Calibrating Macroeconomic and Microsimulation Models to CBO's Baseline Projections

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Changes in tax policy can influence economic incentives for households to work and save and for businesses to invest. Subsequent changes in employment, investment, and incomes can affect Federal tax revenues. Dynamic analyses capturing such interactions between taxes and the economy are facilitated by integrating macroeconomic models of the economy and microsimulation models of taxation. An important part of that integration is calibrating both models to the same "baseline" forecast.

In this paper, we describe a process for calibrating a macroeconomic model of the U.S. economy and a microsimulation model of the Federal individual income tax to the Congressional Budget Office's (CBO's) January 2006 baseline projections. The microsimulation model is based on the Public-Use Tax File produced by the Statistics of Income (SOI) Division of the Internal Revenue Service (IRS). The macroeconomic model, Global Insight's U.S. Macroeconomic Model, is based on Bureau of Economic Analysis (BEA) national income and product accounts (NIPA) data.[1] Once calibrated to the same official baseline, the two models can be used jointly to simulate the economic and budgetary effects of changes in tax policies. Direct comparisons can then be made between dynamic estimates from the macroeconomic model and conventional estimates from the microsimulation model.

The Congressional Budget Office (CBO) produces biannual baseline projections of the U.S. economy and the Federal budget (generally in January and August of each year). Those projections embody the rules and conventions governing a current-services Federal budget. They project gross domestic product (GDP), prices, personal and corporate incomes, and Federal receipts, expenditures, and net saving, among other economic and budgetary variables over 10 years assuming current-law tax (and nontax) policies and the continuation of current levels of spending.

CBO's 10-year baseline projections serve as Congress's official starting point for gauging the budgetary effects of proposed changes in taxes and spending. For example, the Joint Committee on Taxation (JCT) estimates the conventional revenue effects of tax proposals using CBO's economic and

budgetary projections as a baseline. JCT's conventional revenue estimates may include some microeconomic behavioral effects of a change in tax policy. Thus, they may take into account shifts in the timing of transactions and income recognition.[2] But they generally exclude the economywide macroeconomic effects of changes in tax policy on Federal receipts. Similarly, CBO uses its own economic and budgetary projections as a baseline when generating conventional estimates of the budgetary effects of spending proposals.

Simulation models meant to generate comparable "dynamic" estimates of the economic and budgetary effects of Federal tax and spending proposals should also be calibrated to CBO's baseline projections. Dynamic estimates include the effects of changes in labor force participation, investment, and interest rates on Federal tax policies. They can differ, sometimes significantly, from conventional revenue estimates. Dynamic estimates that are not made relative to the CBO baseline can provide a broad-brush analysis of a proposed tax policy's economic and budgetary effects. But they cannot be used as a dynamic alternative to a conventional estimate of the proposed policy's effects. At best, they can serve as a vehicle for ranking the relative strengths and weaknesses of alternative proposals.[3]

We calibrate two models to CBO's baseline economic and budgetary projections. We typically use both models to evaluate proposed changes in tax policy. The first model is the Global Insight (GI) short-term U.S. Macroeconomic Model. The second is a proprietary microsimulation model of individual income tax returns developed by analysts at The Heritage Foundation's Center for Data Analysis.

A CBO-like baseline forecast is constructed using the Global Insight model and the details that CBO provides about its economic and budgetary projections. Using the GI model, we infer the implications of CBO's current-law assumptions for key macroeconomic variables, including personal consumption, investment, employment, and the components of NIPA personal income. In combination with SOI data, the microsimulation model uses the final CBO-like baseline forecast and estimated relationships between NIPA personal income and personal income reported to the IRS to project the characteristics of individual income tax records. The result is an integrated calibration of macroeconomic and microsimulation models that can be used for policy simulations.

The paper proceeds as follows. The second section gives key facts about CBO's baseline economic and budgetary projections. We focus on CBO's current-law assumptions and the variables CBO publishes, and we use, in calibrating to CBO's baseline projections. The third section discusses our general approach to calibrating the GI and microsimulation models to CBO's published projections. The fourth section concludes by examining the impli-

cations of using the calibrated macroeconomic and microsimulation models for tax policy analysis.

An Overview of CBO's Baseline Projections

CBO's biannual baseline projections play a dual policy role. They inform policymakers about the implications of current fiscal policies for Federal budgetary aggregates, and they provide a common baseline for scoring the budgetary effects of proposed changes in taxes and spending. As a result, CBO's economic and budgetary projections are unique when compared with other--particularly commercial--forecasts. Specifically, they embody current law, and they explicitly assess the impact of current-law policies (fiscal and nonfiscal) on key indicators of economic activity.

CBO's Current-Policy Assumptions. A set of detailed rules govern the process by which CBO's economic and budgetary projections embody current law and policy. The Balanced Budget and Emergency Deficit Control Act of 1985 and various other conventions for a Federal baseline require CBO to produce a very specific kind of forecast.[4] CBO's baseline budgetary projections--and, hence, the CBO-like forecast we construct to replicate them--cannot anticipate changes in current law. Rather, they must assume that future taxes, spending, and other (nonfiscal) policy measures evolve as stipulated by previously enacted legislation.

This means that CBO's 10-year revenue projections assume no change in tax provisions or tax rates unless such a change is already included in current law. Thus, CBO's January 2006 baseline revenue projections assume the 2008 expiration (or "sunset") of the preferential capital gain and dividend tax rates enacted under the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA)[5] and the 2010 expiration of tax relief provisions enacted under the Economic Growth and Tax Relief Reconciliation Act (EGTRRA).[6] Similarly, despite widespread discussion of the issue, CBO's revenue projections do not include any changes to the alternative minimum tax (AMT). Private sector forecasts typically anticipate some change in the current law governing the AMT--if only because without some adjustment, a growing number of taxpayers will see their tax burdens increase as a result of the AMT.

CBO's budgetary projections also exclude changes in Federal spending not already set by current policies. Thus, CBO uses current-law eligibility and benefits criteria to project mandatory spending on entitlement programs like Social Security, Medicare, and Medicaid over the 10-year budget period.[7] Current law in the form of appropriations bills does not dictate a path for discretionary spending and supplemental budget authority beyond the current

budget year.[8] However, the Balanced Budget and Emergency Deficit Control Act of 1985 requires that CBO assume that both discretionary spending and supplemental appropriations in the most recent year's budget authority continue in each subsequent year of CBO's 10-year budgetary baseline.[9] In that baseline, projected current-services outlays keep pace with projected current-services budget authority. Both projected budget authority and outlays rise because CBO adjusts budget authority to offset projected inflation and cost-of-living adjustments.

CBO assesses the impact of GDP, prices, interest rates, incomes, and other economic variables on current-law revenues and spending over a 10-year period. CBO's baseline economic projections consist of two conceptually and analytically distinct components--a 2-year (short-term) forecast of cyclical fluctuations and a separate 8-year (medium-term) projection of potential output (GDP).[10] This split in the budget period determines how CBO assesses the economic implications of current-law fiscal policies.

In the short term, CBO allows the path of GDP to deviate from that of its underlying potential.[11] CBO gauges the impact of the gap between actual and potential GDP on a range of economic variables. Those variables include inflation, interest rates, employment, personal and corporate incomes, personal consumption and saving, and residential and business fixed investment. CBO also anticipates how monetary policy, exchange rates, and energy prices as well as recently enacted changes in current-law policies (fiscal and nonfiscal) are likely to affect fluctuations in aggregate demand. For example, the August update to CBO's January 2003 *The Budget and Economic Outlook* estimated the impact of JGTRRA's partial-expensing provisions on business fixed investment in 2003 and 2004.[12] It also discussed the effects of JGTRRA's accelerated tax cuts on personal saving.[13]

In the medium term, CBO does not project fluctuations in aggregate demand. Instead, it uses a growth model to estimate potential GDP and assumes that any gap between actual GDP and estimated potential GDP remaining at the end of the short-term forecast closes over the subsequent 8 years.[14] Other key economic variables are similarly assumed to trend toward an estimated long-run average over the medium term. For example, CBO's projected rate of return on 10-year Treasury notes equals 5.2 percent from 2007, 1-year prior to the start of CBO's medium-term projections.[15] CBO's projected unemployment rate attains its long-run natural rate (5.2 percent) only 2 years later, in 2009. In contrast, the unemployment rate in Global Insight's February 2006 short-term U.S. Macroeconomic forecast fluctuates around its long-run natural rate over much of GI's 10-year forecast horizon.[16]

As a result, CBO's medium-term projections are largely limited to assessing the impacts of current-law fiscal policies on potential GDP and related

variables, notably potential labor hours and capital. For example, EGTRRA's expiring provisions and increasing taxpayer exposure to the AMT are likely to generate a steady rise in average marginal tax rates on wages. CBO adjusts potential labor hours for the anticipated disincentive effects, layering an estimated decline in the supply of labor hours onto a baseline projection that reflects long-run trends in demographics and labor force participation.[17] CBO also estimates the potential effects of rising Federal deficits and debt on the capital stock. It includes some "crowding out" of private investment into its growth model, using projections of net foreign investment to gauge the extent to which increased capital inflows from abroad are likely to offset declines in national saving and domestic private investment.[18]

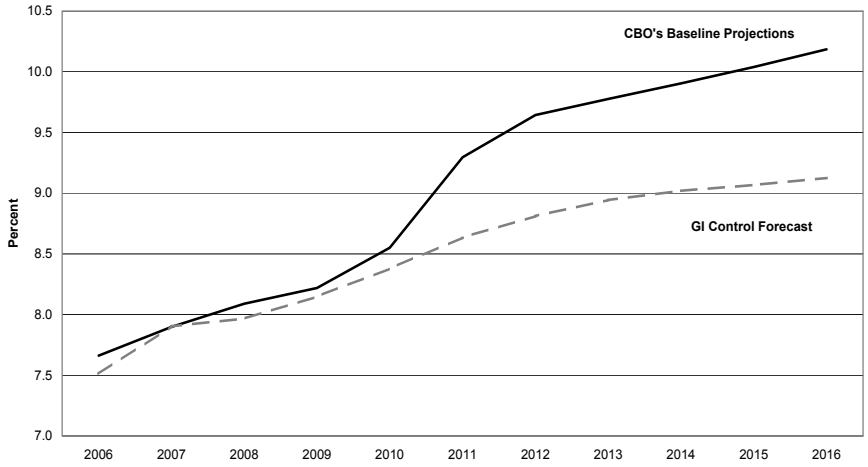
Federal Policy Assumptions Found in Other Macroeconomic Forecasts. Unlike CBO, other forecasters--particularly commercial forecasters--are not restricted by the rules and conventions governing a Federal baseline. They can therefore build into their forecasts expected changes in taxes and spending that are inconsistent with a current-law baseline. They can also anticipate changes in other, nonfiscal current-law policies. Those expectations about future fiscal and nonfiscal policies can dramatically impact projected values of key economic and budgetary aggregates.

For example, GI's February 2006 U.S. Macroeconomic forecast assumes a partial extension of expiring tax relief provisions originally enacted under EGTRRA and JGTRRA. As a result, GI projects a far more gradual increase than does CBO in NIPA personal income tax revenues as a share of GDP (see Figure 1A). Unsurprisingly, GI also projects higher levels of NIPA personal disposable income as a share of GDP--particularly after 2010 (see Figure 1B).

Commercial forecasts can also include expected changes in Federal spending that are inconsistent with a current-services budget.[19] Both CBO's baseline budgetary projections and GI's February 2006 U.S. Macroeconomic forecast allow for growth in Federal defense spending over the next 10 years. However, GI consistently projects higher levels of defense spending as a share of GDP (see Figure 2).

