

WASHINGTON'S TAX GAMBLE

An Evaluation of Washington's Income Tax Hike



By Rea S. Hederman Jr., Sai C. Martha, and
Donavan Rees Lingerfelt



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INTRODUCTION

Only eight states levy no individual income tax at all. Washington historically avoided taxing individual income and, although the state began taxing capital gains in 2022, wages and salaries have remained untaxed.¹ But Senate Bill 6346 changes course and assesses a 9.9 percent tax on taxable income above a \$1 million standard deduction beginning in 2028.² The legislation follows the broader trend of states adopting or considering higher taxes on high-income households.³

Washington policymakers confront persistent budget pressures. In each of the past three biennia, adopted general state spending exceeded projected general state tax revenues by approximately \$1.9 billion in 2019–21, \$2.6 billion in 2021–23, and \$4.1 billion in 2023–25.⁴ The Office of Financial Management’s June 2026 forecast reported that weaker economic activity had reduced projected state revenue by nearly \$1 billion since February and widened the expected shortfall for the 2027–29 biennium,⁵ and given this dim fiscal outlook state legislatures increasingly seek additional revenue from higher-income households. Beginning in 2022, Washington imposed a single seven percent rate on taxable long-term capital gains above a \$250,000 standard deduction;⁶ in 2025, lawmakers raised the marginal rate to 9.9 percent on taxable gains above \$1 million while retaining the seven percent rate on the first \$1 million.⁷

But as confidence in this approach wanes, Senate Bill 6346 looks to reach more individual income in search of more revenue. The new tax is expected to apply to roughly 25,000 Washington households⁸ and will generate an estimated \$3.1 billion in fiscal year 2029, with subsequent annual collections of about \$4 billion.⁹

¹ Janelle Fritts and Katherine Loughhead, **State Individual Income Tax Rates and Brackets, 2026**, Tax Foundation, February 17, 2026.

² **S.B. 6346**, 69th Legislature (Washington 2026).

³ **State Millionaire Surtaxes: Which States Tax High Earners Extra—and How Much They’re Really Making**, DaveManuel.com (last visited, August 21, 2026).

⁴ **The “\$10 Billion” Budget Shortfall: How Did We Get Here?**, Washington State House Republicans (last visited, August 21, 2026).

⁵ **June Revenue Forecast Shows Mixed Picture, Adds to Expected Shortfall in Coming Budget Cycle**, Washington State Office of Financial Management, June 26, 2026.

⁶ **RCW 82.87.040(1)(a); RCW 82.87.060(1)** (2021).

⁷ **RCW 82.87.040(1)(b)** (2025).

⁸ Jerry Cornfield, WA Revenue Officials: **Income Tax Will Bring in More Money Than First Expected**, *Washington State Standard*, August 12, 2026.

⁹ **Fiscal Impact Statement for Initiative 645**, Washington State Office of Financial Management, July 23, 2026.

Unfortunately, such projections do not capture the tax's risks or its broader economic effects as households and businesses respond to higher tax rates.

First, as critics often warn, establishing a new income tax risks future legislatures raising the initial tax rate and inevitably levying the tax on ever-lower income thresholds.¹⁰ That concern is heightened by Washington's continued budget pressures, with only about \$2 billion of room for spending growth in 2027–29 even after the new income-tax revenue is included.¹¹ New York, for example, famously enacted a “temporary” three-year tax on high incomes in 2009,¹² and has continued to impose higher rates on high incomes ever since, with current rates extended through 2032.¹³ Washington's capital gains tax track record looks similarly ominous.

Second, Senate Bill 6346 applies to a concentrated revenue base, taxing several forms of high-income, including compensation from restricted stock units and pass-through business income, making it particularly relevant to business owners and highly compensated workers in the state's technology sector.¹⁴ Such concentration means that any changes in taxpayer income, investment, business decisions, and corporate migration may affect economic activity and future tax revenues. Washington's capital gains tax exemplified a concentrated tax base as first-year net payments totaled roughly \$896 million,¹⁵ with the top 10 payments accounting for 56 percent of the total.¹⁶

To provide Washington policymakers with a more accurate perspective on the broader economic impacts of Washington's new income tax, The Buckeye Institute's state tax and economic long-run analysis (STELA) model estimates how the legislation will affect the state's gross domestic product (GDP), employment, personal consumption, private investment, and tax revenue relative to the

¹⁰ The Editorial Board, **Washington State's Income Tax Con**, *The Wall Street Journal*, March 12, 2026.

