

**U.S. TREASURY
DISTRIBUTIONAL ANALYSIS METHODOLOGY**

by

Julie-Anne Cronin*
U.S. Department of the Treasury

OTA Paper 85 September 1999

OTA Papers is an occasional series of reports on the research, models, and data sets developed to inform and improve Treasury's tax policy analysis. The papers are works in progress and subject to revision. Views and opinions expressed are those of the authors and do not necessarily represent official Treasury positions or policy. *OTA Papers* are distributed in order to document OTA analytic methods and data and invite discussion and suggestions for revision and improvement. Comments are welcome and should be directed to the authors.

Office of Tax Analysis
U.S. Department of the Treasury
Washington, DC 20220
julie.anne.cronin@do.treas.gov

* Financial Economist, Office of Tax Analysis (OTA). This paper describes a methodology which has been developed and refined over time and represents the efforts of many OTA economists. The paper greatly benefitted from comments by James Nunns, as well as those by Jon Talisman, Len Burman, Lowell Dworin, Jim Cilke, David Joulfaian, Laura Kalambokidis, Virginia Myers, Susan Nelson, Donald Rousslang, and Paul Smith.

Introduction

One of the principal tasks undertaken by the Treasury Department's Office of Tax Analysis (OTA) is the analysis of the distribution of tax burdens. OTA's distributional analyses show how proposed changes in tax law would affect the distribution of after-tax income across families. They provide policy makers with guidance on the "fairness" of proposed changes in tax law. Distributional analyses do not address economic efficiency, simplicity, or other important aspects of good tax policy.

A "fair" tax law is generally considered to be one under which individuals with equal abilities to pay taxes pay equal amounts, and individuals with greater abilities to pay taxes pay greater amounts. The controversy in measuring fairness begins with defining the personal attributes and resources that determine an individual's ability to pay and continues with the determination of which individuals are actually burdened by a tax. Economists generally recognize that a tax is not always borne by the entity or individual upon whom it is levied, but there is not universal agreement concerning the incidence of all taxes. Even if there were universal agreement on all the theoretical issues concerning distributional analysis, the practical implementation of the theory, including data and measurement issues, may lead to somewhat different rankings of ability to pay and measures of fairness.

Nonetheless, even though the quantitative results may not be perfect, the qualitative results of distributional analyses are still very informative, and are important to the decision-making process. Policy makers often want a general sense of how their proposed policies will affect the distribution of after-tax income. A tax law that is perceived as fair increases public support for and compliance with the law. Because distributional analysis frequently plays a significant role in the deliberation over tax proposals, it is important that the methodology for producing them be well-developed and well-understood.

This paper provides a detailed description of, as well as the rationale behind, Treasury's current distribution methodology.¹ It also offers some insight into why Treasury's distributional results sometimes differ from those of other government organizations, such as those produced by the Joint Committee on Taxation (JCT) and the Congressional Budget Office (CBO).² While the primary purpose of this paper is to inform the users of Treasury's distributional analyses, we also hope to further the discussion of distributional issues and elicit suggestions for further improvements to Treasury's methodology.

¹ The last formal description of Treasury's methodology is contained in Nunns (1995), but a number of technical improvements and extensions of Treasury's distribution methodology have been made since that paper was written.

² Non-government organizations which routinely produce distributional analyses include the Tax Foundation, Citizens for Tax Justice, and the Center on Budget and Policy Priorities.

1. Overview of Treasury’s Distribution Methodology

Distributional analysis has several components. The component choices affect the quantitative results of the analysis and, in some instances, the qualitative results as well. The major components of distributional analysis are: (i) the taxes included, (ii) the time period of analysis, (iii) the unit of analysis, (iv) the income measure, (v) the incidence assumptions, and (vi) the tax burden measures and presentation of results. This section provides an overview of Treasury’s component choices. Detailed descriptions are provided in sections 2 through 7. Treasury’s choices are guided by the objective of its distributional analyses, which is to show the annual change in total federal tax burdens between fully phased-in current law and fully phased-in proposed law for families classified by a broad income measure.

Taxes Included: All federal taxes are included in Treasury’s analyses: individual and corporate income taxes, payroll taxes, excises and customs duties, and estate and gift taxes. Estate and gift taxes and customs duties were added in 1998. The inclusion of all federal taxes is an improvement in Treasury’s methodology because it allows a comprehensive analysis of all proposed tax changes.

Time Period of Analysis: Treasury’s distributions are annual measures based on long-run, fully phased-in law but at income and demographic levels present in the succeeding calendar year (referred to as the “current” year). “Fully phased-in law” is generally the law as it will apply in real (inflation indexed) terms at the end of the Budget period. Proposed changes in tax law often include a mix of provisions: some temporary, some not indexed for inflation, some effective immediately, and others delayed or phased-in. Using fully phased-in law provides a measure of tax burdens under the law as it will operate at the end of the Budget planning horizon, which should most fully reflect the intended distributional consequences of legislation.

Unit of Analysis: The family is the unit of analysis. Treasury uses families, as opposed to individuals or tax returns, because families generally operate as an economic unit. The actions of one family member affect the resources and welfare of the entire family unit.

Income Measure: Treasury uses a broad-based, pre-tax post-transfer income measure referred to as Family Economic Income (FEI). Because it is a broad measure of income, FEI more effectively captures a family’s relative economic well-being than a measure that, for example, excludes some components of income such as nontaxable transfer income or employer-provided fringe benefits or income accruing in retirement accounts.

Incidence Assumptions: Treasury assumes the individual income tax is borne by payors, the corporate income tax by capital income generally, payroll taxes (employer and employee shares) by labor income, and estate and gift taxes by decedents. Excise on purchases by businesses and customs duties are assumed to be borne by labor and capital income. Excises on purchases by consumers are assumed to be borne in proportion to relative consumption of the taxed good as well as by labor and capital income.

Tax Burden Measures and Presentation of Results: Treasury distribution tables show families ranked by income quintiles. Quintile distributions have the advantage of separating the issue of rank from absolute income levels, thereby making it easier to compare Treasury's distributions with those prepared by other organizations using differing income concepts. The tax burden measures included for each income class are: (i) the average change in tax burdens; (ii) the total change in tax burdens; (iii) the share of the total change in tax burdens; (iv) the percentage change in tax burdens; and (v) the percentage change in after-tax income. Of these, the last is the best measure of the change in a family's well-being.

The remainder of this paper describes each component of Treasury's distribution methodology in greater detail.

2. Taxes Included

Generally, from the 1960s (when computer micro-simulation models were first used) through the mid-1980s, Treasury only included individual income taxes in its distributions.³ Since 1990, Treasury has included individual and corporate income taxes, payroll taxes, and excise taxes in its distribution tables. Customs duties and estate and gift taxes were added in 1998. The individual income tax represents the largest share of the total federal tax burden (47 percent at 2000 income levels), followed by payroll taxes (37 percent), the corporate income tax (11 percent), excises (including customs duties) (4 percent), and estate and gift taxes (1 percent).

Including all federal taxes allows Treasury to measure the total federal tax burden and to analyze the distributional effect of a proposed change to any federal tax. As will be seen in Section 6, the distribution of tax burdens for the various federal taxes is not the same. As a result, omitting one or more taxes could affect the qualitative as well as the quantitative results drawn from a tax burden analysis. For example, the federal tax burden on the lowest income quintile is primarily due to the payroll tax. An analysis which omitted the payroll tax would yield the incorrect conclusion that the poor, on average, bear no federal tax burden.⁴ Likewise, an analysis which did not include the corporate income tax would underestimate the progressivity of the current federal tax law.

As explained below, the term tax burden as used in this paper generally refers only to tax liabilities. Treasury's measured tax burdens do not include the indirect costs of taxation such as losses in consumer and producer surplus and the cost of complying with and administering taxes. However, where possible, the effects of tax changes on consumer surplus are included (see section 6.1).

³ Exceptions, all of which involve the inclusion of the corporate income tax as well as the individual income tax, include Treasury's *Blueprints for Basic Tax Reform* (1977), Treasury's *Tax Reform for Fairness, Simplicity, and Economic Growth, volume 1 (Treasury I)* (1984), and Nelson (1987).

⁴ Treasury distribution tables do not offset the burden of payroll taxes by the present value of future benefits. Contributions are treated as taxes and distributions are treated as transfers.

3. Time Period of Analysis

Baseline tax burdens are measured by tax liabilities in the succeeding calendar year (also referred to as the “current year”), as estimated by Treasury in the preparation of tax receipt forecasts for the Budget. Estimated liabilities are then adjusted to reflect the tax law as it would be in effect in the last year of the ten-year budget window. Specifically, expiring provisions are removed from the baseline,⁵ and end-of-the-budget-period tax parameters are adjusted for inflation.⁶

Treasury’s measure of proposed changes to current law are likewise measured in current year dollars but assuming the proposal is fully phased-in. As a result, Treasury does not typically include in its distribution tables any provisions which are due to expire before the end of the budget period. However, in cases where the major provisions of a tax bill expire prior to the end of the Budget period, the proposal is evaluated as if the provisions remained in effect.

In general, Treasury’s methodology does not differentiate among proposals with different phase-in periods; only the value of the tax parameters in the last year of the budget period are reflected in Treasury analyses. Tax parameters are deflated from their end-of-the-budget-period value to their real value in current year dollars. For example, a calendar year 1999 proposal that included an unindexed credit valued at \$500 in 2009 would have a real value of only \$408 in 2000 dollars.⁷

Table 1: Tax Burdens at 2000 Income Levels¹

	<u>2000 Law</u>	<u>2009 Law</u>
	(\$B)	(\$B)
Individual Income Tax	\$ 835	\$ 853
Corporate Income Tax	\$ 187	\$ 190
Payroll Tax	\$ 645	\$ 662
Excises and Customs Duties	\$ 86	\$ 76
Estate and Gift Taxes	<u>\$ 29</u>	<u>\$ 26</u>
Total	\$ 1,781	\$ 1,807

Table 1 compares, at 2000 income levels for each federal tax, tax burdens measured under 2000 law and those measured under 2009 law. The adjustment (from 2000 law to 2009 law) to the individual income tax primarily reflects the effect of unindexed provisions, while the adjustment to the corporate income tax reflects the expiration of the Puerto Rico economic activity and possessions tax credits in 2005. The 2009 law payroll tax burden is higher

1. Tax law as of August 1999.

⁵ There is one automatic exception to the expiring provision rule. As mandated by the 1990 Budget Act, taxes dedicated to trust funds (e.g. the Highway Trust Fund) are assumed to be extended for budget score keeping purposes. Revenue from dedicated excise are automatically included in Treasury receipt forecasts and the distribution baseline, and proposals to extend these excises are neither scored nor distributed.

⁶ The (Budget forecast) CPI-U is used to deflate parameters. Prior to 1996, Treasury used a 5-year budget window and current-law parameters were not deflated from the end-of-the-budget window.

⁷ The FY2000 Budget forecast for the CPI-U deflator in 2000 is 170.6 and in 2009 is 209.3 (170.6/209.3=.815).

because the wage cap on the OASDI portion of the payroll tax grows with average wages, which are expected to rise faster than inflation. 2009 law excises are lower because many excises are unit taxes which are not indexed for inflation. The estate tax burden is lower under 2009 law because the increase in the unified credit enacted by TRA97 is phasing in over the budget period.

Treasury's distribution tables show the distribution of tax burdens for the current population, given current income levels, but assuming fully phased-in law. One alternative to this methodology would be to use current-year tax law. Given the nature of proposed law changes, many of which are temporary, or have long phase-in periods or unindexed parameters, it is not clear that distributing changes in current-year tax burdens would accurately capture the distributional impact of a proposal. For example, most of the major proposals in the Taxpayer Relief Act of 1997 (including the new child credit, both new education credits, the reduction in the capital gains rate and the increase in the unified credit for the estate tax) were subject to phase-in periods of varying lengths, and several key parameters were not indexed for inflation.