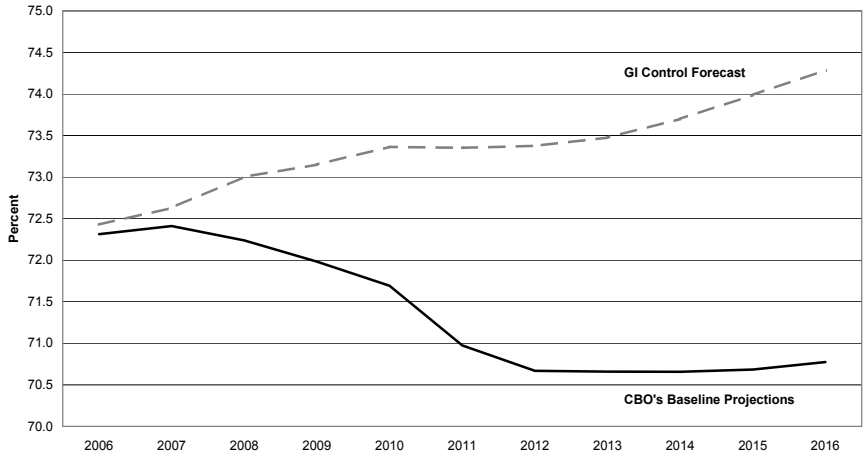
Initial differences between CBO's and GI's projections of defense spending seem in part explained by different assumptions about the rate of spending. Federal defense spending fell in the fourth quarter of 2005, after expanding at a double-digit rate in the third quarter of the same year.[20] It followed a similar pattern in the final two quarters of 2004 before bouncing back strongly in the first quarter of 2005. GI largely attributes both third-to-fourth quarter declines to delays in the passage of the current fiscal years' defense appropriations bill.[21] Using history as a guide, it assumes a strong rebound in defense spending in

Figure 1A. Federal Personal Income Tax Revenue as a Share of GDP



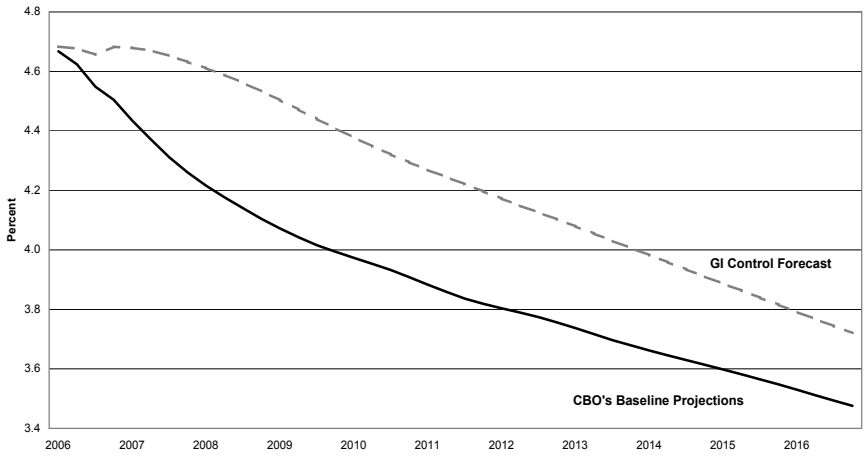
Notes: GDP = Gross Domestic Product; CBO = Congressional Budget Office; GI = Global Insight.
Sources: The Heritage Foundation, Center for Data Analysis; Congressional Budget Office; Global Insight.

Figure 1B. Personal Disposable Income as a Share of GDP



Notes: GDP = Gross Domestic Product; CBO = Congressional Budget Office; GI = Global Insight.
Sources: The Heritage Foundation, Center for Data Analysis; Congressional Budget Office; Global Insight.

Figure 2. Federal Defense Spending as a Share of GDP



Notes: GDP = Gross Domestic Product; CBO = Congressional Budget Office; GI = Global Insight.
Sources: The Heritage Foundation, Center for Data Analysis; Congressional Budget Office; Global Insight.

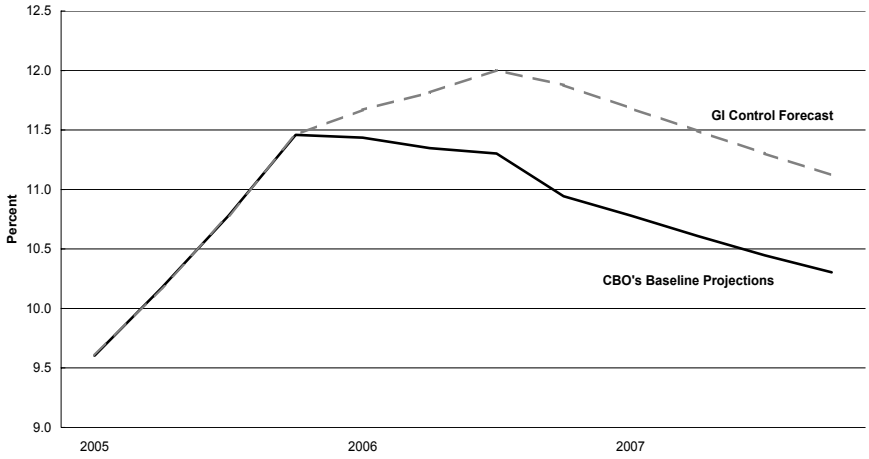
the first half of 2006. Such a strong rebound in Federal defense spending is not as apparent in CBO's budgetary projections.[22]

After 2006, CBO projects current fiscal-year defense spending forward at the rate of inflation. GI is not restricted by such current-services budget requirements. Thus, through 2010, GI's standard forecast includes additional supplemental appropriations for Iraq and Afghanistan. From 2011 to 2016, it includes a slightly higher deflator for military wages and salaries. The result is a persistent gap between CBO and GI projections of NIPA Federal defense spending.[23]

Finally, commercial forecasts can anticipate changes in other (nonfiscal) current-law policies. The Pension Funding Equity Act of 2004 (PFEA) expired at the end of 2005. PFEA temporarily lowered firms' required contributions to defined-benefit (DB) pension plans. It did so by setting the maximum applicable discount rate used to calculate the present value of DB pension liabilities above the rate required by the Employment Retirement Income Security Act of 1974 (ERISA). In general, the higher the applicable discount rate, the lower the present value of pension liabilities and the lower required DB pension contributions.[24]

GI's February 2006 U.S. Macroeconomic forecast assumes a change in current law that extends PFEA's higher discounting through 2006. CBO's baseline economic and budgetary projections do not.[25] As a result, GI makes

Figure 3. Corporate Profits as a Share of GDP



Notes: GDP = Gross Domestic Product; CBO = Congressional Budget Office; GI = Global Insight.
Sources: The Heritage Foundation, Center for Data Analysis; Congressional Budget Office; Global Insight.

no specific adjustments to corporate (book) profits or to the corporate income tax base to reflect a jump in DB contributions. CBO includes such adjustments, dramatically lowering projected corporate profits as a share of GDP relative to the GI forecast (see Figure 3).

Limitations of Using CBO's Published Baseline Projections. We calibrate a commercial macroeconomic model of the U.S. economy and a proprietary microsimulation model of individual income tax returns to CBO's baseline projections. The challenges faced in calibrating the two models differ. However, for both models, a common factor complicates our work. CBO publishes only a small subset of the economic and budgetary variables making up its baseline projections (see Table 1). This limits the number of variables available as guides in adjusting the two models to reflect CBO's current-law assumptions.

Calibrating the Global Insight Model. We develop our CBO-like baseline forecast using GI's February 2006 U.S. Macroeconomic forecast as a starting point (or control).[26] GI's U.S. Macroeconomic forecasts typically include expected changes in fiscal and nonfiscal policies. The calibration procedure in part involves iteratively adjusting the control forecast to remove the effects of those expectations so that our CBO-like forecast is consistent with current law.

Adjusting the control forecast to match CBO's baseline budgetary projections is relatively straightforward. CBO publishes all but a handful of needed NIPA Federal revenue and spending projections. It also provides a detailed crosswalk between its NIPA Federal budget numbers and its projections of unified (budget) Federal revenues and unified Federal outlays.[27]

However, CBO does not publish its projections of a number of key macroeconomic and income variables. Those variables include the components of GDP, NIPA taxable personal income (with the exception of wage and salary income), and national saving (with the exception of NIPA net Federal government saving).[28] They also include a number of miscellaneous items describing critical assumptions (policy and otherwise) underlying CBO's 2-year forecast and medium-term projections.

For example, CBO does not typically describe in great detail its projections of the trade-weighted U.S. dollar exchange rate, the price of oil, and the Federal funds rate. Rather, the economic outlook chapter of *The Budget and Economic Outlook* indicates CBO's expectations for their levels or movements in the short term.[29] When calibrating the GI model to CBO's baseline economic projections, we use such statements as guides in adjusting (if necessary) GI's projections of equivalent variables.

Thus, in August 2005, CBO indicated that it expected oil prices to stop rising--but not to "retreat" to pre-2004 levels--during 2005 and 2006.[30] In January 2006, CBO again indicated that it expected oil prices to stabilize in 2006.[31] We adjusted a weighted average price of imported crude in the GI model appropriately. Similarly, in August 2005, CBO anticipated that the Federal Reserve would continue to raise the target for the Federal funds rate until it reached a neutral rate. CBO observed that the consensus of financial market participants was consistent with a neutral rate ranging between 4 percent and 5 percent.[32] In January 2006, CBO reconfirmed its outlook for monetary policy, specifying that the consensus of financial market participants put the expected Federal funds target rate at 4.75 percent by mid-2006.[33]

More significantly, CBO does not typically provide sufficient detail to establish how it adjusts a number of key macroeconomic and income variables to reflect current law. Figures 4 and 5 reorganize NIPA data as a series of income and expenditure flows among institutional sectors of the economy (households, firms, government, rest of the world, etc.).[34] Moving across the columns gives an accounting of income flows among the sectors. Moving down the rows gives an accounting of expenditure flows.

Figure 4 broadly summarizes the level of detail we require for calibration of the microsimulation model and for policy analysis. For example, calibrating the microsimulation model to CBO's baseline budgetary projections of individual income tax receipts requires projections of the individual compo-

Figure 4. National Income and Product Accounts (NIPA) Income-and-Expenditure Flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Production (1)		Domestic Output								
Goods and Services (2)					Personal Consumption		Federal Consumption and Gross Investment	State & Local Consumption and Gross Investment	Private Domestic Investment	Exports
Labor Income (3)	Compensation of Employees									
Capital Income (4)	Operating Surplus									
Households (5)			Wage and Salary Income, Other Labor Income	Proprietor Income, Rental Income, Net Interest Income		Transfer Payments from Business, Dividend Income	Federal Transfer Payments, Net Interest Payments	State & Local Transfer Payments, Net Interest Payments		
Enterprises (6)				Corporate Profits, Transfer Payments by Business						
Federal Government (7)	Federal Taxes on Production and Imports (Less Net Subsidies, Customs Duties, and Excise Taxes)	Federal Customs Duties and Excise Taxes	Federal Social Insurance Tax Receipts		Federal Personal Tax Payments, Transfer Receipts from Persons	Federal Corporate Income Tax Payments, Transfer Receipts from Business				Federal Tax Receipts from ROW
State & Local Government (8)	State & Local Taxes on Production and Imports (Less Net Subsidies and Sales Taxes)	State & Local Sales Taxes	State & Local Social Insurance Tax Receipts		State & Local Personal Tax Payments, Transfer Receipts from Persons	State & Local Corporate Income Tax Payments, Transfer Receipts from Business	Federal Grants-in-Aid to State and Local Governments			
Gross Capital Formation (9)				Consumption of Fixed Capital	Personal Saving	Retained Earnings	Net Federal Saving	Net State & Local Saving		Net Foreign Investment
Rest of World (10)		Imports		Net Factor Payments to ROW	Net Transfer Payments to ROW	Corporate Taxes Paid to ROW, Transfer Payments to ROW	Social Insurance Payments, Other Transfers to ROW			

Notes: ROW = rest of the world.

Net interest income equals personal interest income minus the sum of interest payments by individuals and net interest payments by government (federal and state and local).

Operating surplus is a balancing item equal to the difference between value added and the sum of compensation of employees and taxes on production and imports (less net subsidies). It measures the "…surplus or deficit accruing from processes of production before deducting any explicit or implicit interest charges, rents, or other property income payable on financial assets, land, or tangible non-produced assets required to carry on the production." For unincorporated enterprises owned by households, this component of value added is called mixed income. See paragraph 7.82, at http://unstats.un.org/unsd/sna1993/tocLev8.asp?L1=7&L2=5 (July 19, 2006).

Net operating surplus excludes consumption of fixed capital.