¹¹ Ryan Frost, **Six Charts That Explain Washington's Budget Problem**, Washington Policy Center, August 31, 2026.

¹² **Senate Passes Fair Share Tax Reform That Protects 96% of New Yorkers While Raising \$4 Billion to Avoid Devastating Cuts to Social Services**, New York State Senate press release, April 2, 2009.

¹³ **Recent Legislation That Has Affected Tax Expenditures**, New York State Department of Taxation and Finance, updated February 18, 2026.

¹⁴ Jared Walczak, **Proposed Washington Income Tax Would Yield a Top Rate of More Than 18 Percent**, Tax Foundation, January 14, 2026.

¹⁵ **Capital Gains Excise Tax Generates \$896 Million for Education, School Construction**, Washington State Department of Revenue press release, January 17, 2024.

¹⁶ **Net Capital Gains Tax Payments**, Washington State Department of Revenue (last visited, August 21, 2026).

baseline. A separate sensitivity analysis examines the potential for high-income taxpayer migration and employer startup formation.

TAXES AND ECONOMIC INCENTIVES

State tax burdens affect individual and business behaviors. The Washington Department of Commerce once touted the absence of a state individual income tax as “great marketing” for attracting businesses and investment.¹⁷ But that advantage has dwindled. Ranked as high as sixth-best business climate in the nation in 2014, Washington fell to sixth-worst in a 2026 Tax Foundation analysis.¹⁸ Washington also has a five-year business failure rate of 58.9 percent—more than 10 points higher than the national average of 48.4 percent.¹⁹

Senate Bill 6346 will do nothing to help turn that tide. As Washington competes for businesses, investment capital, entrepreneurs, and high-earning workers, its estimated combined state and local marginal rate on wage income and restricted stock unit vesting in Seattle could exceed 18 percent, including employer-side payroll taxes—the highest in the country.²⁰ And that is a growing concern for employers. A spring 2026 survey of more than 400 employers found that 72 percent identified the overall tax burden as a top business challenge, while 24 percent were considering relocating out of state.²¹ Such considerations are consistent with economic research and should not surprise policymakers. Moretti and Wilson have reported that state tax differences influence where high earners—especially in mobile professions—choose to live.²² Rauh and Shyu have explained that higher state income tax rates increase out-migration among high-income taxpayers.²³ Giroud and Rauh have observed that employment, capital, and business activity shift across states in response to tax changes,²⁴ and Washington-

¹⁷ Jason Mercier, **WA Department of Commerce: No State Income Tax “Is Great Marketing” for Washington**, Washington Policy Center, September 21, 2018.

¹⁸ Janelle Fritts, Jared Walczak, Abir Mandal, and Katherine Loughead, **2026 State Tax Competitiveness Index**, Tax Foundation, October 30, 2025, updated March 16, 2026.

¹⁹ Todd Myers, **Report Card for Washington: Business & Taxes**, Washington Policy Center, January 30, 2025.

²⁰ Jared Walczak, **Proposed Washington Income Tax Would Yield a Top Rate of More Than 18 Percent**, Tax Foundation, January 14, 2026.

²¹ **Spring 2026 Employer Survey**, Association of Washington Business, 2026.

²² Enrico Moretti and Daniel J. Wilson, “**The Effect of State Taxes on the Geographical Location of Top Earners: Evidence from Star Scientists**,” *American Economic Review*, Volume 107, Issue 7 (July 2017) p. 1,858–1,903.