4. Unit of Analysis

In order to measure the distribution of tax burdens, units must be ranked from the least well-off to the most well-off. The income measure, described in the following section, is one crucial aspect of a proper ranking. The unit of analysis is also very important. Treasury uses families as the unit of analysis. This choice is based on the observation that families generally operate as an economic unit, making common decisions and sharing resources.

Treasury uses a family definition similar to that of the Census Bureau's Current Population Survey (CPS). Treasury's family includes the taxpayer, and his or her spouse and dependents (if any) living in the same household.⁸ A family may include two or more income tax filing units. All families are included, whether or not any member of the family files an income tax return. Dependents, along with their income, are attached to their larger family unit. Single (non-dependent) individuals are considered one-person families. The economic incomes of all members of a family are added together to compute the family's FEI.

When ranking families, Treasury does not make an adjustment for family size.⁹ A family of four with an income of \$50,000 is ranked the same as a family of one with an income of \$50,000. By not adjusting for family size, one could argue that Treasury is making the implicit assumption that families

⁸ Dependent college students living away from home are considered members of CPS and Treasury families.

⁹ The JCT likewise does not adjust for the number of persons associated with a tax return. In contrast, the CBO and the Organization of Economic Cooperation and Development (OECD) have adjusted for unit size in some of their distributional analyses. The CBO has divided each family's income by the poverty threshold for a family of its respective size (Kasten and Toder, 1995). The OECD has adjusted household income by dividing by the square root of the number of persons in the household (OECD, 1997).

benefit from perfect returns to scale; that is, the addition of a family member without additional income does not affect the family's well-being. One alternative would be to rank units on a per capita basis by dividing family income by family size. This is equivalent to assuming that there are no returns to scale from living within a family unit. A family of four with an income of \$100,000 would be ranked equivalently to a family of one with an income of \$25,000. It is not clear whether the qualitative results of distributional analyses would be significantly affected by family size adjustments.

5. Family Economic Income

Central to the measurement of the distribution of tax burdens is the measurement of a family's relative ability-to-pay. The ability-to-pay measure allows Treasury to rank families from the least well-off to the most well-off, and to use this ranking to group families into quintiles and percentiles of ability-to-pay. Treasury uses a very broad measure of income, Family Economic Income (FEI), to measure a family's ability-to-pay. Treasury has been using a broad-based income concept for tax burden analyses since *Blueprints for Basic Tax Reform* (1977).¹⁰ The importance of using a broad measure of income such as FEI for distributional analyses has been noted by leading tax economists. For example, Musgrave et. al (1974, p. 269) states:

Total income, as noted before, was defined to include not only money income, but also certain other items such as corporate source income other than dividends (i.e., corporation tax and retained earnings), other capital gains, imputed rent, and so forth.

.....
For purposes of this study the broader or total income base is more appropriate. With the entire corporation tax included in the numerator of the effective rate ratio, consistency calls for inclusion of total corporate source income (and not only dividends) in the denominator. More generally, total income is a better measure of taxable capacity and hence more suitable for judging the equity of the tax structure.

State governments and research groups also use broad income measures in their distribution studies. For example, a study by the Tax Foundation (1989, p. 13) states:

A critical initial assumption is how to define a family's economic income. The study's definition does not consist solely of money income to a family, although that is the appropriate starting point. A broader income concept is needed, to correspond with the broad definition of tax burden. The tax burden is considered to consist of taxes levied on businesses as well as taxes paid out of 'money incomes.'

Likewise, both the JCT and the CBO recognize the need to use broad concepts of income to analyze

¹⁰ *Blueprints* included distribution tables that used a concept nearly identical to FEI. FEI was used officially for the first time in Treasury's initial study for the 1986 Tax Reform, *Tax Reform for Fairness, Simplicity, and Economic Growth, (Treasury I)* (1984). Since that time, FEI has been continuously used by the Treasury to classify families in distribution tables.

the distributional effects of tax proposals. Although the JCT and CBO income concepts are not as broad as FEI, they both are considerably broader than adjusted gross income (AGI) as reported on federal income tax returns.¹¹

Because the income concept is fundamental to tax burden analysis, and because Treasury's use of FEI is unique and at times has been a source of controversy, this section goes into great detail. It is divided into six subsections: (5.1) A conceptual description of FEI; (5.2) The relationship between FEI and Gross Domestic Product, (5.3) The relationship between FEI and Adjusted Gross Income; (5.4) Net rent on owner-occupied housing; (5.5) The individual tax model and consumption imputations; and (5.6) The distribution of FEI.

5.1 A Conceptual Description of FEI

Family Economic Income (FEI) is based on the Haig-Simons¹² definition of income as consumption plus the change in net worth. That is, a family's annual income is the amount it can spend during the year and still have the same net assets at the end of the period as it did at the beginning. Haig-Simons income is widely accepted by economists as the proper income concept for measuring "ability to pay."¹³ In accordance with the Haig-Simons definition, FEI measures income on a pre-tax, post-transfer basis, with returns to capital adjusted for inflation and accelerated tax cost recovery (depreciation, depletion, and amortization). It includes estimates of amounts unreported and underreported on tax returns and in survey data. FEI is also comprehensive with respect to the population; it includes the income of all families in the United States. However, FEI differs from the Haig-Simons concept in its measurement of pension and transfer income.

With respect to pensions, adherence to the Haig-Simons definition would require that pension contributions and accruals be included in FEI, but not pension benefits. Under this definition, some families receiving pension benefits would have little or no income in the current year even though they would be paying income tax on the taxable portion of their benefits. To deal with the mismatch between the timing of pension income accruals and the tax due on benefits, Treasury includes pension

¹¹ JCT adds to AGI employer contributions for health and life insurance, the employer share of FICA taxes, the foreign earned income exclusion, tax-exempt interest, AMT preferences, nontaxable Social Security benefits, workers' compensation, and the insurance value of Medicare benefits (footnote 2, JCT (1997)). A description of CBO's income measure can be found in Kasten and Toder (1995).

¹² See Haig (1921) and Simons (1938).

¹³ Pechman and Okner (1974) states: "Economists define income as the amount an individual can spend during a particular time period and still have the same net assets (valued in money terms) at the end of the period as at the beginning. Another way of saying the same thing is that income is the amount of an individual's consumption outlays plus the increase (or minus the decrease) in his net worth during a particular time period. Although this definition is almost universally accepted by economists, no government or private agency provides regular estimates of income on the basis of this concept."

benefits in FEI as well as pension contributions and real earnings on pension assets.¹⁴

With respect to transfer income, all transfers, including payments-in-kind, are conceptually part of Haig-Simons income. FEI only includes cash transfers and food stamps. Non-cash transfers, in particular the value of Medicare and Medicaid benefits and housing subsidies, are excluded from FEI. This exclusion is due to both the difficulty of assigning a value of benefits to the recipient, and the difficulty of properly identifying recipients for some benefits.

5.2 The Relationship Between FEI and Gross Domestic Product

FEI is closely related to, and can be derived from, gross domestic product (GDP), the broadest and most widely used measure of the Nation's economic output. Like FEI, GDP is broad-based, extends to all members of the U.S. population, is on a pre-tax basis, includes all corporate income, and includes income that is underreported on tax returns and in surveys.

Starting with GDP, Table 2 shows the additions and subtractions necessary to arrive at FEI. GDP is based upon what is produced within the United States whereas FEI is based upon the income received by the U.S. population. Therefore, income payments from the rest of the world are included in FEI and income payments to the rest of the world are excluded. The largest exclusions in the table are for the consumption of fixed capital (\$832 billion) and indirect business tax liability (\$606 billion).¹⁵ The largest addition (\$463 billion) is the inclusion of government transfer payments (e.g. social security and welfare benefits). Government transfer payments and government net interest payments increase individual income but not the income of the country, so they are included in FEI but not GDP. Similarly, non-stock capital gains increase an individual's net worth but do not represent an increase in current production, so they are included in FEI but not GDP.¹⁶ Finally, FEI does not include income not attributable to persons (that of nonprofit institutions).

The FEI total derived in the table (\$6,944 billion) is not equal to the estimated FEI total Treasury used in its 1996 level distribution tables (\$6,330 billion). There have been two major technical corrections to FEI since 1996 which account for the majority of the discrepancy. Employer

¹⁴ This approach, which has been in place since 1988, has the drawback of double-counting pension income. The mismatch between the timing of pension income accruals and the tax due on benefits might be better addressed by taking a longer term perspective of income and tax burden. As discussed in the conclusion, Treasury is currently studying the feasibility of multi-year income and tax burden measures.

¹⁵ FEI does not currently include indirect business tax liability, even though indirect business taxes are distributed as part of federal excise taxes, and indirect business tax liability would be considered part of Haig-Simons income. Conceptually, FEI, like Haig-Simons income, is a pre-tax, post-transfer measure. Because, indirect business tax payments such as excises (as explained in Section 6.6) reduce factor payments, the factor incomes observed under an excise tax are lower than those that would be observed on a pre-tax basis. To measure "pre-tax" income, Treasury should gross-up observed factor incomes to their pre-excise tax levels.

¹⁶ Accrued capital gains on corporate stock also represent a change in net worth and an addition to income. Stock gains are included in GDP (and FEI) as part of pre-tax corporate profits.

contributions for social insurance were added and Treasury's measure of unreported income was targeted to the NIPA. In addition, state and local tax refunds (prior year income) were removed from FEI and the self-employed health deduction was added back to income. In total, these technical corrections add \$540 billion to the 1996 level estimate of FEI, bringing the technically correct estimate to \$6,870 billion. The remaining difference of \$74 billion (1.1 percent of the actual figure) is an estimation error which arises because the "current year" level of FEI is forecast in the prior year (the 1996 level of FEI was forecast at the beginning of 1995).

Table 2: The Relationship between FEI and GDP in 1996

	(\$B)
GDP ¹	\$ 7,662
plus	
receipts of factor incomes from the rest of the world ¹	\$ 236
subsidies less current surplus of government enterprises ¹	\$ 22
less	
payments of factor incomes to the rest of the world ¹	\$ 223
consumption of fixed capital ¹	\$ 832
indirect business tax and nontax liability ¹	\$ 606
Equals National Income ¹	\$ 6,256
plus	
government transfer payments	\$ 463
federal, state and local net interest payments to U.S. persons and businesses ¹	\$ 157
real accruals of non-stock gains	\$ 26
pension benefits	\$ 357
less	
income attributable to nonprofit institutions ^{1,2}	\$ 317
Equals FEI	\$ 6,944

1. The source for these figures is the August 1998, *Survey of Current Business*.

2. Includes compensation of employees and net interest income (the detail for the latter was provided by the Bureau of Economic Analysis).

5.3 The Relationship Between FEI and Adjusted Gross Income

FEI can also be described by the additions, subtractions, and adjustments made to AGI to arrive at FEI. At 2000 income levels, \$5.6 trillion (67.1 percent) of FEI is included in AGI, and \$2.8 trillion

(32.9 percent) is (net) additions, subtractions, and adjustments to AGI. The major differences between FEI and AGI can be categorized into six types: (i) unreported and underreported income included in FEI but not AGI; (ii) adjustments from a realization-based AGI to an accrual-based FEI valuation of assets; (iii) income items excluded from the definition of gross income under the tax code but included in FEI; (iv) costs of earning income not deductible for tax purposes but deducted in computing FEI; (v) adjustments to exclude income earned and losses incurred in other years; and (vi) adjustments for inflation and real economic depreciation.

Unreported and underreported income. AGI excludes the income of persons who do not file income tax returns.¹⁷ It also excludes income that is unreported or underreported by filers, either due to error or noncompliance. FEI includes imputations for the income of nonfilers and the unreported and underreported income of filers. The aggregate amount of total unreported and underreported income in FEI is benchmarked, by type (e.g. sole proprietorship income), to the National Income and Product Accounts (NIPA).¹⁸ At 2000 income levels, FEI included \$31 billion of imputed AGI of nonfilers and \$713 billion of unreported and underreported income of filers. The largest single category of the latter is attributable to sole proprietors.