Corporate profits here refer to before-tax economic profits. The Congressional Budget Office (CBO) publishes projections of before-tax book profits.

Private domestic investment includes both private domestic fixed investment and changes in inventories.

Net factor payments to the ROW equal the difference between factor service imports and exports of factor services.

Source: The Heritage Foundation, Center for Data Analysis.

nents of NIPA personal income.[35] Calculating the Federal corporate income tax requires projections of both corporate profits and the corporate income tax base. Finally, doing dynamic analyses of fiscal policy requires the ability to quantify the effect of changes in taxes and spending on the components of GDP and personal income.

The Global Insight model, once calibrated to CBO's published baseline projections, provides this level of detail. A forecasting model like Global Insight provides unique advantages to analysts constructing a CBO-like baseline forecast. This is because it includes enough structural detail to fill in the blanks

Figure 5. NIPA Income-and-Expenditure Flows For Which Projections Are Available from CBO

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Production (1)										
Goods and Services (2)							Federal Consumption and Gross Investment			
Labor Income (3)										
Capital Income (4)										
Households (5)			Wage and Salary Income				Federal Transfer Payments, Net Interest Payments			
Enterprises (6)				Corporate Profits						
Federal Government (7)	Federal Taxes on Production and Imports (Less Net Subsidies)		Federal Social Insurance Tax Receipts		Federal Personal Tax Payments, Transfer Receipts from Persons	Federal Corporate Income Tax Payments, Transfer Receipts from Business				Federal Tax Receipts from ROW
State & Local Government (8)							Federal Grants-in-Aid to State and Local Governments			
Gross Capital Formation (9)							Net Federal Saving			
Rest of World (10)										

Notes: NIPA = national income and product accounts; CBO = Congressional Budget Office.

See notes to Figure 4.

Corporate profits here refer to before-tax economic profits. CBO publishes projections of before-tax book profits.

Source: The Heritage Foundation, Center for Data Analysis.

left by CBO. Figure 5 highlights the extent of those blanks. It shows the same reorganization of NIPA income and expenditure flows as Figure 4, but with identifiers only in the cells for which CBO publishes its baseline economic projections. We use the GI model to help us infer consistent approximations of CBO's projections of the missing income and expenditure flows.

Although useful for policy evaluation purposes, CBO's current-law assumptions complicate our efforts to infer those projections using the GI model. For example, the control forecast implicitly assumes some extension of EGTRRA's expiring provisions after 2010. It therefore includes levels of personal consumption and saving that are higher than those projected by CBO. The calibration procedure involves iteratively lowering the projected rate of growth in personal consumption implied by the control forecast so that the projected personal saving rate is not unreasonable. Unfortunately, CBO typically provides little or no detail on how it adjusts consumption and saving

to reflect EGTRRA's sunset. As a result, we have only personal judgment and historical data to rely upon when determining an appropriate current-law level for the personal saving rate.

Similarly, CBO typically publishes only its projections of NIPA taxable personal income and wage and salary income.[36] Calibration requires allocating the difference between the two among personal dividend income, personal interest income, personal rental income, and proprietors' income (farm and nonfarm). We can use information from the control forecast to do this. However, the control forecast implicitly assumes some extension of JGTRRA's preferential tax rates on dividend income. And CBO typically provides little or no additional detail to use in deriving an allocation that would be more consistent with current-law assumptions.

Calibrating the Microsimulation Model. The primary challenge we face in calibrating the microsimulation model to CBO's baseline projections is a bit different. The inputs into the calibration procedure for the microsimulation model already reflect current law. For example, we use a number of economic variables from the CBO-like forecast. We also use many of the Federal revenue projections published in the revenue outlook chapter of CBO's *The Budget and Economic Outlook*.

However, economic inputs from the CBO-like forecast provide only a starting point. This is because they are expressed as NIPA values and not as amounts reported on tax returns. The microsimulation model simulates the effects of tax law changes on a representative sample of over 100,000 Federal individual income tax returns based on the characteristics of the individuals and families associated with those returns. A crosswalk is therefore needed to reconcile the definitional and timing differences among NIPA personal income, the amount of income reported on income tax returns, and supplementary information obtained from the Current Population Survey (CPS). Non-NIPA components of individual income such as capital gains, pensions, annuities, and individual retirement accounts must also be added. Data for tax return filers and nonfilers must then be extrapolated ("aged") over the 10-year budget period.

As a result, a key part of our calibration procedure involves deriving detailed targets for the amount of tax-related income, the distribution of tax-related income, and the demographic characteristics of the U.S. population. These targets are then used to adjust data on records in the microsimulation model so that those records are in aggregate consistent with CBO's baseline economic and budgetary projections. Such information is not typically published by CBO and cannot generally be obtained directly from CBO or other sources. The exceptions are demographic projections, which are available from the Census

Bureau, and projections of total individual capital gain realizations, which CBO publishes every January in *The Budget and Economic Outlook*.[37]

Calibrating Macroeconomic and Microsimulation Models to CBO's Baseline Projections

Calibration to CBO's baseline projections begins with the macroeconomic model. We first calibrate the Global Insight model to CBO's published economic projections and NIPA Federal revenue and spending projections. We refer to output from the calibrated GI model as the final CBO-like forecast. The final CBO-like baseline forecast not only replicates the published details of CBO's current-law baseline but also includes projections of key macroeconomic and income variables excluded from them.[38]

We then calibrate the microsimulation model to CBO's baseline projections. In doing so, we use data from the SOI and the Census Bureau as well as economic variables from the final CBO-like forecast. Those economic variables include nominal GDP, corporate profits, the consumer price index (CPI) for all urban consumers, the components of NIPA taxable personal income, NIPA transfer payments to persons (Federal as well as State and local), and NIPA State and local tax revenues. The calibrated microsimulation model that results approximates CBO's baseline projections of key economic and income variables and individual income tax revenues.

Calibrating the Global Insight Macroeconomic Model. Calibrating the Global Insight model to CBO's current-law baseline involves iteratively adjusting the control forecast so that, when solved, the Global Insight model endogenously reproduces all projections of economic and budgetary variables published by CBO.[39] This is a multistep process. In each step, we replace variables in the GI model with CBO's projections. We then solve the GI model so that those variables that have not been targeted adjust. In essence, we are using econometrically estimated relationships and accounting identities within the GI model to create a forecast that is consistent with what we know about CBO's baseline economic and budgetary projections.

Step 1. We first set key economic assumptions and price levels. This process involves setting the price of oil and the trade-weighted U.S. dollar exchange rate so that they are consistent with what we know about CBO's baseline economic assumptions. It also involves setting some policy variables such as the statutory corporate income tax rate and the Federal social insurance tax rate so that they are consistent with CBO's baseline revenue projections. Finally, it

requires that we impose CBO's projections of certain key economic variables. Those variables include the unemployment rate, the 3-month Treasury bill rate, and the 10-year Treasury note rate.

The 3-month Treasury bill rate is also used to set the Federal funds rate. The GI control forecast includes a projection of the Federal funds rate that differs from what CBO describes as the consensus of financial market participants. We correct for this by imposing a target for the Federal funds rate that is broadly consistent with not only CBO's description of financial market consensus but also CBO's projection of the 3-month Treasury bill rate. We obtain this target by first calculating the spread in the control forecast between the 3-month Treasury bill rate and the Federal funds rate. We then apply this spread, with some adjustments, to CBO's projection of the 3-month Treasury bill rate.

We complete the first step by setting price levels for all components of GDP. CBO publishes 10-year projections of year-over-year percentage changes in an aggregate GDP price index. We use this along with information about the components of the GDP price deflator contained in the GI control forecast to set all underlying GDP price indices so that they are consistent with CBO's projection of GDP inflation.

Setting price levels early in the calibration procedure is critical. This is because many exogenous Federal outlays variables in the Global Insight model are in real (inflation-adjusted) terms. We therefore require a price level variable to convert CBO's nominal baseline budgetary projections for those variables into consistent real targets.

Step 2. In the second step, we set Federal spending (outlays) net of Federal interest payments.[40] Federal spending broadly includes Federal consumption spending, Federal transfer payments, and other spending items in the Federal Government's budget.

CBO publishes its projections for most--but not all--of the Global Insight model's NIPA federal spending variables. For example, the Federal Government's budget includes Federal social benefits to the rest of the world and Federal subsidies. CBO publishes its projections of both aggregates. We replace GI's projections of these variables with CBO's published NIPA projections. Similarly, CBO publishes its projection of Federal net investment.[41] We combine this with CBO's baseline projections of NIPA defense and nondefense consumption of fixed capital to obtain a NIPA target for Federal gross investment.

However, CBO does not provide baseline projections for all NIPA Federal spending variables. In some instances, we rely on the GI control forecast to obtain needed targets. For example, Federal consumption spending includes both defense and nondefense "other" purchases of goods and services and wages

and salaries for personnel. CBO only publishes its projection of the sum of the two (labeled defense and nondefense "consumption"). In the absence of any additional information from CBO, we set "other" Federal purchases of goods and services equal to the difference between CBO's projections of defense and nondefense "consumption" and GI's projections of defense and nondefense outlays for personnel

In other instances, we derive needed targets from CBO's published projections of budget (unified) Federal outlays. Federal transfer payments include both social benefits to persons and grants-in-aid to State and local governments. CBO publishes its NIPA projection of grants-in-aid to State and local governments. However, it publishes only budget projections of Federal spending on Social Security, Medicare, and Medicaid. To obtain equivalent NIPA targets, we use historical Government social benefits data from CBO and BEA to adjust CBO's published projections of Social Security, Medicare, and Medicaid spending for administrative costs.[42]

Step 3. In the third step, we adjust the components of GDP so that they are consistent with not only CBO's projections of real GDP and real Federal spending (on both current consumption and investment) but also current laws and policies. We follow a three-step procedure.

First, we adjust all components of GDP for which CBO's baseline projections are unavailable. Those components include personal consumption, gross private domestic investment, State and local government purchases of goods and services (including State and local investment), and net exports. We scale all four aggregates proportionately so that they are consistent with CBO's projections of real GDP and real Federal spending. We do so using information from the control forecast about the allocation of GDP among its constituent components.

Second, we derive a target for personal consumption that is more in line with CBO's current-law assumptions. A target for real personal consumption obtained using information strictly from the control forecast is likely to be too high. This is because the control forecast does not assume current law. CBO does not describe in detail its baseline projections of personal consumption. However, the economic outlook chapter of *The Budget and Economic Outlook* typically gives annual rates of growth in personal consumption for the 2 years covered by CBO's short-term economic forecast.[43] We derive a target for real personal consumption using those growth rates and some judgment about the likely impacts on personal saving of not extending EGTRRA's and JGTRRA's expiring provisions after 2010.

Finally, we readjust all components of GDP for which we do not have published projections from CBO. At this stage, those components include gross

private domestic investment, State and local government purchases of goods and services, and net exports. We scale all three aggregates proportionally so that they are jointly consistent with CBO's projections of real GDP and real Federal spending and our target of real personal consumption. In doing so, we again rely primarily on information from the control forecast.

Before continuing to step 4, we consider State and local government operating surpluses in our CBO-like forecast. At this point in the calibration, State and local government purchases of goods and services, when combined with all other State and local spending, could exceed State and local revenues by a wide margin (or vice versa). CBO does not typically describe in any great detail its baseline projections for State and local government budgets. However, we assume that those budgets are roughly in balance. We adjust components of State and local spending (other than purchases of goods and services) to put State and local budgets as close as possible to a slight surplus position in the final CBO-like baseline forecast.

Step 4. We next adjust potential (full-employment) GDP in the GI model to be consistent with CBO's medium-term projections of the rates of growth in potential GDP and the potential labor force.[44]

We use the GI control forecast as a starting point. CBO does not regularly publish levels-estimates of either potential GDP or the potential labor force.[45] We therefore adjust the projected levels of both variables in the control forecast to be consistent with CBO's published growth rate projections. We apply CBO's projections of the growth rate of the potential labor force directly, adjusting the projected level of the potential labor force in the control forecast. We target the growth rate of potential GDP only indirectly, adjusting among other variables the exogenous trend in total factor productivity in the control forecast.

