

Key Points

- This brief describes the assumptions and methods implemented in the three major integrated calculators of the Penn Wharton Budget Model (PWBM) Static Tax Simulator (STS). These calculators estimate and project individual income taxes, payroll taxes and business taxes.
- The PWBM-STS revenue estimates incorporate domestic and international income reclassifications among various entities associated with different policies. Income shifts are modeled between corporate taxpaying entities, across business and individual tax payers, and by businesses across domestic and foreign tax jurisdictions.

Implementing Alternative Tax Reforms in the Penn Wharton Budget Model Static Tax Simulator

Overview

The Penn Wharton Budget Model (PWBM) Static Tax Simulator (STS) implements a highly detailed simulation and projection of U.S. demographics and economy based on the PWBM core microsimulation model. Hundreds of thousands of individuals and families closely representative of the U.S. population are created in the computer. Careful calibration and validation procedures ensure that the simulation's demographic outputs match closely with U.S. demographic features. This exercise utilizes micro-data information from the U.S. Census Bureau and a variety of other micro and aggregate data sources.¹ Individuals and families are assigned scores of demographic and economic attributes to facilitate analysis of U.S. demographic and economic trends and for making future economic projections. Entire populations of individuals and families representative of the historical evolution observed in the United States are created. This simulation database is used to conduct many types of socio-economic and public policy analyses.

Incidence rates of fertility, mortality, immigration, labor-force participation and disability are estimated from micro-data sources and used to calibrate the PWBM microsimulation model. Additionally, conditional rates of education acquisition, marriage, divorce, capital accumulation, wage earnings, non-wage compensation and many other variables are estimated from historical micro-data sources and used as drivers of those processes within the PWBM microsimulation model. A population that closely approximates the U.S. population as of 1996 along numerous dimensions is first created. Next, individuals and families in the simulation undergo various life events each year after 1996. Children are born to adult females and new individuals immigrate. They grow older, go to school, get married, maybe get divorced, get jobs, work and earn, pay taxes, eventually retire, receive government benefits (both before and after retirement) and die. Families are formed through marriage, grow larger through childbirth, and dissolve through divorce, emigration, and death. These processes are simulated by applying scores of Markov transition rates – which specify sub-group-specific rates of shifting between states (for example, from married to single and vice-versa, from non-disabled to disabled and vice versa, from working to non-working and vice-versa and so on). These transition rates are estimated from the aforementioned micro-data surveys. Demographic outcomes are vigorously tested and validated against U.S. historical data through the year 2016 before using them to make future projections.

The PWBM micro-simulation model can be used for many types of socio-economic and public policy analyses. One key objective of developing PWBM-STS, in particular, is to analyze the budgetary implications of alternative

federal tax policies. A two-step procedure is used for estimating and projecting the revenue effects of federal tax reforms.

- First, a constellation of many income items is estimated for the PWBM-STS population and benchmarked to national aggregates using the Internal Revenue Services' Statistics of Income Survey. Next, total income is used to determine which PWBM-STS individuals and families would file income tax returns, pay payroll taxes and receive taxable business-source incomes using micro-data information.
- Second, PWBM-STS aggregates the economy's capital and labor inputs to calculate total, business and labor income using an aggregate growth model framework. Capital income is distributed across different types of business organizations (see below), one component of which is income accruing to C Corporations. Such business income is subject to corporate income taxes.

These two steps give PWBM-STS two key advantages. First, the base unit of analysis is the household rather than individual filers, allowing for more accurate estimation. Second, PWBM-STS can track the evolution of various tax bases and revenues under current and alternative tax policies over a longer future period of time relative to focusing on IRS filers alone. The rest of this brief describes the assumptions and methods underlying each of PWBM-STS's integrated tax calculators.

Three Integrated Tax Calculators

Individuals and families whose incomes would require them to file tax returns according to U.S. tax laws are designated as tax filers. PWBM-STS ensures that some low-income individuals and families also file tax returns – even if they are legally not required to file – in order to claim certain federal refundable credits for which they would qualify. The selection of low-income individuals into the tax-filer group is calibrated to the rate at which such individuals file according to Internal Revenue Service estimates.²

Next, income information necessary for tax calculation is obtained by matching PWBM-STS's filers with actual filer records from the 2010 Statistics of Income Survey (SOI2010). A matching procedure based on available demographic information in SOI2010 is developed for this step.³ The procedure is designed to ensure accuracy in tax revenue estimates as of PWBM-STS's base year (2016) and also to allow PWBM-STS's detailed demographic and economic projections to influence future federal revenue estimates. To that end, a rank-order matching algorithm between PWBM-STS filers and SOI2010 filers is employed that adjusts tax filer weights in each projection year according to projected differences in relative growth rates of PWBM-STS's population sub-groups.

PWBM-STS generates aggregate growth rates of GDP, labor and capital income and other macro-economic variables of interest. It includes three tax-calculators to generate revenues from individual income taxes, payroll taxes and corporate income taxes.