Accrual-based valuation of assets. Unlike AGI, which only includes realized income from assets, FEI measures accrued income, a family's change in net worth. Accruals represent income to the holder whether or not they are realized. In computing FEI, it is assumed that real accruals on stock capital gains are due to current corporate retained earnings. Therefore, the adjustment from realizations in AGI to real accruals in FEI is made by subtracting realizations of capital gains on stocks and adding pre-tax corporate profits (net of dividends paid) adjusted for accelerated tax cost recovery (depreciation, depletion, and amortization) and the inflationary component of corporate debt.

For gains on other (non-stock) assets, Treasury uses a single adjustment factor to convert realized gains on these assets to real accruals. There is not sufficient data to properly benchmark the non-stock capital gain basis, or to allocate real accruals to families who do not have current realizations of gains on non-stock assets. Because of the adjustment to an accrual basis, the timing of income tax liabilities on capital gains realizations may not match income accruals from capital gains as measured in FEI.¹⁹

Income excluded under the tax code. FEI includes a number of items which clearly represent income

¹⁷ In 2000, the respective filing thresholds for single and joint filers (below the age of 65) are forecast to be \$7,200 and \$12,950. Families below these thresholds but who qualify for the earned income tax credit (EITC) may choose to file to obtain a refund.

¹⁸ See Park (1996 and 1997) for a discussion and presentation of the difference between AGI as derived from the NIPA and AGI as reported to the Internal Revenue Service.

¹⁹ Similar mismatches occur due to other timing differences of income between AGI and FEI. For example, taxes that accrue on tax favored pension contributions and accumulated assets are not paid until the pension benefits are received.

to the recipient but are not included in AGI. With respect to labor earnings, these items include: employee 401(k) contributions, IRA and Keogh deductions, the foreign earned income exclusion, the self-employed health deduction, and employer-provided fringe benefits (including military benefits and the employer share of payroll taxes). With respect to capital income, these items include: AMT income preferences, real (non-corporate) earnings on IRAs, Keoghs, pensions and life insurance, tax exempt interest, and imputed rent on owner-occupied housing. With respect to transfer income, these items include: nontaxable Social Security benefits, Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), general assistance, other support, food stamps, Low Income Housing Energy Assistance (LIHEA), veterans' compensation, and workers' compensation.²⁰

Costs of earning income. FEI excludes all costs of earning income, whether or not they are allowable as deductions under the tax code.²¹ Employee business expenses and moving expenses are subtracted from labor earnings in FEI to the extent that they are disallowed as deductions in AGI, and disallowed passive losses are subtracted from capital income in FEI.

Income earned and losses incurred in other years. FEI also excludes income or losses incurred in other years. As a result net operating loss carryforwards are added back, and state and local tax refunds are subtracted.

Inflation and real economic depreciation. Finally, FEI also adjusts the capital component of non-corporate business income in AGI for accelerated tax cost recovery and adjusts all non-corporate interest income and expenses for inflation.

The relationship between FEI and AGI at 2000 income levels is given in Table 3.

5.4 Net Rent on Owner-occupied Housing

Net imputed rent on owner-occupied housing is the net income (positive or negative) a homeowner would receive if he or she rented to him or herself. It is a component of GDP and is included in FEI.²² The inclusion is necessary to insure comparable rankings by “well-being” (income) between homeowners and renters. Net imputed rent is gross rent minus the costs of home ownership (mortgage interest payments, property taxes, depreciation, maintenance, and repairs). As a result of the costs of home ownership, net imputed rent on owner-occupied housing is a very small component of FEI, only 0.5 percent of the total (at 2000 levels).

²⁰ All of these items are adjusted to totals from administrative data to correct for underreporting in AGI and survey data.

²¹ For non-itemizers, OTA imputes the costs of earning income (see Section 5.5 below for further discussion).

²² The inclusion of net imputed rent as a component of income is not unique to Treasury analyses. For example, Feenberg et. al (1997), Pechman (1985), and the Tax Foundation (1989) include net rent in their income measures.

Table 3: The Relationship between FEI and AGI in 2000

	(\$B)
AGI	\$ 5,649
plus	
unreported and underreported income (includes AGI of nonfilers)	\$ 744
adjustment from a realization to an accrual-based valuation of assets	\$ 127
income not included in AGI	
labor income	\$ 974
capital income	\$ 335
transfer income	\$ 460
costs of earning income disallowed in AGI	- \$ 44
adjustments to exclude income earned/losses incurred in previous years	\$ 58
adjustments for inflation and economic depreciation on non-corporate assets	\$ 115
Equals FEI	\$ 8,419

5.5 The Individual Tax Model and Consumption Imputation

The Individual Tax Model (ITM) is the basic tool of Treasury's distributional analyses.²³ FEI is computed on the ITM and individual income and payroll tax changes are simulated directly on the ITM. The distributions of corporate income and estate and gift taxes are derived from the ITM's capital income distribution, and the distribution of excise taxes is derived from the ITM's factor income and consumption distributions.

The base ITM file is the Statistics of Income (SOI) annual stratified random sample of individual income tax returns. The SOI Division of the IRS collects entries from each sampled return's form 1040EZ, 1040A, or 1040 including attached schedules and supporting forms. OTA then creates a set of imputations based on the SOI tax data. For example, to simulate the response to a proposal that changes the treatment of itemized deductions, non-itemizers must have the option to itemize. Because non-itemizers do not report itemized deduction expenses, OTA imputes itemized deduction expenses to non-itemizers. Other SOI-based ITM imputations include: wage and self-employment earnings attributable to each spouse for two-earner joint returns; employee pension plan participation; and social security income for tax returns with AGIs below the inclusion threshold. Such imputations

²³ See Cilke (1994) for a more complete description of Treasury's ITM.

are based on information returns (forms W-2 and SSA-1099) matched to the tax returns.

The base tax file is augmented by files containing other demographic and economic data. The age of each taxpayer is added using an exact match of date of birth from social security records. Family structure, non-filers, and non-taxable sources of income are obtained from a statistical match with the CPS.²⁴

Finally, the following additional imputations are added to the merged SOI-CPS files: consumption (described below); pre-tax corporate income; earnings on pensions, life insurance and IRA accounts; accruals of non-corporate capital gains; employer contributions to health insurance and pensions; military benefits; net rent on owner-occupied housing; and underreported and unreported income. These imputations are made using data or targets from the Bureau of Labor Statistics' Consumer Expenditure Survey (CEX), the SOI, the NIPA, the CPS, the Federal Reserve Board's Survey of Consumer Finances (SCF), the Department of Housing and Urban Development's American Housing Survey (AHS), the Department of Health and Human Services' National Medical Expenditure Survey (NMES), and the IRS's Taxpayer Compliance Measurement Program (TCMP).

In addition to its detailed data base, the ITM consists of an extensive set of computer programs which are used to simulate individual income tax liabilities and changes in these liabilities for every year in the budget window. The Office of Management and Budget (OMB) provides Treasury with an economic forecast of income levels, employment, price levels, and interest rates which are then used to extrapolate the ITM over the ten-year budget window, and thus ensure that Treasury's model is consistent with OMB's forecast of national income, employment, and inflation.

Consumption imputations. In order to assess the burden of relative price changes caused by excises, the ITM also includes an imputation of each family's consumption of goods and services. The only source of detailed consumption information is the CEX. Unfortunately, it has documented problems with regard to underreporting of income, and the accuracy of its consumption rates (consumption relative to income), particularly for low- and high-income households, have been questioned.²⁵ Table 4, reproduced from Sabelhaus (1998), shows very low-income families in the CEX spending over twice their income and very high-income families spending only 67 percent of their income. While a somewhat skewed distribution of consumption rates is consistent with life-cycle income and consumption patterns, other evidence suggests that the high degree of skewness in the CEX cannot be completely explained by life-cycle effects. Sabelhaus and Groen (1998), for example, find the

²⁴ In preparation for the merge between the SOI and CPS data, tax filing units are constructed from the CPS file, and adjusted gross income and tax status are calculated. The CPS and SOI files are partitioned into groups according to filing status, the presence of wage income, and the presence of children. The files are then statistically merged by partition, and families formed based on relationships from the CPS records. Future ITM models will not depend on the CPS to form statistical families for taxpayers. Beginning with the 1995 filing year, SOI's annual cross-section of individual income tax returns is family based; it includes the returns of dependent filers and spouses that file separately.

²⁵ See the JCT (1993, part III), Sabelhaus (1998), and Sabelhaus and Groen (1998).

same pattern of consumption rates within age-specific cohorts. Further, when the authors considered income fluctuations across time (using the Panel Survey of Income and Dynamics) they found that “almost all” movements were within one or two deciles of a family’s original decile ranking. In their study, a family whose permanent income placed it in the bottom decile had a 69.6 percent chance of being in the bottom decile in any given year and a 23.8 percent chance of being in the second lowest decile. Thus, it appears that low-income families could not sustain consumption levels well above their income levels.

In order to build a more consistent relationship between consumption and income, Treasury recently began to derive aggregate consumption by income class using tax data and estimates of aggregate savings from the NIPA.²⁶ The CEX is still used to apportion aggregate consumption within an income class across particular categories of goods.

Derived aggregate consumption is equal to FEI minus personal taxes and net private savings as illustrated in Table 5. FEI, income, payroll, and estate and gift tax estimates are Treasury derived. The state and local income tax estimate is the 1997 NIPA estimate (\$164.3 billion) extrapolated to 2000 levels.²⁷ Treasury uses the distribution of deductions for state and local income taxes (including the imputations for non-itemizers) less refunds from the ITM to distribute the NIPA state and local income tax estimate to families by income class. The net private savings amount is the sum of OMB’s 1998 Winter Budget forecasts for personal savings and retained corporate earnings. Net private savings is distributed to families in proportion to their level of capital

Table 4: Consumption Rates in the CEX

Income Class	Expenditure - Income Ratio
Less than \$10,000	2.07
\$10,000 to \$20,000	1.31
\$20,000 to \$30,000	1.08
\$30,000 to \$40,000	0.91
\$40,000 to \$50,000	0.85
\$50,000 to \$75,000	0.80
\$75,000 to \$100,000	0.70
\$100,000 or More	0.67
Less than \$100,000	0.94
All consumer units	0.90

Source: Table 4 Sabelhaus (1998)

Table 5: Aggregate Consumption in 2000

	(\$B)
FEI	\$ 8,419
minus	
individual income tax	- \$ 853
corporate income tax	- \$ 190
payroll tax	- \$ 662
estate and gift taxes	- \$ 26
state and local income taxes	- \$ 206
Equals Disposable FEI	\$ 6,483
minus	
net private savings	- \$ 188
Equals Aggregate Consumption	\$ 6,295

²⁶ The JCT (1993) advocates a somewhat similar procedure: using the Survey of Consumer Finances to calculate savings rates and then imputing consumption based on those savings rates.

²⁷ State and local income taxes grew from \$131.2 billion in 1994 to \$164.3 billion in 1997 (about 25 percent, Table 3.3, *Survey of Current Business*, August 1998). This growth rate was used to extrapolate the 1997 state and local income tax figure to a 2000 level figure.

income.²⁸ The resulting distribution of aggregate consumption is shown in Table 6 (following page). Treasury's derived savings rate (savings as a percentage of disposable FEI) rises from 0.8 percent for the lowest income quintile to 4.7 percent for the highest income quintile and 8.4 percent for the top 1 percent of families.