Step 5. In the fifth step, we adjust the components of NIPA taxable personal income. CBO typically publishes its projections of NIPA taxable personal income only in the January release of *The Budget and Economic Outlook*.[46] CBO's NIPA taxable personal income includes wage and salary income (both private and government), personal interest income, personal dividend income, personal rental income, and proprietors' income (farm and nonfarm). CBO publishes projections only of the wage and salary component of NIPA taxable personal income.

We rely primarily on information from the control forecast when deriving targets for the remaining components of NIPA taxable personal income. We follow a two-step procedure. First, we set private wages and salaries by subtracting GI's projections of defense and nondefense outlays for personnel (government wages and salaries) from CBO's published projection of NIPA

wage and salary income. Second, we allocate the difference between CBO's published projections of NIPA taxable personal income and NIPA wage and salary income among the remaining components of NIPA taxable personal income. In doing so, we apply information from the control forecast. To the extent possible, we also adjust any targets we derive for the components of NIPA taxable personal income so that they are more in line with CBO's current-law assumptions.

For example, at the time we constructed our January 2006 CBO-like forecast, current law stipulated the 2008 sunset of JGTRRA's preferential tax rates on dividend income. The control forecast assumed some extension of those preferential rates and, thus, in all likelihood, a different path for personal dividend income than would be included in CBO's baseline projections. In the past, we have attempted to adjust our target for personal dividend income accordingly. Unfortunately, we could not easily confirm the accuracy of our income target and, therefore, did not attempt to include an equivalent adjustment in our January 2006 CBO-like forecast.

Before continuing to step 6, we consider the personal saving rate in our CBO-like forecast. Personal saving is a residual variable in the GI model. This means that CBO's published projections of NIPA taxable personal income and our target for NIPA personal consumption jointly determine projected personal saving and, thus, the personal saving rate in the final CBO-like forecast.

The calibration procedure can yield what seems like an unrealistically negative personal saving rate if we do not adjust for the likely impact of EGTRRA's sunset on personal consumption. In the final CBO-like forecast, the personal saving rate averages roughly -0.1 percent between 2007 and 2010 and roughly -1.1 percent between 2011 and 2016. When initially constructing the final CBO-like forecast, we did not adjust personal consumption for an increase in personal income tax payments and, hence, a drop in personal disposable income after 2010. As a result, the personal saving rate averaged well above -1.1 percent in absolute value. This compares with a personal saving rate of about -0.5 percent in 2005.[47]

Step 6. We next adjust the CBO-like forecast to be consistent with CBO's baseline projections of NIPA Federal tax receipts. NIPA Federal tax receipts include taxes from the rest of the world, taxes on production and imports, taxes on personal income, and taxes on corporate income.[48] CBO publishes projections for all four. Setting Federal taxes from the rest of the world and Federal taxes on production and imports is relatively straightforward. We replace GI's projections with published projections from CBO's current-law baseline.

Setting Federal taxes on personal and corporate incomes is more involved. This is because doing so requires that we separately target both average ef-

fective Federal income tax rates and the GI model's Federal personal and corporate income tax bases. For example, the GI model defines the Federal personal income tax base as a function of both NIPA taxable personal income and individual capital gains. CBO publishes projections of individual capital gains realizations.[49] We must therefore adjust our target for the Federal personal income tax base to reflect CBO's projections of capital gains.

The GI model also includes an approximation of the corporate income tax base. The Global Insight model defines the Federal corporate income tax base as before-tax corporate (book) profits minus rest-of-world corporate profits and the profits of the Federal Reserve.[50] CBO publishes its projections of corporate (book) profits. However, targeting corporate profits is complicated because they are a residual of gross national product (GNP) in the GI model.[51] As such, they cannot simply be replaced in our CBO-like forecast with CBO's published projections.

Rather, we iteratively modify the statistical discrepancy in the CBO-like forecast to target corporate profits indirectly. The statistical discrepancy in the final CBO-like forecast generally exceeds the statistical discrepancy in the control forecast. This is in part because we adjust corporate profits in the CBO-like forecast to fall roughly in line with the jump in contributions to defined-benefit pension plans forecast by CBO. Thus, the statistical discrepancy averages just under 0.4 percent of GDP between 2007 and 2016 in the control forecast. It averages just over 0.7 percent of GDP over the same period in the final CBO-like forecast.

Before completing step 6, we calculate average effective Federal tax rates on personal and corporate incomes. These average effective rates reconcile CBO's projections of Federal personal and corporate income tax revenues with approximations of the Federal personal and corporate income tax bases included in the final CBO-like baseline forecast.[52] We impose these average effective tax rates in the CBO-like forecast.

Step 7. In the final step, we complete calibration of the GI model to CBO's baseline projections. We begin by setting the levels of publicly-held Federal debt and net Federal interest payments in the CBO-like forecast.[53]

We only indirectly impose CBO's projection of the stock of publicly-held Federal debt. A net change in publicly-held Federal debt is calculated using CBO's published projections of unified Federal surpluses along with CBO's published projections of the Federal Government's other means of financing publicly-held debt. That net change is used to make quarterly adjustments to the GI model's variable for publicly-held Federal debt that are consistent with CBO's other published budgetary projections. After setting the stock of

Federal debt, we impose a target for net Federal interest payments. That target is calculated using CBO's projections of gross Federal interest payments and Federal income on assets.[54]

After setting net Federal interest payments, we make our final adjustments to the CBO-like forecast. These final adjustments include setting the level of the consumer price index (CPI) to be consistent with CBO's projections of CPI inflation. They also include finetuning average effective Federal tax rates on personal and corporate incomes and for Federal contributions to social insurance so that the final CBO-like forecast is consistent with CBO's published projections of Federal tax receipts. Finally, they include slight adjustments to the statistical discrepancy to ensure that the GI model calibrated to the final CBO-like forecast reproduces CBO's published projection of corporate profits.

Calibrating the Microsimulation Model. We next calibrate the microsimulation model of individual income tax returns to CBO's baseline projections. Data produced by the SOI play a vital role in helping us develop a database for use in doing tax policy analysis. A base-year SOI sample of individual income tax returns is adjusted so that, when the model simulates current-law tax provisions, the results are consistent with CBO's baseline economic projections and approximate CBO's individual income tax revenue projections.

The final CBO-like baseline forecast provides a number of NIPA measures of personal and business income that we use in calibration. Those NIPA income measures include wage and salary income, investment income (personal interest and dividend income), proprietors' income (farm and nonfarm), other business income (including personal rental income), transfer payments to persons (Federal as well as State and local), and corporate profits. The final CBO-like forecast also provides price-level variables (the CPI for all urban consumers and the GDP deflator for medical goods and services) and some NIPA budgetary variables (State and local tax revenues) used in calibration.

The Public-Use Tax File. The core data for the microsimulation model are derived from a comprehensive cross-sectional sample of individual income tax returns produced by the SOI. Analysts at the U.S. Department of the Treasury's Office of Tax Analysis (OTA), JCT, and CBO use the records of individual income tax returns included in that sample to develop revenue estimates and to research tax policy issues.

The SOI also releases a subsample of those records of individual income tax returns through its Public-Use Tax File.[55] The SOI takes a number of steps to modify the records that are released to protect the confidentiality of tax return filers. Those protections include dropping a large set of records that correspond

to particularly high-income earners and removing all identifying information (names, Social Security numbers, etc.) from the records that remain in the public-use file. They also include significantly reducing the number of data fields on the included returns and further "rounding and blurring" the data that remain to protect the identity of tax filers.[56]

The SOI designs its comprehensive cross-sectional sample of individual income tax returns to be an accurate statistical representation of all returns filed over a 12-month period. The public-use version of this database has a long, established history of providing policy researchers outside the Federal Government with an invaluable tool for studying the Federal individual income tax and the distribution of income. However, the public-use file has important limitations for analysts projecting the effects of proposed changes in the individual income tax.

These limitations include:

- *An absence of some key data fields needed to determine tax liability*. The SOI includes the majority of data fields from Form 1040 (and equivalent forms) in the public-use file. It also includes some of the most important data fields from the various schedules and forms supporting Form 1040. However, the public-use file does not provide all (or even most) of the data from Form 1040's supporting schedules and forms that are needed to calculate Federal tax liability. As a result, users of the public-use file simulating the effects of changes in the individual income tax must sometimes make inferences about missing values.

  For example, the public-use file includes the "Other income" line on Form 1040. However, data on foreign-earned income, a component of "Other Income," is not provided in the public-use file and cannot be calculated using data provided there.[57] Other examples of data fields excluded from the public-use file are the division of wages and salaries between spouses from Form W-2, deductions for home mortgage interest from Schedule A, and amounts for prior-year business losses and capital losses that are carried forward from Schedule D.

- *Not all records included in the public-use file represent tax returns filed for a common base year*. The vast majority of records in the public-use file represent tax returns filed for a common tax liability year. However, the sample excludes some returns that will be filed in future years as late returns, and it includes other returns that are filed for future, or differently defined, liability years.

For example, numerous prior-year returns are included because they were filed late. The dollar amounts on those prior-year returns are not inflation-adjusted, and their tax calculations reflect tax laws applying in the tax year for which the return was filed. The public-use file can also include a small number of returns that are filed by a decedent's estate for a subsequent tax year, and some tax returns that are filed on a fiscal-year, rather than a calendar-year, basis.

- *Uncertainty about the family structure for a small number of married separate returns*. Married separate returns are typically filed by individuals who are separated from their spouses. However, under certain circumstances, married couples can reduce their total tax liabilities by splitting their incomes and deductions and reporting them on separate returns. These tend to be cases where the couple can claim a large amount of itemized deductions relative to their incomes or where there are net tax losses.

  The public-use file does not indicate whether married separate returns are filed by individuals living with their spouses. However, married couples who are living together but filing separately often have very different characteristics from those couples with similar incomes who have separated and are now living apart and filing separately. Treating all married separate filers as individuals living on their own can produce misleading results.

- *The limited amount of nontax data included in the public-use file*. The public-use file provides some information about family structure based on filing status (married joint, single, etc.) and the number and types of exemptions and credits. However, it provides no information on demographic variables such as age or gender or on nontaxable sources of income such as most transfer payments to persons. It also excludes information on certain household characteristics useful to analysts simulating the effects of a change in the individual income tax. Such information includes employment characteristics, health care coverage, and the amount of retirement savings.

We address these limitations of the public-use file in various ways. For example, we impute missing values for itemized deductions, loss carry-forwards, and types of capital income using tabulated data (when available). We remove records for time periods other than the base year and adjust weights for the remaining records to compensate for tax returns that are filed for a different tax year. Some married separate returns for individuals living in the same household are statistically matched using information provided by statisticians at the SOI.[58]

Finally, we supplement tax return data with information on demographic variables and household characteristics. We do so by statistically matching the public-use file with household and demographic survey data from the CPS.[59] The result is the core base-year matched file which is used in the microsimulation model.

Primary Components of the Microsimulation Model. The microsimulation model consists of three primary components--the core base-year data, a Federal income tax and payroll-tax calculator, and an optimizing routine that ages (extrapolates) the core base-year data. The first component consists of tax return data and demographic data in the base year. The second component reads a data file and replicates the process of calculating individual income and payroll taxes in the base year and future years. The third component adjusts the base-year matched file to reflect projected changes in not only key demographic and economic aggregates but also the distribution of income.

We construct the core base-year data by combining tax return data from the public-use file with annual demographic survey data and household survey data from a special supplement of the March CPS[60] and other public-use microfiles.[61] The March CPS supplement includes additional detail about the amount and types of income flowing to households. In the March CPS, the Census Bureau also groups individuals into tax filing units and, for those it assumes file tax returns, imputes values for the Federal Adjusted Gross Income (AGI), the Federal tax liability, the earned income credit (EITC), and other tax-related variables. All person-level records in the CPS are assigned to a tax filing unit or are identified as being a nonfiler. We use these assignments to create synthetic CPS tax return records that include the imputed tax variables generated by the Census and other person-level data taken from the March CPS supplement. We also use information about the family structure to assign dependent filers to families.

Before conducting a statistical match of the SOI public-use file and the synthetic CPS tax records, we equalize sample weights within families in the CPS and between the SOI and CPS samples of tax returns. We adjust weights in the CPS samples to equalize the number of tax returns.