²³ Joshua Rauh and Ryan Shyu, “**Behavioral Responses to State Income Taxation of High Earners: Evidence from California**,” *American Economic Journal: Economic Policy*, Volume 16, Issue 1 (February 2024) p. 34–86.

²⁴ Xavier Giroud and Joshua Rauh, “**State Taxation and the Reallocation of Business Activity: Evidence from Establishment-Level Data**,” *Journal of Political Economy*, Volume 127, Issue 3 (June 2019) p. 1,262–1,316.

based companies have confirmed the academic research. After the Washington Supreme Court upheld the state's capital gains tax in 2023, Fisher Investments announced it would move its headquarters to lower-tax Texas and focus future hiring there.²⁵ More recently, Moment, a Seattle-founded photography technology company, announced plans to relocate to Wyoming, with its CEO citing recent tax changes and the cumulative cost of doing business in the state.²⁶

²⁵ Taylor Soper, **Will the New Capital Gains Tax Cause Businesses to Leave Washington State?**, GeekWire, March 28, 2023.

²⁶ Randy Diamond, **Companies Leaving Washington After Millionaire's Tax Passage**, The Center Square, March 17, 2026.

MODELING THE ECONOMIC IMPACT OF WASHINGTON'S NEW INCOME TAX

Using STELA to estimate the economic effects of Washington's new 9.9 percent tax on income above \$1 million beginning in 2028, The Buckeye Institute concludes that the tax reduces private economic activity and increases state tax revenue. Because the tax applies to income earned beginning January 1, 2028, STELA treats 2028 as the first year of the policy change, even though the first returns and payments are due in 2029.²⁷ The 2028 revenue estimate therefore reflects revenue associated with income earned that year, rather than the timing of when the state receives those payments.

In 2028, the first year the tax applies, GDP is approximately \$4.9 billion below the baseline, personal consumption is \$3.6 billion lower, and private investment declines by \$3.1 billion. The workforce loses approximately 7,800 jobs, while state tax revenue increases by \$2.6 billion. (See Table I.)

These effects persist. By 2036, annual GDP is approximately \$8.3 billion below the baseline, personal consumption drops by \$4.7 billion, and private investment declines approximately \$2.4 billion. Employment falls about 18,800 jobs below the baseline, while state tax revenue is approximately \$3.3 billion higher. Measured against the revenue gain, the GDP shortfall increases from about \$1.90 for every \$1 of additional state revenue in 2028 to approximately \$2.50 by 2036, indicating that although the tax generates additional state revenue, economic activity weakens, with output, employment, consumption, and investment falling below their respective baselines.

²⁷ **Income Tax**, Washington State Department of Revenue (last visited September 4, 2026).

Table I | Economic Effects of Washington’s 9.9 Percent Personal Income Tax²⁸

Year	GDP	Employment	Tax Revenue	Consumption	Investment
2028 Baseline	\$0.98T	3.74M	\$43.0B	\$576.0B	\$209.3B
2028 Change	-\$4.9B	-7.8K	\$2.6B	-\$3.6B	-\$3.1B
2029 Baseline	\$1.01T	3.78M	\$44.3B	\$593.2B	\$215.6B
2029 Change	-\$5.6B	-15.4K	\$2.7B	-\$3.8B	-\$2.7B
2030 Baseline	\$1.04T	3.81M	\$45.6B	\$611.0B	\$222.1B
2030 Change	-\$6.2B	-16.4K	\$2.8B	-\$3.9B	-\$2.5B
2031 Baseline	\$1.07T	3.84M	\$47.0B	\$629.4B	\$228.7B
2031 Change	-\$6.7B	-17.1K	\$2.9B	-\$4.0B	-\$2.4B
2032 Baseline	\$1.10T	3.88M	\$48.4B	\$648.2B	\$235.6B
2032 Change	-\$7.1B	-17.6K	\$2.9B	-\$4.1B	-\$2.3B
2033 Baseline	\$1.13T	3.91M	\$49.9B	\$667.7B	\$242.7B
2033 Change	-\$7.4B	-18.0K	\$3.0B	-\$4.3B	-\$2.3B
2034 Baseline	\$1.17T	3.95M	\$51.4B	\$687.7B	\$249.9B
2034 Change	-\$7.7B	-18.3K	\$3.1B	-\$4.4B	-\$2.3B
2035 Baseline	\$1.20T	3.98M	\$52.9B	\$708.4B	\$257.4B
2035 Change	-\$8.0B	-18.6K	\$3.2B	-\$4.5B	-\$2.4B
2036 Baseline	\$1.24T	4.02M	\$54.5B	\$729.6B	\$265.2B
2036 Change	-\$8.3B	-18.8K	\$3.3B	-\$4.7B	-\$2.4B