Kennickell and Starr-McCluer (1996), using the 1983 and 1989 SCF, derive savings rates from income and wealth data and find a similar pattern of savings behavior, although their average savings rate of 12.2 percent is much higher than Treasury's average rate. Direct comparison between the two studies is complicated by the fact that the years of analysis are different, Treasury's income measure is broader, the income classes are defined differently, and Treasury's rates are expressed in terms of disposable income. Table 7 facilitates the comparison by indexing each of the derived savings rates by income class to the average rate for all families and by showing the share of families in each of the income classes. The result illustrates a similar pattern of savings rates using the two approaches. Treasury's savings rate for the lowest quintile is higher than the Kennickell and Starr-McCluer rate at least in part because Treasury's tables exclude families with negative incomes, who typically have large dissavings, from the lowest quintile.²⁹

Table 7: KSM and Treasury Savings Rates Indexed to their Respective Average Rate

FEI Quintile	Treasury		SCF Income	KSM	
	Share of families	Savings Rate Index		Share of families	Savings Rate Index
	----- 2000 levels -----		----- 1989 levels -----		
Lowest ¹	19.4	0.3	Below \$10K	17.3	0.1
Second to Fourth	60.0	0.8	\$10K to \$50K	66.4	0.6
Highest	20.0	1.6	Over \$50 K	16.4	1.7
All families	100.0	1.0	All families	100.0	1.0

Source for KSM figures: Tables 1 and 4, Kennickell and Starr-McCluer (1996)

1. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

²⁸ For persons with negative FEI, or FEI less than (positive) personal tax liability, Treasury allows an initial dissavings equal to the sum of negative FEI plus personal tax liability or, in the latter case, the difference between income and (positive) personal tax liability.

²⁹ Treasury excludes negative income families (0.6 percent of all families) from the lowest quintile because they typically have large amounts of negative capital income and in other ways are not similar to the typical low-income family.

Table 6: Distribution of FEI, Personal Taxes, Disposable FEI, Consumption, and Savings in 2000

Family Economic Income Quintile	Total	Personal Taxes ¹		Disposable		Savings	
	FEI ¹ (\$B)	(\$B)	(% of FEI)	FEI (\$B)	Consumption (\$B) (% of DFEI)	(\$B)	(% of DFEI)
Lowest ²	226	13	5.8	213	211 99.2	2	0.8
Second	602	71	11.9	531	521 98.2	9	1.8
Third	1,062	190	17.9	872	851 97.6	21	2.4
Fourth	1,790	377	21.1	1,413	1,379 97.6	34	2.4
Highest	4,771	1,280	26.8	3,491	3,326 95.3	165	4.7
Total ²	8,419	1,936	23.0	6,483	6,295 97.1	188	2.9
Top 10%	3,407	960	28.2	2,446	2,308 94.3	138	5.7
Top 5%	2,479	725	29.3	1,754	1,638 93.4	116	6.6
Top 1%	1,247	401	32.1	846	775 91.6	71	8.4

1. Personal taxes include individual income, corporate income, payroll (employer and employee shares), state and local income, and estate and gift taxes.
2. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

5.6 The Distribution of FEI

Table 8 shows the distribution of families and FEI at both 1996 and 2000 income levels. The distributions are presented for two different years to facilitate comparisons with the text which includes references to both 1996 and 2000 level data. FEI is concentrated among high-income families. At 2000 levels, the lowest quintile of families in the income distribution receives only 2.7 percent of total FEI and the bottom 60 percent of families receives less than 25 percent of total FEI, whereas the highest quintile of families receives 56.7 percent of total FEI.

Table 8: Distribution of Family Economic Income (FEI) at 1996 and 2000 levels¹

Family Economic Income Quintile	----- 1996 levels -----			----- 2000 levels -----		
	Families (millions)	Family Economic Income (\$B)	(%)	Families (millions)	Family Economic Income (\$B)	(%)
Lowest ²	21.4	185	2.9	22.4	226	2.7
Second	21.9	492	7.8	23.0	602	7.2
Third	21.9	844	13.3	23.0	1,062	12.6
Fourth	21.9	1,364	21.5	23.0	1,790	21.3
Highest	21.9	3,473	54.9	23.0	4,771	56.7
Total ²	109.4	6,330	100.0	115.2	8,419	100.0
Top 10%	10.9	2,465	38.9	11.5	3,407	40.5
Top 5%	5.5	1,787	28.2	5.8	2,480	29.5
Top 1%	1.1	905	14.3	1.2	1,247	14.8

1. The total FEI levels for the two years should not be construed as representing growth in FEI over this period; the definition of FEI is not the same for the two periods. The 1996 level figures do not include the employer share of payroll taxes, nor do they adjust for state income tax refunds and the self-employed health deduction, and the 1996 unreported income amounts are not targeted to the National Income and Product Accounts (see Section 5.2).
2. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles at 1996 levels begin at FEI of: Second \$15,604; Third \$29,717; Fourth \$48,660; Highest \$79,056; Top 10% \$108,704; Top 5% \$145,412; Top 1% \$349,438. Quintiles at 2000 levels begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

FEI compared to Cash Income. Although FEI is a broad income concept, its distribution across income quintiles is not substantially different than the distribution of other relatively broad income concepts, such as the cash income concept used by CBO. Table 9 shows the distribution of FEI and a family's cash income at 2000 income levels.³⁰ Because FEI is a broader income concept, the lower limits of the FEI quintiles are higher than those of the cash income quintiles. Total cash income for all families is \$7,007 billion compared to \$8,419 billion of FEI. Nonetheless, the respective income shares are very similar, with FEI showing a slightly larger share of income at the top of the

³⁰ Cash income in the table is Treasury derived but based upon the CBO concept.

distribution than cash income because FEI includes total pre-tax corporate profits and non-stock gains, pensions, IRAs, Keoghs, and life insurance on an accrual basis. (As discussed below, capital income is concentrated at the upper end of the income distribution.) The top quintile of households as ranked by FEI has a 56.7 percent share of FEI while the top quintile of families as ranked by cash income has a 55.5 percent share of cash income.

Table 9: Cash Income Compared to FEI in 2000

Income Quintile	Family Economic Income		Family Cash Income ¹	
	Lower Limit	Share	Lower Limit	Share
Lowest	\$0	2.7	\$0	2.9
Second	\$17,988	7.2	\$16,426	7.7
Third	\$34,844	12.6	\$30,964	13.1
Fourth	\$59,019	21.3	\$49,862	21.1
Highest	\$100,767	56.7	\$81,967	55.5
Top 10%	\$140,581	40.5	\$115,239	39.7
Top 5%	\$189,835	29.5	\$154,900	28.8
Top 1%	\$462,053	14.8	\$346,555	15.1

1. Cash Income consists of wages and salaries, net income from a business or farm, taxable and tax-exempt interest, dividends, rental income, realized capital gains, cash transfers from the government, and retirement benefits. Employer contributions for payroll taxes and the federal corporate income tax is added to place cash income on a pre-tax basis.

FEI factor income distributions. The components of FEI can be divided into labor earnings, returns to capital, and transfer payments. At 2000 income levels, FEI totals \$8.4 trillion, of which \$6.0 trillion (71 percent) is labor earnings, \$1.9 trillion (22 percent) is returns to capital, and \$0.6 trillion (7 percent) is transfer payments. Labor earnings include wages before taxes and before employee contributions (e.g. 401(k) contributions); employer-provided fringe benefits (primarily health insurance, pension contributions, and the employer share of payroll taxes);³¹ and the labor component of self-employment income (from sole proprietorships, partnerships, and subchapter S corporations). Returns to capital include real (inflation adjusted) net interest income; pre-tax corporate profits (adjusted for inflation and accelerated tax cost recovery); real accruals of non-stock capital gains; the capital component of non-corporate business income (adjusted for inflation and accelerated tax cost recovery); pension and IRA benefits; real earnings on retirement (pension, IRA, and Keogh) and life insurance assets; and imputed rent on owner-occupied housing. Transfer payments include Social Security benefits, SSI, TANF, LIHEA, veterans' compensation, workers' compensation,

³¹ The employer share of payroll taxes and the self-employed health deduction were added to FEI in 1997 as technical corrections.

unemployment compensation, other general cash assistance, and food stamps.³²

Table 10 shows the percentage distribution of FEI factor incomes. Two columns appear under each factor income component. The first column shows the percent of each quintile's total FEI attributable to the factor income, and the second column shows the distribution of the factor income across income quintiles. For example, 44.9 percent of the lowest income quintile's total FEI is from labor, 6.1 percent from capital, and 49.0 percent from transfers. Although transfer income represents almost half the income received by the lowest income quintile, the lowest income quintile's share of total transfer income is only 19.2 percent, an amount that is lower than that received by the second and third quintiles (25.8 and 23.0 percent respectively).

Capital income is concentrated in the upper end of the income distribution. The highest income quintile receives 73.2 percent of all capital income whereas the bottom 60 percent of families receive 14.1 percent of all capital income. Labor income is also concentrated in the upper end of the distribution but to a lesser degree. The highest income quintile receives 55.6 percent of all labor income whereas the bottom 60 percent of families receives 20.7 percent of all labor income. In contrast, transfer income is more evenly distributed across income classes, ranging from shares of 14.8 percent for the highest income quintile to 25.8 percent for the second lowest income quintile.

Table 10: Percentage Distribution of FEI Factor Incomes in 2000

Family Economic Income Quintile	Labor Income		Capital Income		Transfer Income		FEI
	As a percent of Total FEI	Percent Distribution	As a percent of Total FEI	Percent Distribution	As a percent of Total FEI	Percent Distribution	Percent Distribution
Lowest ¹	44.9	1.7	6.1	0.7	49.0	19.2	2.7
Second	62.3	6.3	13.0	4.2	24.8	25.8	7.2
Third	71.4	12.7	16.1	9.2	12.5	23.0	12.6
Fourth	78.9	23.6	15.6	15.1	5.5	17.0	21.3
Highest	69.7	55.6	28.5	73.2	1.8	14.8	56.7
Total ¹	71.1	100.0	22.1	100.0	6.9	100.0	100.0
Top 10%	65.0	37.0	33.6	61.5	1.4	8.3	40.5
Top 5%	60.1	24.9	38.8	51.8	1.1	4.8	29.4
Top 1%	52.3	10.9	47.1	31.6	0.5	1.2	14.8

1. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

³² Food stamps are included in FEI although all other forms of non-cash transfer payments (e.g. subsidized housing) are not. Food stamps are included because they serve as a close cash substitute although recipients may not value food stamps at their full face (dollar) value.

Labor income is the largest source of income for all income quintiles except for the lowest; over 60 percent of all income is from labor in the top four income quintiles and over 70 percent for the third and fourth income quintiles. Capital income is a significant source (over 15 percent) of income for the third and fourth income quintiles and becomes an increasingly significant source of income as income rises. For the top quintile, 28.5 percent of all income is from capital sources, and for the top 1 percent the capital income component rises to 47.1 percent.

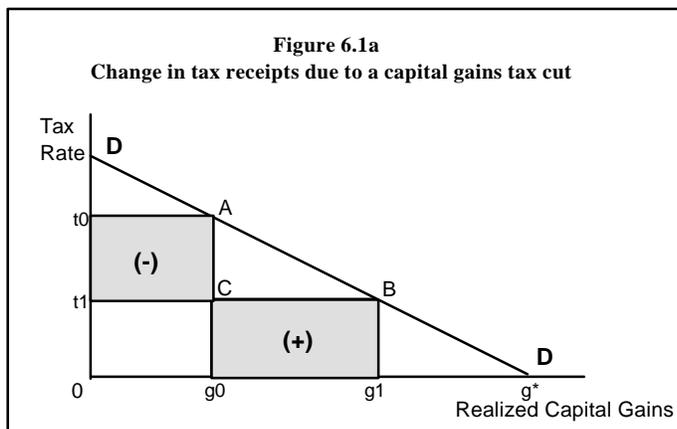
6. Incidence Assumptions

In general, Treasury assumes the individual income tax is borne by payors, the corporate income tax by capital income generally, and payroll taxes (employer and employee shares) by labor (wages and self-employment income included in the payroll tax base). Excise on purchases by businesses and customs duties are assumed to be borne by labor and capital income. Excises on purchases by consumers are assumed to be borne in proportion to relative consumption of the taxed good as well as by labor and capital income. Treasury assumes estate and gift taxes are borne by decedents. More detailed descriptions of the incidence assumptions for each tax are below in separate subsections. The next subsection (6.1) provides a description of the difference between tax burden estimates and revenue estimates.