We equalize sample weights within families because some person-level records within the same family will have different sample weights. Assigning a common weight for all family members ensures that weighted aggregates are the same regardless of how the data are stratified. Thus, the same aggregate will be generated for reports that stratify by tax return characteristics and reports that stratify by family and person characteristics. This is particularly important because there can be multiple tax returns within the same family. In some instances, individuals will file their own tax returns but will be claimed as a

dependent on their parents' tax returns. In other instances, individuals may live with other family members but claim themselves on their own tax returns.

Once the sample wights have been adjusted, we produce an SOI and CPS matched file. That SOI and CPS matched file constitutes our core base-year data. CPS and SOI records are divided into partitions based on filing status, number of children at home, and types of income. Once each record is assigned to a partition, a constrained matching algorithm links each synthetic CPS tax return record to at least one record in the SOI public-use file. The matching algorithm accomplishes this by finding the set of record linkages that minimizes the sum of the differences between the SOI and CPS records within each partition.[62]

The matched file is a hierarchically structured database. It contains both family and person-level records populated with data from the CPS and tax return records populated with data from the SOI. The hierarchical file links persons to tax returns and tax returns to families. It also includes cross-links for individuals who file their own tax returns and are claimed as a dependent on another return. The married separate tax returns that were combined for purposes of the match are divided, and persons in the family are assigned to one of the two tax returns.

The second component of the microsimulation model is a Federal income tax and payroll tax calculator. The Federal tax calculator is one part of a three-part computer program that reads and links data into hierarchical units, computes tax liabilities, and generates output files. The first part of the program reads the matched file and stores data in a hierarchical memory structure. It can read and traverse the data structure for all the records for a single year. Alternatively, it can sequentially read data for each family (and the tax returns and persons in the family) for all years.

The second part of the program is the Federal income tax and payroll tax calculator. The tax calculator replicates the process of computing current-law individual income and payroll taxes in the base year and future years. It can also simulate the process of calculating individual taxes under different tax plans by changing year-specific input parameters used in the tax computations.

For example, the tax calculator parameters allow us to vary the tax rate applied to different types of taxable income. Individual income taxes are calculated using regular income tax rates, the AMT rates, and preferential rates on long-term net capital gain realizations and qualified dividend income (Schedule D). Projections of the wage-indexed maximum taxable income are used in conjunction with payroll tax rates to compute employment taxes on wages and salaries and self-employment income. The payroll tax rates include contributions for social insurance under both the Federal Insurance Contribution Act (FICA) and the Self-Employment Contributions Act (SECA).[63]

The third part of the tax calculator program reads a parameter file that specifies the column and row content of a report and accumulates and saves the output as a spreadsheet application. Spreadsheets are generated using a parameter input file and record-selection criteria.[64] An output routine produces separate worksheets documenting the economic and tax parameters used to produce the simulation.

The third major component of the microsimulation model is an optimizing routine that ages the core base-year data. The effects of tax law changes can be estimated using only the tax calculator and base-year data in the matched file. However, policymakers are generally interested in estimates of the budgetary effects of changes in taxes over the standard 10-year budget period. Base year data in the matched file must therefore be extrapolated to represent data for future tax returns. This is done by adjusting the weights and values on the matched file to reflect projected changes in key demographic and economic aggregates and the distribution of income.

The matched file is aged over not just the 10-year budget period but also a historical period beginning in the base year. The length of the historical period over which the matched file must be aged can be substantial for several reasons. There is a multiyear lag between the time tax returns are filed and when they are processed by the SOI and released as a public-use file. Statistically matching a newly released SOI public-use file with CPS data to produce a matched file requires additional time. In principle, we could ignore the historical period and only age the base year data to reflect the budget period. However, in practice, we prefer to adjust weights and values on the matched file over the historical period to test and calibrate the parameters used in the model.

We use several sources of data when aging the matched file over the historical period and the 10-year budget period. In years when historical tax data are available, the calibration process depends critically on data provided in several SOI publications.[65] These publications give the total number of tax returns filed and aggregate values for most of the income, deduction, credit, and tax liability variables included in the public-use file. The CPS in turn provides historical data on population growth, nontaxable income, and the number of nonfilers.[66]

In years when historical tax data from the SOI are unavailable, we use NIPA data to help age the matched file.[67] In the current year and every year in the 10-year budget period, we obtain projections of personal income and other economic and budgetary aggregates from the final CBO-like forecast produced using the Global Insight model. Other sources of information include IRS projections of the number of individual income tax returns filed[68] and Census Bureau projections of population by age and gender.[69]

Aging the Matched File To Reflect CBO's Baseline Projections. Aging the matched file involves four major steps. In each, we use an optimization routine to adjust the weights on the matched file to target historical values for, and projections of, tax and nontax variables in the microsimulation model. In the first step, we update all nominal income values on individual tax returns in the database. We also update all targets for demographic variables.

In the second step, we sequentially target four broad measures of individual income by percentile class. Total income is divided into wages and salaries, business income, noncapital gain investment income, and income from other sources. It encompasses both gross income reported on individual tax returns (gross tax return income) and nontaxable income reported on the CPS.[70] We base target values for both nontaxable income and the components of gross tax return income on NIPA measures of personal income from the final CBO-like forecast. For married couples, income from some sources is divided between spouses.

We use historical changes in incomes in the Panel Survey Income Dynamics (PSID) as the basis for aging total income for those taxpayers with positive incomes below the 95th percentile.[71] Specifically, longitudinal data from the PSID have been used to estimate the probability that income for persons with specific demographic and income characteristics will increase or decrease. PSID data are used to estimate the size of the relative change in income for each person. Equations used to calculate that relative change in total income include individual characteristics and key economic indicators.[72] They are applied to data at the individual level and aggregated to compute income targets by percentile.[73]

Unfortunately, the PSID cannot be used as a basis for reliably aging total income in the 95th percentile and higher. This is because the PSID sample does not include information for a sufficient number of individuals whose incomes place them in the upper 5 percent. Instead, we base targets for total incomes in the upper 5 percent on separate estimates of the income thresholds that define breakpoints for percentiles in the topmost income classes and the total amount of income in those classes. Those estimates use relationships between the topmost income classes and income data drawn from individual tax returns falling below the 95th percentile.[74]

In the third step, we target more detailed measures of the components of gross tax return income. Most of the targets are for components of NIPA personal income, with some important exceptions.[75] The sources of gross tax return income that are not included in NIPA personal income include: small business corporation (S corporation) net income, taxable pension and annuity income, net capital gains, and gains from the sale of other assets.[76] In 2003, income from sources not included in NIPA personal income accounted for over

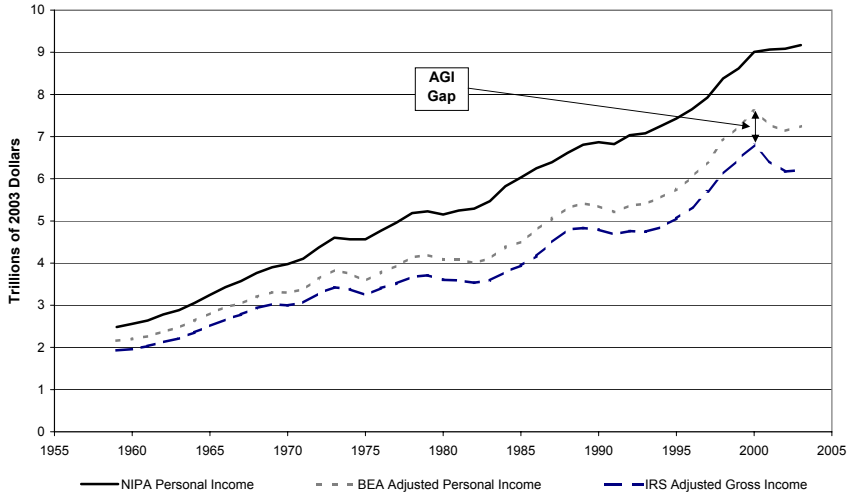
14 percent of gross tax return income.[77] However, between 1990 and 2003, it was responsible for over 40 percent of the year-over-year variation, according to one measure of annual changes in the income components of AGI.[78]

NIPA wage and salary income is the only component of NIPA taxable personal income for which CBO regularly publishes its baseline projection. CBO does not provide its baseline projection of the amount of wage and salary income in AGI.[79] It also typically does not make available its baseline projections for any other component of the tax base or for the total amount of gross tax return income reported by individuals on their tax returns.

As a result, we estimate the income targets used in calibrating the microsimulation model to CBO's baseline projections. We base our estimates on data from the final CBO-like forecast and the historical relationship between the components of NIPA personal income and gross tax return income. However, NIPA personal income and gross tax return income are defined differently and are constructed using data from different sources. Differences between the two income measures can be substantial. They can also change over time due to factors that affect definitional and reporting differences.

The BEA produces annual tables that compare the components of NIPA personal income to tax return income. Specifically, the tables identify and provide estimates for the adjustments needed to reconcile the differences between NIPA personal income and AGI. Those reconciliation adjustments are used to calculate an "adjusted" personal income that approximates AGI.

Figure 6. Real (Inflation-Adjusted) Total Income
Comparison of NIPA Personal Income and IRS Adjusted Gross Income (AGI)



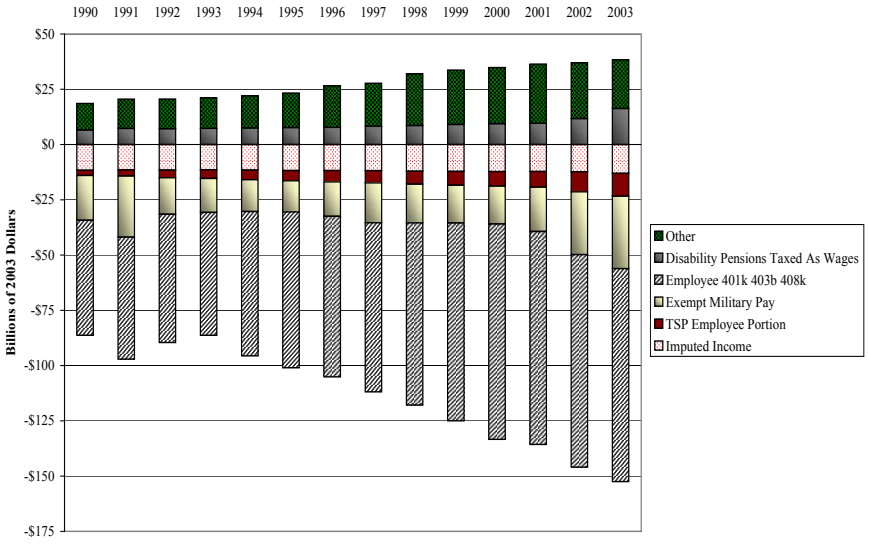
Notes: NIPA = national income and product accounts; BEA = Bureau of Economic Analysis; IRS = Internal Revenue Service.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

The difference remaining between adjusted personal income and AGI is called the "AGI gap." The total AGI gap for real adjusted personal income and inflation-adjusted AGI increased gradually between 1960 and 2000 (see Figure 6). It increased more rapidly between 2000 and 2003. However, the BEA's estimate of adjusted personal income captures most of the turning points in AGI. And differences between adjusted personal income and AGI are within ± 1.7 percent of the 12.3-percent mean difference for about two-thirds of the 45-year period shown in Figure 6.

The total AGI gap has been relatively constant in large part because the AGI gap for wage and salary income has been historically stable. The size of the total AGI gap is influenced by wage and salary income because wages and salaries account for the largest share of both personal income and AGI. In 2003, wages and salaries were over 53 percent of NIPA personal income before subtracting employee-paid social insurance contributions. They were almost 74 percent of gross tax return income in 2003 and over 86 percent of the components of NIPA personal income included in AGI.