Taxes on Income from Capital/Businesses: The individual income tax calculator (PWBM-ITC) subjects each filer to the individual tax code. It computes individual tax liability by making all of the important calculations included on Form 1040 and its related forms and schedules. These include normal tax rates and brackets, preferred rates on certain investment income, above- and below-the-line deductions, the alternative minimum tax, the value of non-refundable and refundable credits and others. The calculator also accounts for income derived from non-C Corporate entities (so-called "pass-through" entities owned or controlled by tax-filing individuals) and distinguishes policies that subject such incomes to preferential tax rates.

Payroll Taxes: The payroll tax calculator (PWBM-PTC) calculates Federal Insurance Contributions Act (FICA) and Self Employment Contributions Act (SECA) tax rates for Social Security and Medicare taxable wages.⁴ These rates are calculated for all wage-earning PWBM-STS individuals, and not just on income tax filers.⁵ Employer and

employee Social Security payroll tax rates are applied to filers' wage earnings up to the Social Security taxable limit. The taxable limit is projected each year, based on PWBM-STS's internally derived growth of average economy-wide nominal wages. The Additional Medicare Tax is also calculated for high wage earners.

Taxes on Income from Capital/Businesses: The capital income tax calculator decomposes total capital income into various corporate and non-corporate tax bases and applies the relevant tax structures to those bases. The four component tax bases are for C Corporations, S Corporations, Partnerships and Sole Proprietorships, the latter three involving "pass-through" income.

- a. C Corporations: C Corporations pay taxes on income (profits) directly at the business level. Distributions of after-corporate-tax income (dividends) are again taxed at the individual level via PWBM-ITC.
- b. Pass-Through Entities: These entities are taxed only at the owner level:
 - *S Corporations*: Owners of S Corporations report pro rata shares of income or loss on their individual tax returns.
 - *Partnerships*: All partners in a partnership business also report income and expenses from the partnership on their respective tax returns. Partners may ultimately file individual or corporate returns.
 - *Sole Proprietorships*: Net income (or loss) from a sole-proprietorship is added to personal income from all other sources and taxed under the individual income tax rate schedule.

Baseline Revenue Projections:

PWBM-STS first implements projections of several macro-economic aggregates – among them, GDP, wages capital income, etc. – by aggregating individual incomes, labor compensation, returns to capital ownership, etc. Under PWBM-STS's current policy (baseline) income projections, the growth rates of these aggregates are fed into the different tax calculators. Those growth rates are applied to dollar amounts at the individual level to determine individual tax bases. Finally, the application of tax rates under given (current-law baseline or reform) policies to individual, payroll and corporate tax bases determines those respective tax liabilities. Aggregation over tax filers plus aggregate C Corporation taxes generate PWBM-STS's revenue projections.

Revenue Projections under Alternative Tax Policies:

Complications can arise when projecting the revenue effects of alternative tax reforms involving changes in individual and corporate tax rates, base-broadening reforms and reforms intended to implement particular policies such as preferential rates on pass-through incomes.

Recent tax reform proposals include sizable changes to tax-rate schedules for both businesses and individuals. It is well known that changes in tax structures affect individual and firm behavior in ways that are important to account for when making revenue estimates. Private entities respond to changes in the tax structure to minimize their tax liabilities.

Businesses adopt organizational forms that are most conducive to maximizing income (profits). A key motivating factor for selecting between alternative business entity types is to conserve tax liabilities. Whereas C Corporations dominated the business landscape during the 1990s, they only account for less than one-half of business income today. "Pass-throughs" have taken their place – entities whose annual incomes are taxed at the owner-level. Shifts between alternative tax-payer entity types (both business and individual) are induced by tax laws that permit business owners to pay taxes on business-sourced income at reduced individual income tax rates. Current tax reform proposals are likely to promote further shifts among business entity types – shifts that PWBM-STS accounts for when making revenue projections under alternative tax policies.

PWBM's tax calculators are calibrated to reflect the current structure of business organization as well as the behavioral responses of businesses to changes in tax structures for individuals and businesses. These include the response of multi-national businesses of shifting income earned abroad and repatriating capital to the United States following a change in the U.S. corporate tax rate.

Depending on the tax policy specified, PWBM-STS's tax calculators apply a set of income-shifting elasticities to the baseline distributions of business income across the entity types noted above. The new distribution of capital income determines alternative growth rates for C Corporation, S Corporation, Partnership and Sole-Proprietorship incomes. In particular, the modified income allocation across these components establishes a different distribution of taxable income at the corporate and individual levels (including pass-through income). Given policy-specific income growth rates for pass-through income, total income subject to the individual tax-rate schedule changes over the projection window and generates new revenue totals from the tax calculators. PWBM-STS's procedure for business income shifting and wage shifting under these cases is described immediately below.