6.1 The Difference Between Tax Burden Estimates and Revenue Estimates

Incidence assumptions include not only assumptions about who bears the burden of a particular tax, but also how much burden or benefit is conferred. For a proposed change in tax law, Treasury distributional analyses reflect the fact that the resulting change in tax burden for a given year is not necessarily equivalent to the expected change in tax liability for that year. This difference in Treasury’s distribution and revenue estimating methodologies is fully consistent with the different purposes served by revenue estimates and distributional analyses.

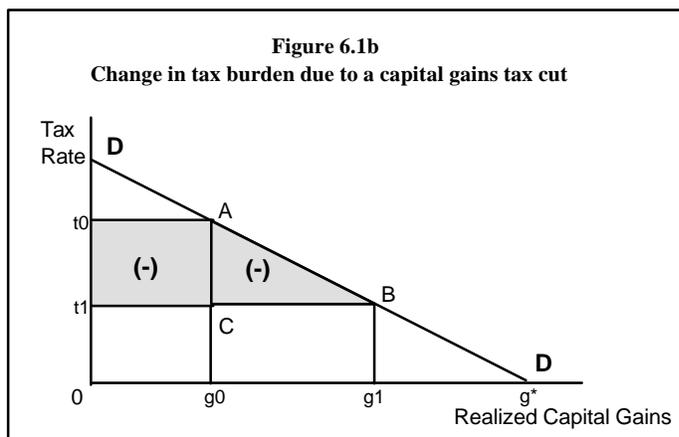
Revenue estimates are measures of the change in *government receipts* due to a tax proposal. Consider the change in tax receipts due to a capital gains tax cut as illustrated in Figure 6.1a.



the figure shows the “demand” (DD) for realized capital gains. If the tax rate is t_0 then the amount of gains realized is g_0 . As the tax rate on realized gains falls, the amount of capital gains realized increases, until at a tax rate of zero, an amount of capital gains equal to g^* is realized. If the capital gains tax rate is reduced from t_0 to t_1 government receipts are reduced by lower tax payments on the current-law level of capital gains realizations but increased by the taxes paid on additional realizations

induced by the tax cut. The reduction in government receipts on current realizations is illustrated in Figure 6.1a by the shaded rectangle t_1t_0AC , and the increase in government receipts due to increased realizations by the shaded rectangle g_0CBg_1 . The estimated net effect of these two changes in government receipts equals Treasury's revenue estimate for a capital gains tax cut.

In contrast, Treasury's distribution estimates are intended to measure the change in *tax burden* due to a tax proposal. The burden, or benefit, of a tax proposal may not be properly measured by the change in tax payments; such is the case with a capital gains tax cut. In figure 6.1b, the total tax burden of a capital gains tax at rate t_0 is represented by the area $0t_0Ag^*$. The burden has two sources: the tax liability, represented by rectangle $0t_0Ag_0$ and a dead weight loss, represented by triangle g_0Ag^* .



If the capital gains tax rate is reduced from t_0 to t_1 , both the amount of tax due on current-law realizations and the amount of dead weight loss is reduced. The total reduction in tax burden is equal to the shaded region t_1t_0AB . Treasury's distribution estimate would only include the reduction in tax liability on current-law realizations (t_1t_0AC), and not the additional reduction in dead-weight loss (CAB).³³ Thus, Treasury would *underestimate* the amount of tax relief arising from a reduction in the capital gains tax rate.

Clearly, however, the tax collected on induced realizations (g_0CBg_1), although part of the revenue estimate because it represents a change in government receipts, does not represent a change in tax burden. Under both rates (t_0 and t_1) area g_0CBg_1 is part of the tax burden. At rate t_0 , it is part of the dead weight loss, and at rate t_1 it is part of taxes collected.

6.2 Individual Income Tax

Individual income taxes are assumed to be borne by payors. The distribution of individual income taxes to families by family economic income class is based on tabulations from the ITM. For many but not all provisions, the change in tax liabilities based on long run fully phased in law is equivalent to the change in burden used for Treasury distributional analysis. Provisions for which this is not the case include capital gains (discussed above), tax preferred savings vehicles, and voluntary speedups of tax payments, such as those induced by rolling over a front-loaded IRA into a back-loaded IRA.

³³ As a separate but related issue, the baseline burden of capital gains is not complete. The existence of a tax on capital gains produces a lock-in effect which has an associated burden (described above as dead weight loss and, for tax rate t_0 , illustrated by triangle g_0Ag^* in Figure 6.1b). Treasury does not include the burden of this lock-in effect in the baseline, nor does Treasury measure the benefit (burden) of provisions that would reduce (increase) the lock-in.

Tax-preferred savings vehicles. For proposed changes, Treasury measures the tax benefit from participation in individual retirement accounts and similar tax-preferred savings vehicles as the present value of the tax savings from one year's contributions.³⁴ In general, a dollar of savings generates a stream of expected future income and an associated stream of expected future income tax liabilities. If the savings vehicle is tax-preferred, then the stream of expected future tax liabilities is lower and a dollar saved realizes a higher after-tax return. Treasury measures the tax benefit as the difference between the present discounted value of the after-tax return on the amount saved in a tax-preferred savings vehicle and the same amount saved in a taxable savings vehicle.³⁵ It is assumed the contribution is kept in the account until it must be distributed, or for retirement accounts, is kept until age 65 and then distributed in equal amounts over the taxpayer's expected remaining lifetime. Thus, Treasury's measure represents the present value of the additional consumption the taxpayer can undertake as a result of the tax preference for one year's contributions.

As an illustration, consider the case of a \$1 pre-tax contribution made to a back-loaded versus a front-loaded IRA, as shown in Table 11. In the table, r is the rate of return and the discount rate, t is the marginal income tax rate (assumed to be constant over the entire period), the contribution is made in year 0, and the distribution is in year n . The table shows that the lifetime tax benefit of a \$1 pre-tax contribution to a back-loaded IRA is the same as a \$1 pre-tax contribution to a front-loaded IRA. In both cases, the participating taxpayer receives tax-free earnings over the entire period and pays a present discounted value of tax equal to t .

Table 11: Cumulative Value and Annual Tax liability on a \$1 Pre-tax Contribution to Alternative Savings Vehicles¹

Savings Vehicle		Year 0	Year 1	Year 2	Year n^2
Taxable	Cumulative Value	$1-t$	$(1-t)(1+r(1-t))$	$(1-t)(1+r(1-t))^2$	$(1-t)(1+r(1-t))^n$
	Annual tax liability	t	$(1-t)rt$	$(1-t)(1+r(1-t))rt$	$(1-t)(1+r(1-t))^{n-1}rt$
Front-loaded IRA	Cumulative Value	1	$(1+r)$	$(1+r)^2$	$(1-t)(1+r)^n$
	Annual tax liability	0	0	0	$t(1+r)^n$
Back-loaded IRA	Cumulative Value	$1-t$	$(1-t)(1+r)$	$(1-t)(1+r)^2$	$(1-t)(1+r)^n$
	Annual tax liability	t	0	0	0

1. In the table, r is the rate of return and the discount rate, t is the marginal income tax rate, the contribution is made in year 0, and the distribution is in year n .
2. For IRAs, assumes withdrawal is made in year n with no penalty. For the taxable account and front-loaded IRAs, the cumulative value is net of taxes paid.

³⁴ In the baseline, Treasury measures the burden of existing tax-preferred savings vehicles on a cash-flow basis, not on the present value of current year contributions.

³⁵ This difference takes into account amounts in the tax-preferred account that would otherwise have received tax-preferred treatment. For example, if IRAs were expanded, the additional contributions to IRAs might otherwise have been invested in tax-exempt bonds or other tax-preferred forms.

Note, however, that the timing of tax payments is not the same for the two savings vehicles. A \$1 contribution made to a back-loaded IRA is taxed in the year the contribution is made (year 0) whereas for a front-loaded IRA the same amount of tax, plus the earnings on the tax, is not collected until distribution in year n. As a result, measuring tax benefits by the change in tax liabilities in a single year would erroneously understate the tax benefits of both accounts and measure one account (front-loaded IRAs) as conferring a greater tax benefit.

Voluntary speedups of tax payments. Treasury does not include voluntary tax payments induced by changes in tax law in its measure of tax burden. If a taxpayer voluntarily initiates a taxable event because of a change in tax law, the taxpayer must be at least as well off taking the action and paying tax as would have been the case if no action had been taken. One example of voluntary payments not representing burdens is the TRA97 rollover provision for Roth IRAs. The provision allows taxpayers with front-loaded IRAs to roll them into back-loaded Roth IRAs.

Because contributions to back-loaded IRAs are not deductible, a taxpayer switching to a back-loaded IRA must pay tax on the amount rolled over in the year of the rollover.³⁶ Note, however, that if the taxpayer's marginal income tax rate were the same in the current year as in the expected year of distribution, and if his or her discount rate were equal to the rate of return on the IRA, then the discounted present value of the tax liability on the front-loaded IRA would be equivalent to the current year tax liability owed due to the rollover. Therefore, if a taxpayer *chooses* to rollover from a front-loaded into a back-loaded IRA, the tax liability incurred from the rollover must be lower than (or at most equal to) the present discounted value of the tax liability the taxpayer would have owed if he or she had maintained the front-loaded IRA. This would occur if the taxpayer expected to be in a higher marginal tax bracket in later years, or if he or she had a discount rate that was lower than the rate of return.

Current law distribution of federal taxes. Table 12 shows the percentage distribution of federal taxes and federal taxes as a percent of FEI at 2000 income levels. Total federal taxes are fairly progressive, ranging from a combined effective rate of 5.9 percent for the bottom quintile of families to 24.6 percent for the top quintile. The highest quintile pays 65.1 percent of the total tax burden relative to its 56.7 percent share of total FEI. The lowest income quintile pays 0.7 percent of the total tax burden relative to its 2.7 percent share of total FEI.

The distribution of the individual income tax. The individual income tax is quite progressive. Its effective rate rises from -2.4 percent for the lowest income quintile to 13.7 percent for the highest quintile and 20.2 percent for the top 1 percent of families. The negative effective rate in the lowest income quintile is due almost entirely to the refundable portion of the earned income tax credit (EITC).

³⁶ TRA97 allowed taxpayers who made such rollovers by December 31, 1998 to spread the income tax payments on the rollover over four years.