The definitional differences between NIPA wage and salary income and wages and salaries included in gross tax return income are numerous (see Figure 7). The NIPA definition includes wages and salaries that are not taxable, such as

Figure 7. Components of Wage and Salary Adjustments In The NIPA - AGI Reconciliation

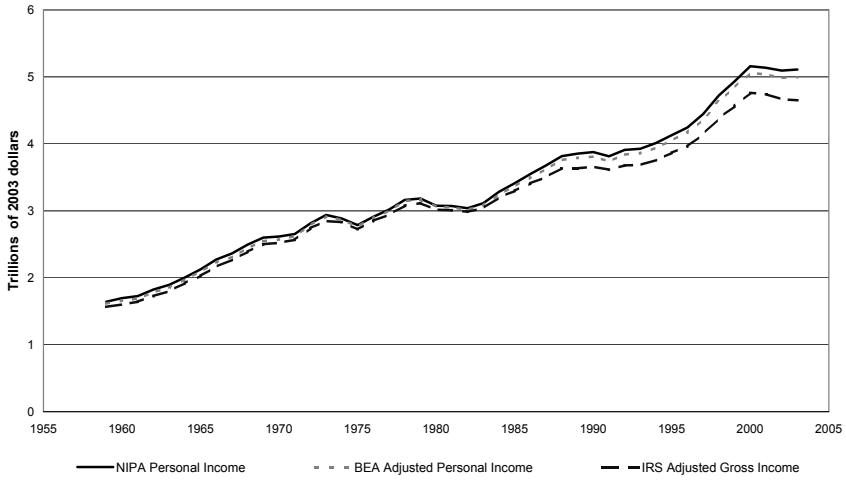


Notes: NIPA = national income and product accounts; AGI = adjusted gross income.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

(some or tax-exempt) payments to military personnel, employee contributions to retirement programs (401K accounts, 403B accounts, TSP plans, etc.), and imputed estimates for noncash income. It also includes earnings for individuals who do not file tax returns. However, it excludes income from disability pension plans and other sources included in taxable wages.

A comparison of the wage and salary components of adjusted personal income and IRS-reported AGI shows trends that are similar to those found in a comparison of total income (see Figure 8). For most of the period between 1960 and 2003, adjusted personal income moved in lock step with AGI wage and salary income, with a real mean overstatement of about 3.3 percent. As with total income, the AGI gap for wages and salaries in recent years has grown, in this case since 1996. By 2003, the adjusted personal income measure of wages and salaries overestimated its AGI equivalent by almost 7.5 percent,

Figure 8. Real (Inflation-Adjusted) Wage and Salary Income
Comparison of NIPA Personal Income and IRS Adjusted Gross Income



Notes: NIPA = national income and product accounts; BEA = Bureau of Economic Analysis; IRS = Internal Revenue Service.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

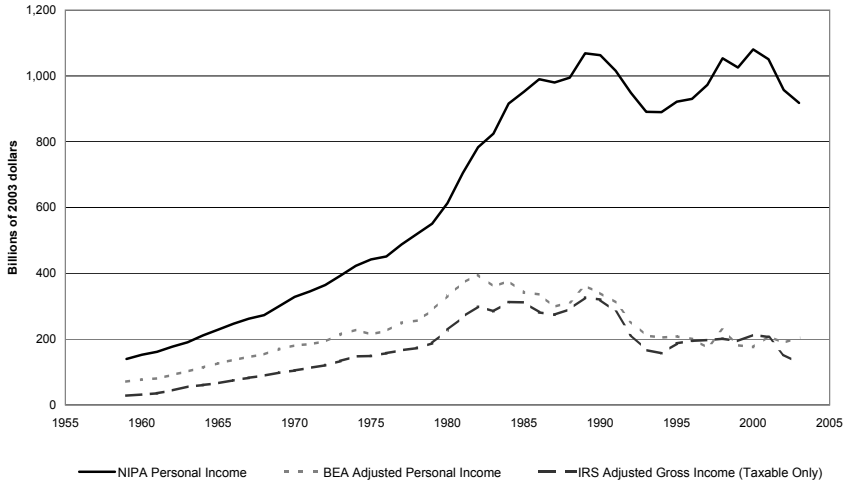
more than double the historical average. Nevertheless, we can derive a reasonably close relationship between NIPA and AGI wage and salary income by developing separate estimates for the reconciliation adjustments and the remaining AGI gap.[80]

In addition to being the largest component of NIPA personal income and AGI, wages and salaries constitute the greatest source of year-to-year variation in the NIPA-based portion of gross tax return income. For example, between 1990 and 2003, inflation-adjusted wages and salaries accounted for over 60 percent of the sum of annual absolute value changes in the income components of AGI that are also included in NIPA personal income.

Interest income is the second largest source of variation in the NIPA-based portion of AGI. Taxable interest accounted for around 15 percent of the absolute value of the inflation-adjusted annual change between 1990 and 2003. Unlike wages and salaries, the trend in interest income as measured in NIPA personal income is substantially different from the trend in interest income as measured in AGI. A large part of that difference may be attributed to the inclusion of imputed income in the NIPA--but not the AGI--measure of interest income. Imputed income comprised over 60 percent of NIPA personal interest in 2003.[81]

Even after subtracting imputed income and making other adjustments, some significant differences remain between the adjusted personal income measure of interest income and the AGI measure (see Figure 9). In general, the components of adjusted personal income, including interest income, are generally larger than the components of AGI. However, adjusted personal interest fell below the IRS measure in 1997 and 2000.

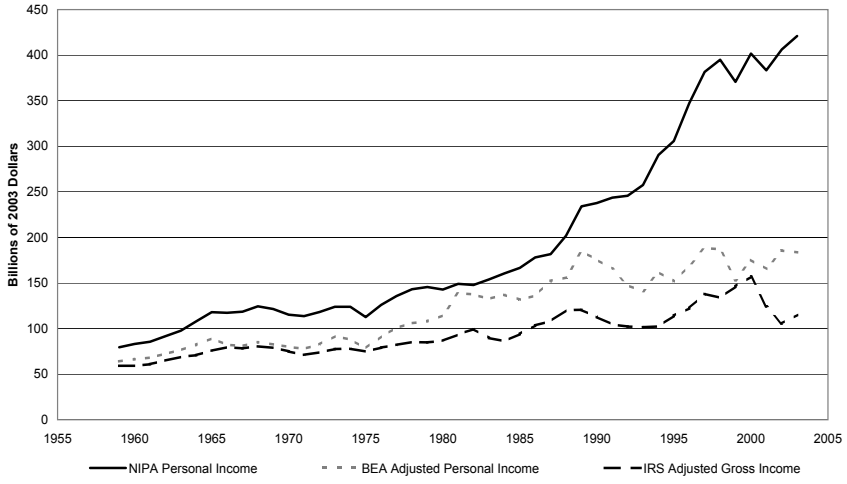
Figure 9. Real (Inflation-Adjusted) Interest Income
Comparison of NIPA Personal Income and IRS Adjusted Gross Income



Notes: NIPA = national income and product accounts; BEA = Bureau of Economic Analysis; IRS = Internal Revenue Service.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

Dividend income is the third largest source of annual variation in the NIPA-based income portion of AGI. Between 1990 and 2003, dividend income was responsible for over 6.5 percent of the absolute value of the inflation-adjusted annual change in the NIPA components of AGI. However, important differences exist between the NIPA and AGI definitions of dividend income. For example, some payments to the owners of small business corporations (S corporations) are included in personal dividend income but excluded from IRS dividends. Such definitional differences complicate estimation of the income targets needed to calibrate the microsimulation model.

Figure 10. Real (Inflation-Adjusted) Dividend Income
Comparison of NIPA Personal Income and IRS Adjusted Gross Income



Notes: NIPA = national income and product accounts; BEA = Bureau of Economic Analysis; IRS = Internal Revenue Service.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

Even after the reconciliation adjustments are taken into account, both the level and movement of dividends in gross tax return income and NIPA personal income are noticeably different (see Figure 10). For example, between 2001 and 2002, AGI dividends fell by over $18 billion while the adjusted personal income measure of dividends showed an increase of over $20 billion, in inflation-adjusted terms.

In general, a comparison of wage and salaries in adjusted personal income and AGI suggests a much closer relationship than evidenced for either interest income or dividend income. As a result, income estimates based on NIPA values are likely to be less accurate for the interest and dividend components of gross tax return income than they are for wages and salaries. Contributing to

any potential inaccuracies, the Global Insight model does not include variables that can be used to estimate the reconciliation adjustments made by BEA when comparing NIPA personal income and IRS-reported AGI.

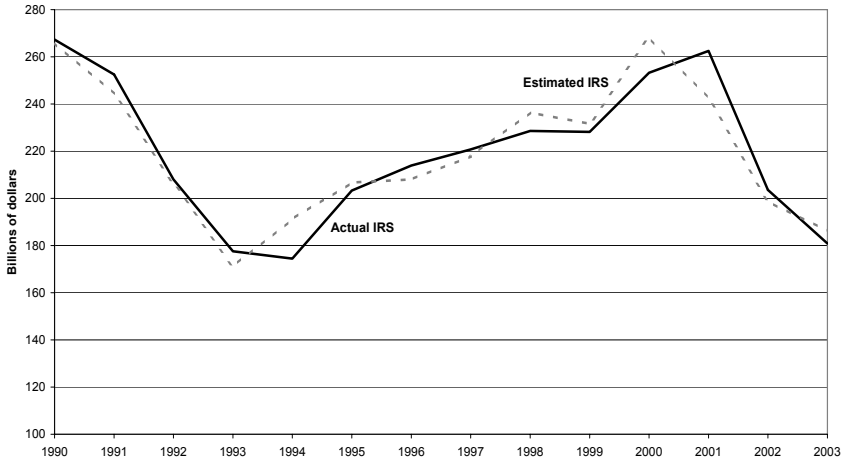
The effect of these limitations can be seen by comparing the actual amounts of gross tax return income and the estimated amounts obtained using a regression based on the historical relationships between the NIPA and tax measures. Most of the predicted amounts are close to their actual values. However, there are noticeable exceptions. For example, between 1993 and 1994, IRS interest income (including the nontaxable portion) was estimated to increase by roughly $20 billion to $191 billion (see Figure 11). Instead, actual IRS interest income fell by around $4 billion to $174 billion. Estimated dividend income in AGI and actual dividend income in AGI likewise diverged for several years between 1990 and 2003 (see Figure 12).

The paragraphs above discuss how we use NIPA data to estimate the amount of wage and salary income, dividend income, and interest income reported on tax returns. We use similar techniques to estimate other NIPA-based components of gross tax return income. Those components include proprietors' (farm and nonfarm) gains and net losses, income from rents and royalties, and income from trusts and estates. We also estimate net passthrough income from S corporations that is included in NIPA corporate profits.[82] Social Security income is introduced as a separate target because a portion of Social Security benefits are included in taxable income.

The sum of our forecasts of the components of NIPA-based income and non-NIPA-based income approximates the taxable income base that CBO uses to project Federal receipts from the individual income tax. CBO does not provide its projections for most of the components of gross tax return income. As a result, there can be differences between income amounts we use and those projected by CBO. We do not have any information about the size of those differences, or whether they even exist, until we calculate Federal revenues in the final step of the calibration process.

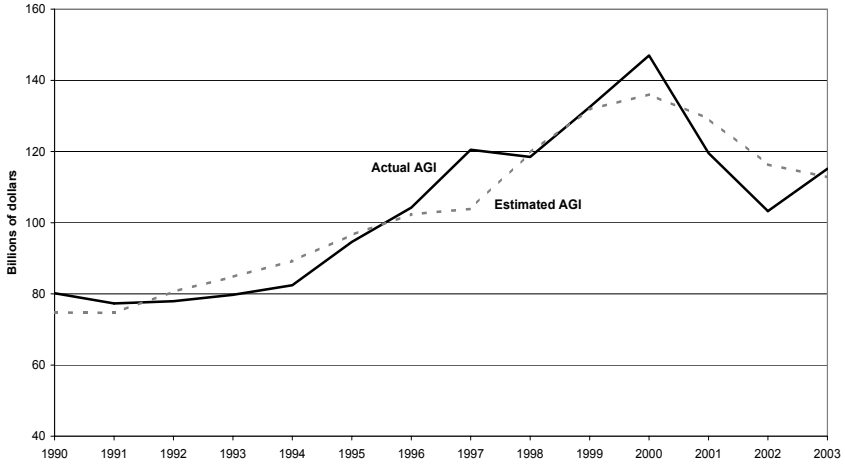
In the final step, we adjust a set of nonincome variables used to calculate taxes in the model and introduce additional distributional targets. The nonincome variables include itemized deductions and some statutory adjustments.[83] We compare CBO's projections of individual income tax collections with estimates of tax liability that are calculated by the microsimulation model and adjusted to reflect the timing of tax payments. Tax payments are divided into withholding, estimated payments, and final payments. The payments are aggregated to estimate fiscal year revenue collections. An additional adjustment is made to reflect payments for fees, penalties, and other collections. When there are material differences in the revenue projections, we modify our targets

Figure 11. Actual IRS Total Interest Income vs. Estimated IRS Total Interest Income



Notes: IRS = Internal Revenue Service.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

Figure 12. Acutal AGI Dividend Income vs. Estimated AGI Dividend Income



Notes: AGI = adjusted gross income.
Sources: The Heritage Foundation, Center for Data Analysis; U.S. Department of Commerce, Bureau of Economic Analysis.

for the distribution of gross tax return income by size of income and by marital filing status.