Implementing Business Income Shifting

Consistent with the literature on tax system effects, PWBM-STS assumes that changes in the relative tax rates faced by C Corporations and pass-through entities would induce businesses to shift income toward the more tax-advantaged business forms. A sizable reduction in the corporate tax rate while holding the pass-through tax rate constant induces businesses to convert to C Corporations and subsequently shift income away from pass-through entities.⁶ The size of the income-shifting response is governed by the difference between the "net corporate tax rate" and the top marginal rate faced by pass-through entities:⁷

$$\omega = \tau_{net_corp} - \tau_{pass_through}$$

The net corporate rate is the statutory rate plus an estimate of the additional tax on corporate income from the taxation of dividends and capital gains through the individual income tax:

$$\tau_{net_corp} = \tau_{corp} + (1 - \tau_{corp}) \cdot (\alpha \cdot \tau_{div} + (1 - \alpha) \cdot \beta \cdot \tau_{cg})$$

where α is the share of corporate income paid out as dividends and β is a measure of the benefits of capital gains deferral. Under current law, the top marginal rate on pass-through income is the top individual income tax rate of 39.6 percent.

For a given change in tax rates, the percentage of C Corporation income that shifts into or out of C Corporations is calculated by applying an elasticity, ϵ , to the change in the tax wedge $\Delta\omega$.⁸

$$\Delta Y_{corp} = \Delta\omega \cdot \epsilon \cdot Y_{corp}$$

Table 1: Income Shifting under Alternative Corporate and Pass-Through Tax-Rate Scenarios

Tax rate		
Corporate	Pass-through	Percentage shift into (+) or out of (-) C Corporations
20.0	39.6	4.03
35.0	25.0	-4.44
25.0	25.0	-1.76

The value of ϵ is set to -0.304.⁹ Table 1 shows estimates of income shifted under three illustrative scenarios (expressed as a percent of C Corporation income).

Income flowing out of C Corporations and into pass-through businesses is distributed across the three forms of pass-through entities – S Corporations, Partnerships, and Sole Proprietorships – in proportions that depend of the direction of the flow.¹⁰

Table 2: Income Shift Allocations Among Pass-Through Entities

Income Shifting Direction	S Corporations	Partnerships	Sole proprietorships
Income shifted into pass-through entities:	45%	55%	0%
Income shifted out of pass-through entities:	55%	41%	4%

PWBM-STS also implements a special procedure for estimating revenues under policies that introduce a 25 percent preferred rate on pass-through income. Individual filers who are subject to the top individual marginal rate are assumed to shift away from wage income and toward business income – S Corporations in particular – to take advantage of the lower pass-through tax rate. Table 3 presents two cases where the preferred pass-through rate is set much lower than the top individual rate.

Table 3: Income Shifting Among Individuals Subject to the Top Individual Marginal Rate

Preferential Pass-Through Rate	Top Individual Rate	Annual Rate of Income Shifting	Final Conversion Target
25%	39.6%	5%	50%
25%	35%	3.33%	50%

- The first case shown in Table 3 establishes a differential of 14.6 percentage points between the pass-through rate and the top individual marginal rate. Under this case, PWBM's revenue estimates assume that those facing the top individual marginal rate (those whose incomes exceed about \$400,000) would convert to S Corporations at the rate of five percent per year until 50 percent of such filers become S Corporations (that is, through ten years after the policy change becomes effective).
- Under a smaller differential between the pass-through rate and the top individual marginal rate (10 percentage points as shown in second row of Table 3), the annual rate of conversion of high income

individuals is assumed to be 3.33 percent until 50 percent of filers have converted to S Corporations (that is, over 15 years after the new tax rates are introduced).

In both cases of conversions of individuals into S Corporations, those who convert are assumed to continue taking a “reasonable amount” of earnings as wage compensation. The wage compensation amount is set to 70 percent of the Social Security taxable maximum in each projection year, consistent with historically observed rates.

Business Income Shifting to the United States from Abroad

Under baseline calculations, foreign-sourced business income is subject to the U.S. corporate tax. However, this income receives a tax credit to offset taxes paid to foreign governments. The foreign tax credit rate is constructed so that the income is not taxed at a rate higher than the U.S. statutory rate. The U.S. statutory corporate tax rate is higher than the average “world” statutory corporate tax rate. As such, foreign sourced income transferred to the United States faces, on net, additional corporate tax equal to the differential between the U.S. and world corporate tax rate. PWBM-STS assumes that the income-shift elasticity equals 1. This elasticity measures how much foreign-sourced income is shifted as a result of change in the tax differential between domestic and foreign statutory tax rates. This calibration choice lies in the middle of alternative estimates of this elasticity. The literature on international income shifting suggests the elasticity lies between 2.25 and 0.4.¹¹

PWBM-STS Baseline Average Marginal Tax Rates:

Distinguishing between income types that are subject to ordinary and preferential tax rates results in tax liabilities for filers in PWBM-STS. Figure 1 shows the average marginal income tax rates, as of 2016, that result from applying current policy. In Figure 1, PWBM-STS tax filers are categorized by income taxable at ordinary income tax rates. In addition to Figure 1’s average marginal tax rates on ordinary income, PWBM-STS also generates a 24.2 percent average tax rate on incomes that are taxable at preferential rates.

Figure 1: Adult-level average marginal tax rates by income (current law baseline)