Table 12: Distribution of Federal Taxes Under Current Law in 2000

Family Economic Income Quintile ¹	Total Federal Taxes	Individual Income	Corporate Income	Payroll	Excises ¹	Estate and Gift
----- <i>Percent Distribution</i> -----						
Lowest ²	0.7	-0.6	1.1	2.3	2.0	0.0
Second	3.9	0.5	4.3	7.9	6.7	0.0
Third	10.2	6.9	9.2	14.9	12.8	0.0
Fourth	19.9	16.3	14.9	26.4	22.1	0.8
Highest	65.1	76.6	70.6	48.3	56.3	99.2
Total ²	100.0	100.0	100.0	100.0	100.0	100.0
Top 10%	48.5	61.3	59.1	28.2	39.6	96.2
Top 5%	36.5	49.1	49.7	15.4	28.4	91.0
Top 1%	20.1	29.5	30.3	4.0	13.9	64.2
----- <i>As a Percent of Income</i> -----						
Lowest ²	5.9	-2.4	0.9	6.7	0.7	0.0
Second	11.7	0.8	1.4	8.7	0.8	0.0
Third	17.4	5.6	1.6	9.3	0.9	0.0
Fourth	20.1	7.8	1.6	9.8	0.9	0.0
Highest	24.6	13.7	2.8	6.7	0.9	0.5
Total ²	21.5	10.1	2.3	7.9	0.9	0.3
Top 10%	25.7	15.4	3.3	5.5	0.9	0.7
Top 5%	26.6	16.9	3.8	4.1	0.9	0.9
Top 1%	29.1	20.2	4.6	2.1	0.9	1.3

1. Includes customs duties.

2. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

6.4 Corporate Income Tax

Treasury assumes changes in the corporate income tax are borne by all (positive) capital income.³⁷ This assumption is supported by both the seminal literature on corporate tax incidence as well as more recent research. In a well-known study, Harberger (1962) uses a two-sector, two-good, general equilibrium model to show how a partial factor tax may be shifted to other factors. In his model, factors are freely mobile but fixed, and the economy is closed. The extent to which the tax on corporate capital is shifted to all capital (both corporate and noncorporate) or labor depends on the relative elasticities of substitution between capital and labor in the two sectors, the elasticity of demand for the corporate good, and the intensity of factor use in each sector. Using reasonable parameter assumptions,³⁸ Harberger concludes that, in the long run, a tax levied on corporate capital will be borne by capital income generally and will not be shifted to labor. More recent extensions of Harberger's work generally support his incidence conclusions (see for example Gravelle and Kotlikoff (1993) and the open economy extension by Gravelle (1994)).³⁹

The distribution of the corporate income tax is one area where Treasury, CBO and JCT have used different incidence assumptions. In a 1987 publication, CBO (1987b) presented separate distributional results based on whether the corporate income tax was assumed to be borne by labor or capital. At the time, CBO reasoned that labor might bear part of the burden of the corporate income tax in an open economy setting, or if the corporate tax led to a decline in savings, reducing productivity and wages. Kasten et. al (1994) describes CBO's incidence assumption as assigning half the burden of the corporate income tax to labor income and half to capital income. In their most recent analyses, CBO has distributed the corporate income tax to all capital income (see for example the OBRA93 distribution in Kasten and Toder (1995) and CBO (1998)).

In the past, JCT has distributed the burden of the corporate income tax to owners of corporate capital (JCT 1993). These JCT analyses focused on the 5-year budget period, and took the view that 5 years was too short a time period for the corporate income tax to be shifted beyond those directly liable for the tax, the owners of corporate capital. More recently, JCT has opted not to include the corporate income tax in its distributional analyses "due to the uncertainty concerning the incidence of the tax" (footnote 3, JCT 1997).

Table 13 illustrates how different the distribution of the corporate income tax would appear under alternative incidence assumptions. The first column shows the short-run incidence where the burden

³⁷ Treasury has maintained this assumption since 1990, although some earlier Treasury studies (including Nelson, 1987) took a shorter run view and distributed the corporate income tax to corporate shareholders.

³⁸ Harberger concludes that the greater relative elasticity of substitution between capital and labor in the corporate sector relative to the noncorporate sector dominates any output effect which might otherwise shift some of the burden of the tax to labor (assuming the corporate sector is labor intensive).

³⁹ For a more complete review of the literature on corporate tax incidence, see CBO (1996).

is borne by owners of corporate capital. The second column shows the long run incidence (used by Treasury and recently by CBO) where all capital income bears the burden. The third column shows the distribution under the assumption that labor would bear half the burden. All three distributions are progressive throughout the income distribution. The short-run incidence assumption is the most progressive, 88.6 percent of corporate capital income is held by families in the top income quintile. In contrast, 70.6 percent of all positive capital income is held by families in the top income quintile, and a distribution based on the burden being divided equally between labor and capital would assign 63.1 percent of the total burden to families in the top income quintile.

Table 13: Corporate Tax Incidence in 2000

Family Economic Income Quintile	Corporate Capital Income (%)	All Positive Capital Income (%)	Half Capital Half Labor Income (%)
Lowest ¹	0.4	1.1	1.4
Second	1.2	4.3	5.3
Third	3.0	9.2	10.9
Fourth	6.5	14.9	19.2
Highest	88.6	70.6	63.1
Total ¹	100.0	100.0	100.0
Top 10%	81.5	59.1	48.1
Top 5%	72.9	49.7	37.3
Top 1%	48.3	30.3	20.6

1. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

Measuring the burden of the corporate income tax. In general, Treasury measures the current-year change in the corporate tax burden by the change in the current-year corporate tax liability, assuming fully-phased in, long-run law. Exceptions include investment incentives such as accelerated depreciation or expensing. These investments, undertaken in the current year, give rise to a stream of future tax benefits and cannot be properly measured by a single year's benefits. Instead, the tax benefit is measured as the sum of the present values of tax savings in each year due to the current year's investment.

The distribution of the corporate income tax. As shown in Table 12, the average effective corporate income tax rate for the highest income quintile (2.8 percent) is more than three times higher than that of the lowest quintile (0.9 percent).

6.5 Payroll Tax

Payroll taxes are broadly assessed on wages and self-employment income. Because of nearly universal coverage and because aggregate labor supply is very inelastic, Treasury assumes that labor bears the entire burden of the payroll tax, both the employee and the employer shares.⁴⁰

⁴⁰ This incidence assumption is followed by JCT, CBO, and Pechman (1985) among others.

The payroll tax has three components. The hospital insurance (HI) component applies to all wages and self-employment income. The old-age, survivors, and disability insurance (OASDI) component is capped at a relatively high level of wage income (\$76,200 in 2000), and the unemployment insurance (UI) component is capped at a relatively low level of wage income (\$7,000).

The distribution of the payroll tax. Although the statutory rate for all but very low and very high income wage earners is flat (15.3 percent combined employer and employee rate on wages in excess of \$7,000 but below \$76,200), the payroll tax is mildly progressive (not proportional or regressive as is generally assumed) through the first four FEI quintiles. As shown in Table 10, labor income as a share of total income rises through the first four income quintiles; a flat rate applied to a component of income whose share of income grows as income increases produces a progressive distribution. Table 12 shows the effective rate on the payroll tax rising from 6.7 percent in the first quintile to 9.8 percent in the fourth quintile. The payroll tax becomes regressive after the fourth quintile for two reasons. First, the OASDI wage cap lowers the statutory payroll tax rate for wage earners over the cap and second, the share of labor income as a percent of total income falls in the top quintile as the share of capital income increases. The effective rate for payroll taxes falls to 6.7 percent for the top quintile, 5.5 percent for the top 10 percent of families and only 2.1 percent for the top 1 percent of families.

Treasury does not offset the burden of payroll taxes by the present value of future benefits. The contributions are treated as taxes and the benefits as transfer payments.⁴¹ Likewise, Treasury does not include the incidence of benefits financed by income, excise, or estate and gift taxes.

6.6 Excises and Customs Duties

In general, excises on purchases by individuals are assumed to be borne in proportion to relative consumption of the taxed good and proportionately by labor and capital income. Excises on purchases by businesses and customs duties are assumed to be borne proportionately by labor and capital income. Before this methodology is explained in greater detail and illustrated by example, some general issues concerning the distribution of excises are addressed, specifically: the treatment of purchases by businesses and customs duties, and price level changes and income and payroll tax offsets.

6.6.1 Purchases by Businesses and Customs Duties

The major federal excise taxes apply to purchases of gasoline, air transportation, tobacco, diesel fuel, alcohol, and telephone services. Excises generally apply to all purchases, including those made

⁴¹ In contrast, some analysts have considered the net distribution of payroll taxes and benefits. For example, Feldstein and Samwick (1992) calculate net marginal social security tax rates (the difference between the social security tax of 11.2 cents per dollar of earnings and the present value of the net benefits to which an additional dollar of earnings entitles the individual) and find that these net marginal rates are negative for some low-income individuals.

directly by families in their role as consumers as well as those made by businesses who use the taxed good or service to produce other goods and services. In order to separate the treatment of excises on production inputs from other excises, Treasury splits the purchases of goods subject to excises into purchases by businesses and purchases by consumers. These splits, given in Table 14, are similar to those used by CBO (1987a). Under current law, the taxed goods and services that are used extensively as intermediate inputs (diesel fuel, gasoline, air transportation, and telephone services) are used to produce a wide range of goods. Thus, Treasury assumes that the incidence of excises on purchases by businesses is the same as that of a broad-based consumption tax.

For example, the \$19.1 billion excise tax on gasoline (at 2000 income levels and 2009 law) is split into \$14.3 (75 percent of \$19.1) billion of tax on purchases by consumers and \$4.8 (25 percent of \$19.1) billion of tax on purchases by businesses. The latter is treated as a \$4.8 billion broad-based consumption tax which, as explained below, is distributed to factor incomes (positive capital and labor income). Because total factor incomes are \$7,929 billion (2000 income levels), the equivalent broad-based consumption tax rate arising from the gasoline excise is only 0.06 percent.

Table 14: Purchasers of Goods Subject to Excises

Excise good	Purchases by Businesses (%)	Purchases by Consumers (%)
alcohol	20	80
air transportation	55	45
diesel fuel	90	10
gasoline	25	75
telephone services	50	50
tobacco	0	100
other	100	0

Like excises on purchases by businesses, customs duties are levied on a wide range of goods and are assumed to have the same incidence as a broad-based consumption tax.

6.6.2 Constant Price Level and Income and Payroll Tax Offsets

To maintain consistency with the Budget forecast of GDP, Treasury’s distributional analyses assume that changes in excise taxes and customs duties do not change the price level.⁴² For small changes in excises, the price level is not likely to be affected. For larger changes, such as a broad-based consumption tax, the effect on the price level would be largely dependent on changes in money supply.

Because the price level is constant, an excise tax change creates a wedge (equal to the amount of the tax) between the price received by producers and the price paid by consumers. As a result, factor incomes and the direct taxes on those factor incomes fall. Likewise, current-law excises reduce

⁴² Prior to 1998, Treasury assumed that excises on purchases by individuals were borne by the purchaser and excises on purchases by businesses were borne in proportion to total consumption. Under this methodology, it was also assumed that the price level rose, and that transfer payments and income tax parameters were indexed for this price level change. These assumptions were consistent with those of CBO (Kasten and Toder, 1995).

observed factor incomes and thus, the current-law individual income, corporate income, and payroll tax liabilities due on these incomes. In the baseline, these income and payroll tax offsets are shown as part of the income and payroll tax distributions, not as part of the excise tax distribution.⁴³

Distributions of proposed excise tax changes, however, do include income and payroll tax offsets. The standard offset (used in revenue estimates) is 25 percent of the pre-offset amount (10.625 percent each for individual income and payroll taxes, and 3.75 percent for corporate income taxes). For example, a proposed increase in the excise tax on alcohol of \$10 billion would be offset by a \$2.5 billion reduction in individual income, corporate income and payroll taxes, for a net increase in tax burdens of \$7.5 billion.

6.6.3 Distributing Excise Taxes and Customs Duties: Method and Illustration

Although the aggregate price level is held constant, excise taxes on purchases by consumers still have *relative* price effects. For example, a tax on alcohol raises the tax-inclusive price of alcohol relative to the price of all other goods, which must fall slightly to maintain a constant price level. Consumers are burdened (or benefit) to the extent their consumption of the taxed good relative to their consumption of all other goods is higher (or lower) than that of the average family. In total, the net price effect is zero, leaving the price level unchanged and the average family with neither a burden nor a benefit from the change in relative prices.