Adjustments may be needed because a large proportion of the total Federal income tax is paid by a relatively small proportion of taxpayers at the top end of the income distribution. Slight changes in assumptions about the number of tax returns in the top classes can produce significant changes in total revenue projections. We do not know CBO's projections for the distribution of income or tax collections by detailed income class. We therefore adjust targets for both distributional variables in the final stage of calibrating the model so that estimates of total income tax collections from the microsimulation model approximate CBO's published projections.[84]

Implications for Tax Policy Simulations

An integrated calibration of the macroeconomic and microsimulation models provides a consistent basis for conventional tax policy analysis. The final CBO-like forecast replicates CBO's published projections. It also includes projections of key components of NIPA personal income not typically published by CBO. The microsimulation model uses the final CBO-like forecast to generate current-law estimates of the Federal income tax over a 10-year period. It includes detailed estimates by income class of gross tax return income on individual tax returns and nontaxable income as reported on the CPS. Those estimates of taxable and nontaxable income are consistent with components of NIPA personal income obtained from the final CBO-like forecast.

Calibrating the Global Insight model and the microsimulation tax model to a common starting point also produces a consistent basis for dynamic policy analysis. This is because an integrated calibration allows us to make direct comparisons between dynamically and conventionally estimated changes in Federal income tax revenues. It also assures us that dynamic revenue estimates from the Global Insight model are broadly consistent with the microsimulation model's conventional estimates of revenue and distributional effects.

Our tax policy simulations broadly proceed in three separate steps once we have calibrated the Global Insight model and the microsimulation model to CBO's baseline projections.

First, we use the microsimulation model to obtain a conventional estimate of the revenue effects of a proposed change in tax policy. That proposed tax policy can involve a change in current-law Federal income tax rates or provisions or a change in the Federal personal income tax base. The microsimulation model is used to make a conventional estimate of the implied change in Federal income tax revenues. It also produces estimates of marginal tax rates

on three types of income--ordinary income, long-term capital gain realizations, and dividend income--under the proposed policy.

Second, we use the Global Insight model to estimate the dynamic revenue effects of the same policy change. We use conventionally estimated changes in Federal tax revenues and marginal tax rates under current law and the proposed policy as inputs in a simulation with the Global Insight model. That simulation produces an alternative to the CBO-like baseline forecast. That alternative (nonbaseline) forecast includes the dynamic effects of the proposed policy on GDP, prices, interest rates, employment, and personal and corporate incomes, among other variables. Revenue feedbacks can be calculated as the difference between the dynamically estimated change in Federal income tax revenues from the Global Insight model and the conventionally estimated change in the same from the microsimulation model.

Third, we update the microsimulation model to reflect the dynamic effects of the proposed tax policy on individual income. We update individual income in the microsimulation model using similar procedures developed for baseline calibration. Thus, NIPA components of personal and corporate income along with price-level variables and some NIPA budget variables from the alternative forecast are used to estimate target values for gross tax return income on individual income tax returns and nontaxable income reported on the CPS. We use those targets to set individual income in the microsimulation model so that they are consistent with the Global Insight model's alternative forecast for the components of NIPA personal income.

We compare dynamically and conventionally estimated changes in Federal tax revenues when evaluating results from the Global Insight model and the microsimulation model.[85] We consider the tax-policy simulation complete if differences between the Global Insight model's dynamically estimated changes and the microsimulation model's conventionally estimated changes in Federal tax revenues can be accounted for by initial differences in the Federal personal income tax bases in the two models.

In practice, we regularly calibrate both the Global Insight model and the microsimulation model to CBO's baseline projections. We also regularly use the calibrated macroeconomic and microsimulation models to analyze a variety of tax proposals. In some instances, tax data in the microsimulation model provide a "stand-alone" conventional revenue estimate. In other instances, the conventional revenue estimate is input into the Global Insight model to generate a "first-round" dynamic estimate of the economic and budgetary effects of the tax proposal. For a handful of major tax proposals, we have used the "first-round" dynamic estimate to re-age the matched file to reflect the new alternative forecast from the Global Insight model. When we have done so, we have iterated between the Global Insight model and the microsimulation model until the two models have produced similar revenue results.[86]

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Endnotes

[1] The methodologies, assumptions, conclusions, and opinions presented here have not been endorsed by and do not necessarily reflect the views of the owners of the Global Insight model or their employees. Fortune 500 companies and numerous Government agencies use Global Insight's short-term U.S. Macroeconomic Model to forecast how changes in the economy and in public policy are likely to affect major economic indicators. The Global Insight model is calibrated to, and used to forecast, national income and product accounts (NIPA) economic and budgetary data. CBO's baseline projections include short-term forecasts and medium-term projections of largely the same economic and budgetary variables.

[2] See Joint Committee on Taxation (2005) for additional details.

[3] Even these rankings will be problematic if they are sensitive to assumptions in the baseline that are contrary to current economic conditions.

[4] See CBO (2006) and previous releases of CBO's *The Budget and Economic Outlook* for additional details on CBO's procedures for projecting Federal revenues and spending beyond 1 year under current-law assumptions. See Williams (2005b) for a summary of the rules governing CBO's current-law Federal budget baseline.

[5] Under JGTRRA, individual long-term net capital gain realizations and qualified dividend income are taxed at preferential rates. Taxpayers with taxable income in the lowest two tax brackets pay a 5-percent tax rate on capital gains and dividend income through 2007 and a 0-percent tax rate on capital gains and dividend income in 2008. Taxpayers with taxable income in all other tax brackets pay a 15-percent tax rate on capital gains and dividend income through 2008. JGTRRA's preferential tax

rates on capital gains and dividend income were set to expire at the end of Calendar Year 2008. The Tax Increase Prevention and Reconciliation Act of 2005 extends JGTRRA's preferential rate structure through the end of 2010. Taxes on both types of capital income will revert to their pre-JGTRRA levels in 2011. This means that, with no further extensions, dividend income will be taxed at ordinary income tax rates, while capital gains realizations will be taxed at a pre-JGTRRA maximum rates of 10 percent and 20 percent.

[6] Those tax relief provisions in EGTRRA that are expiring in 2010 include the reduction in marginal tax rates on the top two income tax brackets, the new 10-percent income tax bracket, the $1,000 child tax credit, and the phaseout of the estate tax. See Joint Committee on Taxation (2001) for additional information.

[7] "Budget period" here refers to the time horizon used either to project baseline, current-law revenues or to estimate the revenue effects of a change in current law. A 10-year period is standard in the Federal budget process.

[8] CBO (2006, pp. 65-74) projects that education, training, and employment; transportation; health research and public health; and income security (primarily housing and food assistance programs) will account for over half of nondefense discretionary spending in 2006.

[9] Supplemental appropriations typically provide budget authority in response to events not anticipated during the regular budget cycle (CBO, 2006, pp. 69-70). Supplemental appropriations in Fiscal Year 2005 totaled $157 billion. They included $82 billion for defense and tsunami relief (the 2005 Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief) and $62 billion in response to Hurricanes Katrina and Rita. Section 257 of the Balanced Budget and Emergency Deficit Control Act of 1985 sets the rules covering CBO's treatment of discretionary spending and supplemental appropriations in a current-law baseline.

[10] See Williams (2005b).

[11] CBO's 2-year economic forecasting record compares favorably to that of the *Blue Chip* consensus and the Office of Management and Budget (OMB). See Williams (2005a) for a recent analysis of CBO's economic forecasting record.

[12] See CBO (2003, pp. 38-41).

[13] See CBO (2003, pp. 25-26, 29-36).

[14] CBO's growth model is an enhanced version of the model developed by Robert Solow. Arnold (2001, 2004) provides additional details.

[15] See CBO (2006, Table E-1, p. 136).

[16] Throughout this paper, we compare CBO's baseline economic and budgetary projections to Global Insight's (standard) February 2006 short-term U.S. Macroeconomic forecast. This is because the latter is used as a starting point (control forecast) in constructing a CBO-like forecast from the Global Insight model. See Global Insight (2006) for additional details on GI's February 2006 forecast. A subscription is required to download Global Insight's February 2006 U.S. Economic Outlook.

[17] See Brauer (2004).

[18] See Williams (2005b) and Dennis (2004).

[19] See Global Insight (2006, pp. 53-59). A subscription is required to download Global Insight's February 2006 *US Economic Outlook*.

[20] Specifically, NIPA Federal defense spending declined at an annual rate of 12.7 percent in the fourth quarter of 2005 after expanding at an annual rate of almost 13.9 percent in the third quarter of the same year.

[21] Congress did not approve the Fiscal Year 2006 defense spending appropriations bill until December 21, 2005.

[22] In fact, CBO (2006, p. 37) expects Federal military purchase to slow under current law in 2007.

[23] Brian Bethune, Director of Financial Economics in Global Insight's U.S. Macroeconomics Group, provided information on GI's baseline assumptions for Federal defense spending.

[24] For 2006, CBO (2006, Box 2-2, pp. 34-35) put the applicable ERISA discount rate at 5.15 percent and DB contributions at $185 billion. Had PFEA been extended, a maximum applicable discount rate of 5.75 percent would have applied under CBO's baseline projections. At that higher discount rate, DB contributions would have totaled only $135 billion.

[25] Brian Bethune, Director of Financial Economics in Global Insight's U.S. Macroeconomics Group, provided information on the extent to which GI's projections of corporate (book) profits reflect PFEA's expiration.

[26] GI's February 2006 U.S. Macroeconomic forecast is used as the control because it was prepared over roughly the same time period as CBO's

January 2006 baseline projections. Using a control forecast prepared over roughly the same time period is particularly important if the BEA revises the NIPA data. For CBO's January 2006 baseline projections, either GI's December 2005 forecast or its January 2006 forecast might have made a better choice for the control. However, we selected the February 2006 forecast because it was the first to include 2016 in the 10-year forecast horizon.

[27] CBO (2006, Appendix D, pp. 125-134) and Russek (2005) provide a single crosswalk table summarizing the coverage, netting, and timing differences between total unified Federal budget aggregates (revenues, outlays, and surpluses) and total NIPA Federal budget aggregates (receipts, expenditures, and net Government saving). The structure of that crosswalk table is similar to Tables 4 and 5 in Mandel and Roy (2006).

[28] NIPA taxable personal income is the sum of NIPA wage and salary income, personal interest income, personal rental income, personal dividend income, and proprietors' income (farm and nonfarm).

[29] The exception is CBO's estimate for the natural rate of unemployment, which also equals CBO's medium-term projection of the unemployment rate. In January 2006, CBO (2006, Chapter 2, p. 43) put the natural rate of unemployment at 5.2 percent.

[30] See CBO (2005, Chapter 2, pp. 37-41).

[31] See CBO (2006, Chapter 2, p. 39).

[32] See CBO (2005, Chapter 2, pp. 36).

[33] See CBO (2006, Chapter 2, p. 41).

[34] Specifically, Figures 4 and 5 reorganize NIPA data into a simple social accounting framework. Although generally used most extensively in input-output analysis and computable general equilibrium modeling, a social accounting framework underlies all systems of national accounts. See United Nations (1993) for additional details.

[35] The microsimulation model also requires targets for types of individual income that are not included in NIPA personal income.

[36] For its August 2006 economic and budgetary projections, CBO published a separate background paper (Mascaro, 2006) discussing how it forecasts the components of gross domestic income. This is the first time CBO has published details about its methodology for forecasting NIPA income variables.

