sixth	99,900	-600	8	–0.6
Seventh	115,800	-700	9	–0.6
Eighth	137,800	-900	12	–0.7
Ninth	174,600	-1,200	15	–0.7
Highest	444,600	-2,700	35	–0.6

Total change in income: –$101 billion

Data source: Congressional Budget Office.

Dollar amounts are rounded to the nearest hundred.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.

Table 5.

Changes in Income, After Transfers and Taxes, Attributable to an Increase in Corporate Taxes, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	–400	100	–0.3
Lowest	32,200	*	1	–0.1
Second	52,400	*	1	–0.1
Third	63,600	–100	1	–0.1
Fourth	74,400	–100	2	–0.1
Fifth	86,400	–100	2	–0.1
Sixth	99,900	–100	3	–0.1
Seventh	115,800	–200	4	–0.1
Eighth	137,800	–200	6	–0.2
Ninth	174,600	–400	9	–0.2
Highest	444,600	–2,700	69	–0.6

Total change in income: –$50 billion

Data source: Congressional Budget Office.

* = between –$50 and $50.

Dollar amounts are rounded to the nearest hundred.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.

Table 6.   [Return to Text]

Changes in Income, After Transfers and Taxes, Attributable to an Increase in Medicare Part B Premiums, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	−300	100	−0.2
Lowest	32,200	−300	11	−0.8
Second	52,400	−300	10	−0.6
Third	63,600	−300	10	−0.5
Fourth	74,400	−300	10	−0.4
Fifth	86,400	−300	11	−0.4
Sixth	99,900	−400	12	−0.4
Seventh	115,800	−400	12	−0.3
Eighth	137,800	−300	11	−0.3
Ninth	174,600	−300	10	−0.2
Highest	444,600	−100	2	**

Total change in income: −$39 billion

Data source: Congressional Budget Office.

** = between −0.05 and 0.05 percent.

Dollar amounts are rounded to the nearest hundred.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.

Table 7.   [Return to Text]

Changes in Income, After Transfers and Taxes, Attributable to a Decrease in SNAP Benefits, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	−300	100	−0.2
Lowest	32,200	−400	19	−1.4
Second	52,400	−500	20	−1.0
Third	63,600	−400	17	−0.7
Fourth	74,400	−400	15	−0.5
Fifth	86,400	−300	10	−0.3
Sixth	99,900	−200	7	−0.2
Seventh	115,800	−100	5	−0.1
Eighth	137,800	−100	3	−0.1
Ninth	174,600	−100	2	**
Highest	444,600	*	1	**

Total change in income: −$35 billion

Data source: Congressional Budget Office.

Dollar amounts are rounded to the nearest hundred.

SNAP = Supplemental Nutrition Assistance Program; * = between −$50 and $50; ** = between −0.05 and 0.05 percent.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.

A household is generally eligible for SNAP if it participates in certain other assistance programs or if it can show that its income and assets are below certain thresholds; those thresholds are set by law and vary for households with different characteristics.

The survey data on which this analysis is based indicate that some households with higher annual incomes receive benefits from SNAP. That may occur for several reasons. One, the income of households can vary during the year, perhaps because of changes in employment or household composition. Those households may therefore qualify for benefits during a period in which their monthly income is low even though annual income is high (the number of households used in this analysis reflects "ever on" participation in SNAP—that is, the number of households that were enrolled in SNAP at any point during the year). CBO estimates that about 10 percent of people with income below 200 percent of the federal poverty guidelines in a given month had income above 200 percent of the federal poverty guidelines when measured on an annual basis in 2019. Two, misreporting of income, program participation, and benefit amounts in the survey data that are the basis for CBO's estimates may contribute to the estimate of the number of households with higher annual income receiving benefits from SNAP. Finally, because households in CBO's analysis are ranked on the basis of their income after transfers and taxes (including benefits from Medicare and Medicaid), households that receive means-tested benefits may appear higher in the income distribution than they would if they were ranked on the basis of income before transfers and taxes. If, for this analysis, households were instead ranked by market income (a measure of income that does not take transfers or taxes into account), households in the bottom half of that income distribution would receive more than 90 percent of SNAP benefits.

Table 8.

Changes in Income, After Transfers and Taxes, Attributable to a Decrease in Premium Tax Credits, 2022

Decile(s)	Baseline Average (dollars)	Change (dollars)	Percentage Share of Change	Percentage Change in Household Income
All	123,700	−100	100	−0.1
Lowest	32,200	*	5	−0.1
Second	52,400	−100	12	−0.2
Third	63,600	−100	12	−0.2
Fourth	74,400	−100	11	−0.1
Fifth	86,400	−100	12	−0.1
Sixth	99,900	−100	13	−0.1
Seventh	115,800	−100	15	−0.1
Eighth	137,800	−100	9	−0.1
Ninth	174,600	−100	7	**
Highest	444,600	*	4	**

Total change in income: −$12 billion

Data source: Congressional Budget Office.

Dollar amounts are rounded to the nearest hundred.

* = between −$50 and $50; ** = between −0.05 and 0.05 percent.

The baseline average is the average household income after transfers and taxes in each decile. See the "Analytic Method" section of this paper for details on how CBO constructs this income measure. That income measure reflects CBO's baseline budget and economic projections as reported in Congressional Budget Office, *The Budget and Economic Outlook: 2022 to 2032* (May 2022), www.cbo.gov/publication/57950.