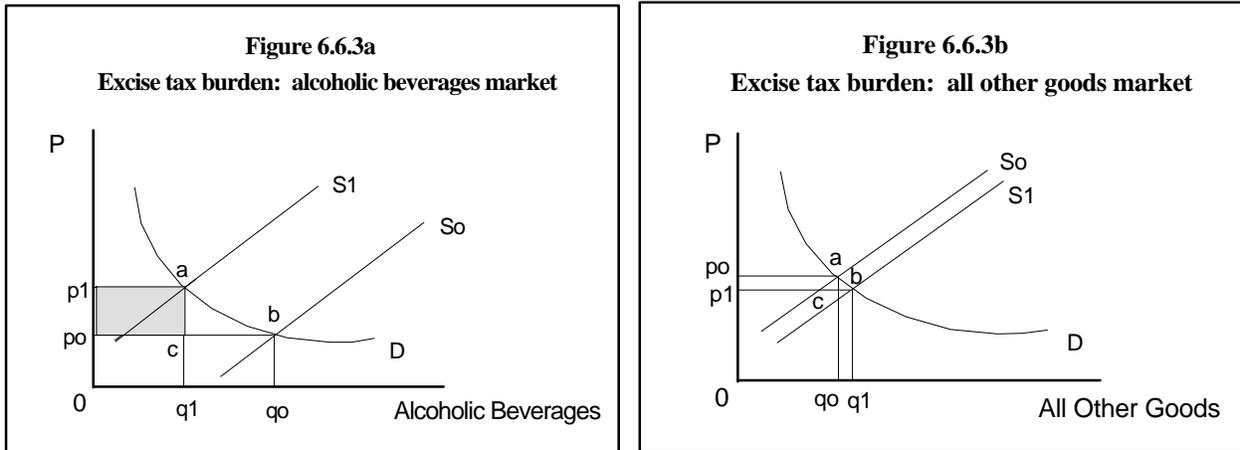
As an example, consider the imposition of an excise tax on alcoholic beverages as illustrated in figures 6.6.3a and 6.6.3b. The figures assume the cross-price elasticity between alcoholic beverages and all other goods is zero, and the own-price elasticity for alcoholic beverages and for all other goods is one. These restrictive assumptions are not necessary but facilitate illustration.

The imposition of the alcoholic beverages excise causes the supply curve to shift backward (from S_0 to S_1 in figure 6.6.3a) in the alcoholic beverages market. Because of the unit elasticity, total expenditures in the alcoholic beverages market do not change, but part of those expenditures (the shaded rectangle p_0p_1ac) are remitted to the government as excise taxes. In addition, the price of alcoholic beverages rises (from p_0 to p_1) and the quantity produced and consumed falls (from q_0 to q_1). Factors (labor and capital) migrate from the alcoholic beverages industry to the production of all other goods, increasing the supply in that market. The increase in supply in the “other” goods market causes the price in that market to fall (from p_0 to p_1) and the quantity consumed to rise (from q_0 to q_1). Total expenditures in the “other” goods market remains fixed and thus GDP is not affected. Whether or not a family is adversely (or positively) affected by the relative price change depends on its share of the total consumption of alcoholic beverages relative to its share of the total consumption of all other goods. However, because GDP is unaffected, factor incomes must fall by the amount of

⁴³ The decision to exclude the excise tax offsets from the baseline excise tax distribution is largely one of presentation. Alternatively, Treasury could base the income and payroll tax distributions on “pre-excise” tax factor incomes, and include the excise tax offsets in the baseline excise tax distribution. The baseline distribution of all Federal taxes would not be affected by the change.

the excise. So, all families with positive capital or labor income are adversely affected by the fall in factor incomes.

Although the very restrictive assumptions (of zero cross price elasticity and unitary own-price elasticity) are not necessary, Treasury does assume that any change in total expenditures in the taxed market will be exactly offset in the market for all other goods.



In the case where taxed goods are purchased by businesses (including broad-based consumption taxes), there are no relative price effects (on consumption goods). Because the aggregate price level and GDP are fixed, prices faced by consumers do not change, but the net-of-tax price received by producers falls and, as a result, factor payments fall.

For all of these taxes (excises on purchases by consumers, indirect business taxes, customs duties, and broad-based consumption taxes) because factor incomes fall, income and payroll tax liabilities will also fall, partially offsetting the burden of an excise tax.

Numerical Illustration. Consider a proposed \$10 billion excise tax on alcoholic beverages. As listed in Table 14, Treasury assumes that 80 percent of alcohol purchases are made by consumers and 20 percent by businesses (e.g., as part of expenditures for business meals and entertainment). The \$10 billion tax would therefore be split into an \$8 billion tax on purchases by consumers and a \$2 billion tax on purchases by businesses.

The price effect from the \$8 billion tax on consumers would increase the cost of consuming alcoholic beverages by \$8 billion (proportionately distributed to families according to their respective consumption of alcoholic beverages) as shown in column 1 of Table 15, and an \$8 billion reduction in the cost of consuming all other goods (column 2). The net price effect is shown in column 3. Because lower and middle-income families' share of alcoholic beverage consumption is greater than their share of all other good consumption, the net price effect for them is positive, giving them a net consumption burden from the excise tax increase.

Table 15: Illustration of a Proposed \$10 Billion Tax on Alcoholic Beverages in 2000

Family Economic Income Quintile	Tax on Consumer Purchases				Total	Tax on Business Purchases	Total Pre-Offset Tax	Income and Payroll Tax Offset	Net Burden ¹	Change in After-Tax Income ²
	----- Price Effect -----		Net	Factor Income Effect						
	Alcohol	All other								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
----- in millions of dollars -----										
Lowest ³	435	-265	170	124	294	31	325	-22	303	-0.14
Second	990	-657	333	463	796	116	912	-106	805	-0.15
Third	1,418	-1,076	342	946	1,288	236	1,524	-266	1,258	-0.14
Fourth	1,886	-1,750	135	1,717	1,852	429	2,281	-510	1,772	-0.12
Highest	3,262	-4,245	-983	4,740	3,757	1,185	4,942	-1,592	3,350	-0.09
Total ³	8,000	-8,000	0	8,000	8,000	2,000	10,000	-2,500	7,500	-0.11
Top 10%	2,067	-2,949	-882	3,396	2,514	849	3,363	-1,173	2,190	-0.09
Top 5%	1,333	-2,095	-762	2,479	1,717	620	2,336	-872	1,465	-0.08
Top 1%	496	-994	-498	1,254	756	313	1,069	-470	599	-0.07

1. The change in Federal taxes is estimated at 2000 income levels but assuming long run (2009) law. The change in Federal taxes is less than the change in the excise tax alone because, as a result of the excise tax increase, labor and capital incomes are assumed to fall and, therefore, income and payroll taxes would also decrease.
2. After-tax income is Family Economic Income less current Federal taxes.
3. Families with negative incomes are excluded from the lowest quintile but included in the total line. Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

Columns 4 and 6 show the factor income effects. An \$8 billion factor income effect is attributed to purchases by consumers and a \$2 billion factor income effect is attributed to purchases by businesses. The percent distributions in these columns are the same and equal to the percent distribution of labor and positive capital income. The total of the two columns adds to the total amount of excise tax collected (the pre-(tax)offset amount, column 7).

The income and payroll tax offset is shown in column 8. The net burden of the price effect, factor income effects, and payroll and income tax offsets is shown in column 9. Column 10 shows the resulting percentage change in after-tax income. An increase in the alcohol excise would be regressive; the reduction in after-tax incomes would be highest for low-income families and lowest for high-income families.

6.7 Estate and Gift Taxes

Estate and gift taxes were added to Treasury's distributional analyses in 1998. With this addition, Treasury can address the distributional implications of any proposed change in federal taxation.

Estate and gift taxes are assumed to be borne by decedents. To the extent that the family income of decedents and heirs are comparable, assuming estate and gift taxes are borne by decedents as opposed to heirs will not greatly affect their distribution. This assumption is also consistent with Treasury's treatment of other taxes on capital, which are assumed to be borne by the current owners of capital income. The JCT does not currently include estate and gift taxes in their distributions. However, JCT's 1993 study examines estate and gift tax incidence and assumes these taxes are borne by decedents.⁴⁴

Treasury's basic strategy for distributing the estate tax is to consider what burden would be assessed to a taxpayer if he or she were to die in the current year (assuming end-of-the-budget-period estate tax law⁴⁵) and what the probability is that he or she would die in the current tax year. In other words, Treasury applies the probability of death to an estimate of the estate tax burden should death occur.

Treasury approximates each family's stock of wealth by grossing up its capital income flows into a measure of its capital stock. Capital income is a component of FEI and, as discussed in section 5, includes interest income (taxable and tax exempt), accrued capital gains (stock and non-stock), real earnings on IRAs, Keoghs, pensions and life insurance, rental income (including imputed rental income from owner-occupied housing), and the capital component of sole proprietor, partnership and subchapter S corporation income. The rate used to gross up the capital income flows into a stock

⁴⁴ Feenberg, Mitrusi, and Poterba (1997) also make this assumption.

⁴⁵ As a consequence of using end-of-the-budget-period law, Treasury's current-law distribution of the estate tax includes the fully phased-in increase in the unified credit enacted under TRA97, deflated to 2000 levels.

of wealth is 7 percent.⁴⁶ Once a stock of wealth is estimated for each family, it is used to calculate the family's estate tax liability should death occur. Fully phased-in estate tax law is applied with two specific adjustments, one for expected charitable contributions and a second for the presence of a surviving spouse.

In the case of a surviving spouse, Treasury assumes that no estate tax liability will be incurred. Estate tax law provides for an unlimited spousal deduction which allows estates with a surviving spouse to avoid the estate tax by bequeathing the value of the estate, in excess of the unified credit amount, to the surviving spouse.

The estate tax allows an unlimited deduction for charitable bequests. The adjustment for expected charitable contributions varies by the size of the estate. In 1992, approximately 2.1 million adults died in the United States. Sixty thousand (2.8 percent) filed an estate tax return and 27 thousand (1.3 percent) had taxable estates.⁴⁷ Considering only the 1992 estates of decedents who were not married, tabulations from the 1992 estate tax file indicate that estates of less than \$5 million bequeathed, on average, less than 10 percent of the estate to charity; estates of \$10 to \$20 million bequeathed an average 18 percent of the estate to charity; and estates in excess of \$20 million bequeathed an average 45 percent of the estate to charity. Treasury's application of estate tax law reflects this pattern of charitable bequest rates. Once the conditional estate tax liability is calculated for each family, Treasury applies mortality rates to the conditional liability to arrive at the expected estate tax burden.⁴⁸ Finally, Treasury's simulated, family-level estimate of expected estate and gift tax liability is adjusted to the aggregate revenue estimate of estate and gift tax liability under fully phased in current law.

The distribution of estate and gift taxes. As can be seen in Table 12, the estate and gift tax is highly progressive. Over 99 percent of the estate tax burden falls on the top quintile of families, with 64.2 percent on the top 1 percent of families.

7. Tax Burden Measures and Presentation of Results

The tax burden measures included in Treasury distribution tables for each income class are: (i) the average change in federal tax burdens; (ii) the total change in federal tax burdens; (iii) the share of the total change in federal tax burdens; (iv) the percentage change in federal tax burden; and (v) the

⁴⁶ The 7 percent figure is the ratio of capital income to wealth as estimated using 1982 estate tax returns. The capital income measure is that reported on the decedent's 1981 income tax return and the wealth measure comes directly from the decedent's 1982 estate tax return.

⁴⁷ These figures were taken from Joulfaian (1998, Tables 7 and 8) which includes a more complete description and history of the estate tax and more detail on the 1992 estate tax file.

⁴⁸ The mortality rates Treasury currently uses vary by age but not by other attributes which may be important, such as income or gender.

percentage change in after-tax income. As shown in Atrostic and Nunns (1991), widely used tax burden measures, like those included in Treasury distribution tables, can give contradictory results. In their paper, the authors use a hypothetical change in tax burdens to show that a given proposal can appear progressive when considering only the total change in tax burdens (the third column in Treasury's tables) or the percentage change in tax burdens (the second to last column in Treasury's tables) but regressive when considering the percentage change in after-tax income (the last column in Treasury's tables).

The only tax burden measure with some theoretical basis is the percentage change in after-tax income. It alone provides some indication of a family's change in welfare, because after-tax income represents the family's consumption possibilities in either the current or future years. In contrast, the share of the total change in tax burdens, which is often quoted in the popular press, does not convey information on a family's relative welfare gains because it does not recognize the importance of a family's initial welfare position. For example, consider a tax proposal to allow all families a \$500 (refundable) tax credit (allowed against the AMT). With 115.2 million families, the cost would be roughly \$57.6 billion and each quintile of families would have an equal share of the tax relief (\$11.5 billion). The welfare changes across families, however, would not be the same. In the lowest income quintile, the average after-tax FEI is less than \$10,000 but in the highest income quintile it is over \$150,000. An increase in after-tax income of over 5 percent for the lowest income families is arguably more welfare-enhancing than an increase in after-tax income of less than a third of 1 percent for the highest income families.