[37] See CBO (2006, Table 4-4, p. 92).

[38] The appendix to an earlier, unpublished draft of this paper shows how closely the final CBO-like forecast reproduces key economic-and-budgetary projections published by CBO. It also details the implications of those projections for components of GDP and NIPA taxable personal income. The appendix is available on request.

[39] Global Insight provided a detailed outline of a methodology for calibrating the GI model to CBO's baseline projections. We created a series of AREMOS programs based on that outline, making adjustments and additions to GI's basic methodology where appropriate. AREMOS is Global Insight's proprietary econometric analysis and modeling software.

[40] Unless otherwise indicated, projections of all Federal outlay variables are taken from Table D-1 and Table D-2 of CBO (2006, Appendix D, pp. 128-129, 133).

[41] CBO's baseline projection of Federal net investment is labeled "Treatment of investment and depreciation" in Table D-1 of CBO (2006, Appendix D, pp. 128-139). It is part of the total difference between NIPA and unified Federal outlays.

[42] See CBO (2006, Table 3-1, p. 52) and NIPA Table 3.12 (U.S. Department of Commerce, 2006).

[43] For example, in January 2006, CBO (2006, p. 33) forecast that "real consumer spending will grow at a 3.5-percent rate this year and in 2007."

[44] See CBO (2006, Table 2-2, p. 44). For the nonfarm business sector, CBO also publishes medium-term projections of annual average rates of growth in potential hours worked and potential capital. We have not yet exploited these additional published projections in calibrating the Global Insight model to CBO's current-law baseline.

[45] CBO published historical estimates of potential output since 1950, along with projections of potential output through 2011 in Arnold (2001).

[46] See CBO (2006, Table 4-3, p. 86). CBO typically does not publish projections of NIPA taxable personal income in its August update.

[47] The appendix to an earlier, unpublished draft of this paper shows the implications of CBO's baseline economic-and-budgetary projections for the personal saving rate. The appendix is available on request.

[48] Contributions for Federal social insurance are an important component of NIPA Federal tax receipts. We set contributions for Federal social insurance to be consistent with CBO's baseline revenue projections in step 1. We do so by calculating the Federal social insurance tax rate as the divisor of CBO's projections of Federal social insurance tax receipts and wage and salary income.

[49] See CBO (2006, Table 4-4, p. 92) for CBO's projections of individual capital gain realizations.

[50] See Petrick (2002) for additional information on how BEA estimates corporate profits in the NIPA.

[51] Specifically, the Global Insight model defines corporate (book) profits as GNP net of, among other variables, consumption of fixed capital (corporate and noncorporate), taxes on production and imports (Federal as well as State and local), transfer payments by businesses, interest payments by businesses, employer-paid payroll taxes, fringe benefits, wage and salary incomes, proprietors' incomes, and personal rental income.

[52] We calculate average effective Federal tax rates on personal and corporate incomes as the divisor of CBO's projections of Federal personal and corporate income tax revenues and our projections of the Federal personal and corporate income tax bases.

[53] Before imposing targets for either publicly-held Federal debt or net Federal interest payments, we adjust individual components of Federal spending so that only gross Federal interest payments account for any deviation in the CBO-like forecast from CBO's published projections of NIPA Federal spending.

[54] Federal income on assets is the sum of Federal interest income and Federal rent and royalty receipts. We calculate net Federal interest payments as the difference between gross Federal interest payments and Federal interest income.

[55] See Weber (2004) for information on the most recent (2001) Public-Use Tax File. SOI has issued public-use files for almost every year since 1960.

[56] Data fields here refer to individual lines on IRS Form 1040 and on supporting schedules and forms.

[57] However, tables published by the IRS do show aggregate amounts of foreign-earned income within the adjusted gross income classes. For

additional details, see Table 1-4 (Individual Income Tax, All Returns: Sources of Income, Adjustments, and Tax Items, by Size of Adjusted Gross Income) of IRS (2005) at http://www.irs.gov/pub/irs-soi/03in14ar.xls.

[58] For example, see Sailer and Weber (1996).

[59] The CPS is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics (BLS). The CPS provides estimates of employment, earnings, hours of work, and other labor force characteristics by a variety of demographic characteristics, including age, gender, and race. Supplemental questions to the CPS provide additional information on education, health, and employee benefits. For a general overview of the design and methodology of the CPS, see U.S. Census Bureau and BLS (2002). For a general overview of the Annual Demographic Survey (March CPS Supplement), see http://www.bls.census.gov/cps/ads/adsmain.htm.

[60] See U.S. Census Bureau (2005) for additional information. The Census Bureau now calls the special supplement of the March CPS the CPS ASEC, although it is still widely referred to as the March CPS supplement.

[61] The SOI and CPS matched file constitutes the core base-year data used in the microsimulation model. However, data from other sources including the Survey of Consumer Finance (SCF) and the Consumer Expenditure Survey (CEX) provide additional information used in the microsimulation model.

[62] The matching algorithm searches for the combination of CPS and SOI records that minimizes differences for a set of variables found on both files. These variables include sources of income, the presence and relative size of income components common to the SOI and CPS, and marginal statutory tax rates. A normalized Z score is used to take into account differences in the distribution of income (by source) on SOI and CPS records. Adjustments are also made for income that is top-coded on the CPS and for differences in the number of records that contain nonzero values. A separate search is performed within each partition. In some instances, minimizing the overall difference within a partition requires that a record be split so that multiple copies are produced. For example, a CPS record might be duplicated and then matched with two separate SOI records. If this occurs, the weights are modified so that

they sum to the prematched total. In addition, the algorithm ensures that the weights for records within the same family will be equal even when the returns are in different partitions.

[63] For married couples, CPS data are used to allocate payroll taxes between spouses.

[64] The parameter input file specifies a set of variables (or equations incorporating variables) to be included in the report. The selection criteria allow the data by record characteristics to be summarized by tax year, size of income, and a wide combination of tax return characteristics.

[65] Two of the most important publications are SOI's (annual) Publication 1304 reports (IRS, 2005) and an SOI report giving the percentile distribution of AGI and tax generated for individual income tax returns (Mudry and Parisi, Table 5, 2006). We also rely on *SOI Bulletin* articles on partnerships (Wheeler and Shumofsky, 2005), S corporations (Luttrell, 2005), and sole proprietorships (Pierce, 2005).

[66] The CPS also provides historical population data.

[67] NIPA income data are available with less of a lag than tax return data published by the SOI.

[68] For example, see Hussain (2006).

[69] See U.S. Census Bureau (2006).

[70] Gross tax return income here refers to a broad income measure that approximates the Internal Revenue Code's definition of gross income reported on Form 1040.

[71] For additional information on the PSID, see http://www.psidonline.isr.umich.edu/.

[72] Individual characteristics here include age, sex, marital status, share of income by type, and the level of income. Key economic indicators include GDP and employment.

[73] Income data taken from the tax returns are first disaggregated to the person level and then used to compute income targets by percentile.

[74] Income targets for those with negative Federal AGI are estimated using both projections of losses in the current year and losses carried forward from prior years.

[75] In estimating detailed personal income targets, we rely on unpublished detailed tables comparing the components of Personal Income

and Adjusted Gross Income. Those tables are available from BEA on request. We refer to them here as the "AGI Personal Income 1959-2003" workbook. We also rely on annual *Survey of Current Business* articles describing the major categories used to reconcile the differences between NIPA personal income and IRS Federal adjusted gross income. Ledbetter (2004) provides additional details. For a summary of a recent reconciliation of NIPA personal income and IRS Federal AGI, see NIPA Table 7.19 (U.S. Department of Commerce, 2005). Table 7.19 appears periodically in the *Survey of Current Business*.

[76] We obtain historical values for, and projections of, capital gain realizations from, CBO (2006, Table 4-4, p. 92). We develop independent estimates for the remaining non-NIPA sources of personal income.

[77] This percentage includes income from S corporations which is not included in NIPA personal income but is included in corporate profits. S corporation income accounted for about 2.4 percent of gross tax return income in 2003.

[78] Non-NIPA income components account for about 41.3 percent of the sum of the absolute value of inflation-adjusted annual changes in the components of tax return income between 1990 and 2003. This excludes net S corporation income although a portion of this income is included in the NIPA measure of personal divident income. These and the remaining calculations in this section are based on data from the "AGI Personal Income 1959-2003" workbook and the authors' calculations.

[79] A CBO background paper (Mascaro, 2006) discusses how CBO forecasts the components of NIPA gross domestic income for its August 2006 economic and budgetary projections. However, that paper does not include details about CBO's methodology for linking forecasted NIPA income with measures of gross tax return income.

[80] For 1990 through 2003, the adjusted R squared is 0.985 for a standard OLS estimate of the relationship between the reconciliation adjustment and the NIPA values of wages and salaries and military pay. The adjusted R squared is 0.988 for an OLS estimate of the relationship between the AGI gap for wage and salary income and NIPA wages and salaries and military pay.

[81] The two imputations are for investment income that is retained by life insurance carriers and pension plans and services that noninsurance financial intermediaries provide without payment (Ledbetter, 2004).

[82] NIPA does not separately report the sum of gains and losses for sole proprietorships or other businesses. Losses are instead added to gains to derive an aggregate net amount of proprietorship income. This is problematic for purposes of estimating Government revenues because taxes are only paid on positive income. We therefore use IRS data to estimate the historical relationship between the aggregate amount of proprietors' income and the amount of net gains and losses.

[83] We estimate growth rates to age many of these nonincome variables.

[84] More specifically, we target Federal individual income tax revenues that have been adjusted to reflect definitional and timing differences between the tax liability reported on tax returns and CBO's published revenue collections.

[85] We isolate changes in Federal personal income tax revenues and Federal corporate income tax revenues when comparing budgetary projections from the Global Insight model and the microsimulation model.

[86] For example, see Foertsch and Rector (2007).

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Table 1. CBO's January 2006 Baseline Economic and Budgetary Projections Used in Constructing the CBO-Like Baseline Forecast

All Baseline Economic Projections	
Nominal GDP	Billions of Dollars
Nominal GDP	Percentage Change
Real GDP	Percentage Change
GDP Price Index	Percentage Change
Consumer Price Index, All Urban Consumers	Percentage Change
Core Consumer Price Index	Percentage Change
Unemployment Rate	Percent
Three-Month Treasury Bill Rate	Percent
Ten-Year Treasury Note Rate	Percent
Corporate Book Profits	Billions of Dollars
Wages and Salaries	Billions of Dollars
Potential GDP	Average Annual Growth Rate
Potential Labor Force	Average Annual Growth Rate
Selected Baseline Budgetary Projections (Billions of Dollars)	
Federal Expenditures/Outlays	**Federal Receipts/Revenues**
Consumption Expenditures	*Current Tax Receipts*
Defense Consumption of Fixed Capital	Taxes from ROW
Non-defense Consumption of Fixed Capital	Taxes on Production and Imports
Defense Consumption	Personal Income Tax Receipts
Non-defense Consumption	Corporate Income Tax Receipts
Gross Investment	*Contributions for Government Social Insurance*
Federal Net Investment (defense and non-defense combined)	Social Insurance Tax Receipts
Transfer Payments	*Other Current Receipts*
Social Security	Transfer Receipts
Medicare	Surpluses of Federal Government Sponsored Enterprises
Social Benefits to the ROW	Income on Assets
Medicaid	**Federal Interest Payments**
Grants-in-Aid to State and Local Governments	Gross Interest Payments
Other Transfer Payments to ROW	Publicly held Federal Debt
Subsidies	Debt Held by Government Accounts
Subsidies (agriculture, housing, all other combined)	Unified (Budget) Surpluses/Deficits
	Other Means of Financing Publicly Held Federal Debt
Federal Reconciliation Items	
Total Difference between NIPA expenditures and Unified Outlays	Total Difference between NIPA Receipts and Unified Revenues

Notes: CBO = Congressional Budget Office; NIPA = national income and product accounts; GI = Global Insight; ROW = rest of the world.

An earlier, unpublished draft of this paper includes more detailed notes to Table 1. Those notes are available upon request.

Sources: The Heritage Foundation, Center for Data Analysis, Congressional Budget Office.