Treasury distribution tables show families ranked by income quintiles. Table 16, which shows the distributional results for the hypothetical \$10 billion tax on alcoholic beverages, is an example of Treasury's standard table. In the table, the population of all families is ranked by income and then the population is divided into fifths. The first quintile contains the lowest income families (excluding a small number of families with negative incomes who are nevertheless included in the totals).

In the past, Treasury has also presented tables by fixed-dollar breaks. In a fixed-dollar table, families are sorted by the level of their dollar income. The CBO presents its tables by quintile classes as well as fixed-dollar breaks. The JCT presents tables by fixed-dollar breaks. The major difference between quintile and fixed-dollar tables is that a quintile table emphasizes rank and therefore a family's relative income position, whereas a fixed-dollar table emphasizes nominal income levels. As a result, fixed-dollar tables may not always clearly convey a family's relative position in the total income distribution.

Quintile tables also facilitate comparisons of tables using different income measures. For example, if families were ranked the same under alternative income definitions, the resulting quintile assignments would be the same under the two definitions even if the absolute levels of one definition were significantly higher. As a result, some measures of tax burden, such as the share of the total change in federal tax burdens, would be the same in the two tables even though the income definitions were different. Other measures, such as the percentage change in after-tax income, would still differ because they depend on income levels as well as rankings.

Table 16: \$10 Billion Tax on Alcoholic Beverages¹

(2000 Income Levels)

Family Economic Quintile ²	Number of Families (millions)	Average Tax Change (\$)	Total Tax Change		Percent Change in:	
			Amount ³ (\$M)	Percent Distribution (%)	Current Federal Taxes ⁴ (%)	After-Tax Income ⁵ (%)
Lowest ⁶	22.4	14	303	4.0	2.27	-0.14
Second	23.0	35	805	10.7	1.15	-0.15
Third	23.0	55	1,258	16.8	0.68	-0.14
Fourth	23.0	77	1,772	23.6	0.49	-0.12
Highest	23.0	145	3,350	44.7	0.29	-0.09
Total ⁶	115.2	65	7,500	100.0	0.42	-0.11
Top 10%	11.5	190	2,190	29.2	0.25	-0.09
Top 5%	5.8	254	1,465	19.5	0.22	-0.08
Top 1%	1.2	515	599	8.0	0.16	-0.07

Department of the Treasury
Office of Tax Analysis

- (1) This tables distributes the estimated change in tax burden due to a proposed \$10 billion tax on alcoholic beverages.
- (2) Family Economic Income (FEI) is a broad-based income concept. FEI is constructed by adding to AGI unreported and under-reported income; IRA and Keogh deductions; nontaxable transfer payments such as Social Security and AFDC; employer-provided fringe benefits; inside build-up on pensions, IRAs, Keoghs, and life insurance; tax-exempt interest; and imputed rent on owner-occupied housing. Capital gains are computed on an accrual basis, adjusted for inflation to the extent that reliable data allow. Inflationary losses of lenders are subtracted and gains of borrowers are added. There is also an adjustment for accelerated depreciation of noncorporate businesses. FEI is shown on a family rather than a tax-return basis. The economic incomes of all members of a family unit are added to arrive at the family's economic income used in the distributions.
- (3) The change in Federal taxes is estimated at 2000 income levels but assuming long run (2009) law.
- (4) The taxes included are individual and corporate income, payroll (Social Security and unemployment), excises, customs duties, and estate and gift taxes. The individual income tax is assumed to be borne by payors, the corporate income tax by capital generally, payroll taxes (employer and employee shares) by labor (wages and self-employment income), excises on purchases by individuals in proportion to relative consumption of the taxed good and proportionately by labor and capital and excises on purchases by businesses and customs duties proportionately to labor and capital, and the estate tax by decedents. Federal taxes are estimated at 2000 income levels but assuming 2009 law and, therefore, exclude provisions that expire prior to the end of the Budget period and are adjusted for the effects of unindexed parameters.
- (5) After-tax income is Family Economic Income less current Federal taxes.
- (6) Families with negative incomes are excluded from the lowest quintile but included in the total line.

NOTE: Quintiles begin at FEI of: Second \$17,988; Third \$34,844; Fourth \$59,019; Highest \$100,767; Top 10% \$140,581; Top 5% \$189,835; Top 1% \$462,053.

Concluding Remarks

This paper describes Treasury's current distribution methodology, including the most recent improvements. Further improvements are under consideration.

Foremost, Treasury is presently studying whether to supplement or replace the current single-year income measure with one which measures individuals' income over a longer time period, such as the ten-year Budget period. Such a measure would be able to capture some life-cycle effects, such as low current-year/high lifetime incomes associated with schooling. It would also allow us to better identify the lifetime poor and thus better assess improvements in vertical equity.

Likewise, Treasury is also considering the feasibility of measuring the impact of a proposed change in tax law on individuals' tax liability over a time period longer than a year. For example, although a child credit may not affect a childless couple's current-year tax liability, such a proposal could lower expected future tax liabilities if the couple plans to have children. Similarly, education tax credits and lower capital gains rates may hold future rather than current benefits for some individuals. A multi-year measure of changes in tax burdens would also allow Treasury to capture the differences among provisions with varying phase-in rates or phase-in levels, indexed and unindexed provisions, and temporary versus permanent provisions.

Finally, Treasury is also studying the sensitivity of its analyses to family size and other demographic characteristics. We would like to know the extent to which a per capita or adult-equivalent distribution would give the same qualitative results as a distribution (like the current one) that does not adjust for family size. Because families change composition over time (because of births and deaths, marriage and divorce, and other changes), adult equivalency measures become necessary if multi-year income and tax measures are used.

REFERENCES

- Atrostic, B.K. and James R. Nunns. 1991. "The Simple Analytics of Tax Burden Measures." Paper presented at Annual Research Conference for the Association for Public Policy Analysis and Management, October 24-26.
- Bureau of the Census, Department of Commerce. 1997. "Money Income in the United States: 1996," *Current Population Reports: Consumer Income P60-197*, September.
- Cilke, James. 1994. *The Treasury Individual Income Tax Simulation Model*. Washington, D.C.: Office of Tax Analysis, U.S. Department of the Treasury.
- Congressional Budget Office. 1987a. *The Distributional Effects of an Increase in Selected Federal Excise Taxes*, Staff Working Paper, January.
- Congressional Budget Office. 1993. *Trends in Federal Tax Progressivity: 1977-1994*.
- Congressional Budget Office. 1996. *The Incidence of the Corporate Income Tax*, CBO Paper, March.
- Congressional Budget Office. 1998. *Estimates of Federal Tax Liabilities for Individuals and Families by Income Category and Family Type for 1995 and 1996*, CBO Memorandum, May.
- Feenberg, Dan, Andrew Mitrusi and James Poterba. 1997. "Distributional Effects of Adopting a National Retail Sales Tax." Working paper No. 5885. Cambridge: National Bureau of Economic Research.
- Feldstein, Martin and Andrew Samwick. 1992. "Social Security Rules and Marginal Tax Rates," *National Tax Journal*, 45(1):1-22.
- Gravelle, Jane G. 1994. "Measuring the Distribution of Income and Income Tax on an Accrual Basis," pp.173-178 in National Tax Association, *Proceedings of the Eighty-Sixth Annual Conference 1993*. Columbus, Ohio: National Tax Association.
- Gravelle, Jane G. And Laurence J. Kotlikoff. 1993. "Corporate Tax Incidence and Inefficiency When Corporate and Noncorporate Goods Are Close Substitutes," *Economic Inquiry*, 31:501-516.
- Haig, Robert Murray. 1921. "The Concept of Income -- Economic and Legal Aspects." In *The Federal Income Tax* edited by Robert Haig. New York: Columbia University Press.
- Harberger, Arnold C. 1962. "The Incidence of the Corporate Income Tax," *Journal of Political Economy*, 70(June):215-40.

- Joint Committee on Taxation. 1993. *Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens* (JCS-7-93), June 14.
- Joint Committee on Taxation. 1997. *Distributional Effects of the Conference Agreement on the Revenue Provisions of H.R.2014* (JCX-41-97).
- Joulfaian, David. 1998. *The Federal Estate and Gift Tax: Description, Profile of Taxpayers, and Economic Consequences*. Office of Tax Analysis Working Paper No. 80. Washington, D.C.: U.S. Department of the Treasury.
- Kasten, Richard, Frank Sammartino, and Eric Toder. 1994. "Trends in Federal Tax Progressivity, 1980-93," Chapter 2 in *Tax Progressivity and Income Inequality* edited by Joel Slemrod. Cambridge: Cambridge University Press.
- Kasten, Richard A. and Eric J. Toder. 1995. "Distributional Analysis at the Congressional Budget Office." Chapter 6 in *Distributional Analysis of Tax Policy* edited by David Bradford. Washington, D.C.: The AEI Press.
- Kennickell, Arthur B. and Martha Starr-McCluer. 1996. "Household Savings and Portfolio Change: Evidence from the 1983-89 SCF Panel." Working paper. Washington, D.C.: Federal Reserve Board of Governors.
- Musgrave, Richard A., Karl E. Case and Herman Leonard. 1974. "The Distribution of Fiscal Benefits and Burdens," *Public Finance Quarterly*, 2(July):259-311.
- Nelson, Susan C. 1987. "Family Economic Income and Other Income Concepts Used in Analyzing Tax Reform." Chapter 3 in U.S. Treasury, Office of Tax Analysis, *Compendium of Tax Research, 1987*. Washington, D.C.: U.S. Government Printing Office.
- Nunns, James R. 1995. "Distributional Analysis at the Office of Tax Analysis." Chapter 5 in *Distributional Analysis of Tax Policy* edited by David Bradford. Washington, D.C.: The AEI Press.
- Organisation for Economic Cooperation and Development (OECD). 1997. "Annex 2. Data, Concepts and Methods, Income Distribution and Poverty in Selected Countries." Working paper for Working Party No.1 on Macroeconomic and Structural Policy Analysis, September 30.
- Park, Thae S. 1996. "Relationship Between Personal Income and Adjusted Gross Income: New Estimates for 1993-94 and Revisions for 1959-92," *Survey of Current Business*, 76(May): 78-92.
- Park, Thae S. 1997. "Comparison of BEA Estimates of Personal Income and IRS Estimates of Adjusted Gross Income: New Estimates for 1995 and Revised Estimates for 1947-94," *Survey of Current Business*, 77 (November):12-19.

- Pechman, Joseph. 1985. *Who Paid the Taxes 1966-85?* Washington, D.C.: Brookings Institution.
- Pechman, Joseph and Benjamin Okner. 1974. *Who Bears the Tax Burden?* Washington, D.C.: Brookings Institution.
- Sabelhaus, John. 1998. "Using the Consumer Expenditure Survey For Research on Savings and Consumption." Handout prepared for Conference on Current and Future Developments in the Consumer Expenditure Survey: Towards Improving Consumption Measurement Research. New Jersey: The Woodrow Wilson School, Princeton University May 19th.
- Sabelhaus, John and Jeff Groen. 1998. "Can Permanent-Income Theory Explain Cross-Section Consumption Patterns?" Working paper.
- Simons, Henry C. 1938. *Personal Income Taxation: The Definition of Income as a Problem of Fiscal Policy*. Chicago: University of Chicago Press.
- Tax Foundation. 1989. *Tax Burdens by Income Class, 1986-1987*. Washington, D.C.: Tax Foundation.
- U.S. Department of the Treasury. 1977. *Blueprints for Basic Tax Reform*. Washington, D.C.: U.S. Government Printing Office.
- U.S. Department of the Treasury. 1984. *Tax Reform for Fairness, Simplicity, and Economic Growth, volume 1 (Treasury I)*. Washington, D.C.: U.S. Government Printing Office.