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²⁸ The Buckeye Institute’s STELA model. Dollar figures are in 2025 dollars, employment is full-time equivalent non-farm jobs.

MIGRATION AND EMPLOYER STARTUP SENSITIVITY

Washington once attracted taxpayers from other states. Using 2016 Internal Revenue Service (IRS) data, the Cato Institute ranked Washington second nationally in net household inflows and identified the state as a destination for high-income households.²⁹ That advantage has diminished. A National Taxpayers Union Foundation analysis of IRS migration data found that Washington experienced one of the largest high-earner outflows in the country in 2022, the first year the state's capital gains tax applied.³⁰ Growing concerns among Washington business leaders and entrepreneurs have accompanied the changing tax environment, including Howard Schultz's move to Florida and Starbucks' expansion in Tennessee.³¹

Tax policy also affects business formation. Economists Fairlie, Fossen, Johnston, and Lyu argue that tax increases can reduce startup activity and employment.³² And using 21,530 federal tax returns in the state reporting adjusted gross income (AGI) of \$1 million or more as the baseline,³³ The Buckeye Institute's own sensitivity analysis estimates that approximately 575 high-income filers, or 2.67 percent of that high-earners' tax base, could leave Washington over the long run. Those filers account for approximately \$1.76 billion in annual AGI. Washington averaged approximately 11,800 new employer firms per year from 2014 through 2023.³⁴ Applying the startup sensitivity estimate to that baseline reveals an 11.9 percent decline in employer startup formation, equivalent to roughly 1,400 fewer new firms and approximately 6,100 associated jobs per year.

²⁹ Chris Edwards, *Tax Reform and Interstate Migration*, Cato Institute, September 6, 2018.

³⁰ Andrew Wilford, *Migration in Minutes: Latest IRS Data on Interstate Migration Shows Taxpayers Continuing to Flee California and New York*, National Taxpayers Union Foundation, April 6, 2026.

³¹ Anna Edgerton, *Starbucks Founder Leaves Washington State with Millionaire Tax Rattling the Rich*, *The Spokesman-Review*, March 12, 2026.

³² Robert Fairlie, Frank M. Fossen, Andrew C. Johnston, and Ke Lyu, *Taxes, Incentives and Entrepreneurship: Evidence from the Universe of U.S. Startups*, working paper, May 1, 2025, revised February 13, 2026.

³³ *SOI Tax Stats—Historic Table 2: Individual Income and Tax Data, by State and Size of Adjusted Gross Income*, Internal Revenue Service (last visited, August 14, 2026).

³⁴ *2023 Business Dynamics Statistics Data Tables*, U.S. Census Bureau (last visited, August 21, 2026).

CONCLUSION

Washington's new income tax may provide additional state revenue but raising it from a narrow group of high-income taxpayers risks broader economic consequences. Economic evidence and modeling show that higher marginal tax rates affect investment, employment, business formation, taxpayer migration—the economic base that supports future tax revenue. Abandoning the state's no income tax policy and its competitive advantages could prove economically disastrous, especially when the new tax is borne by such a small minority. When revenue shortfalls persist under the new tax regime, Washington may be tempted to follow New York's example by raising relative rates and lowering the income threshold.

Persistent budget pressures ultimately require more than another source of tax revenue. A sustainable fiscal strategy must address public spending growth and commitments without sacrificing the private investment, entrepreneurship, and economic activity that generate public revenues. Rather than rely on a small, potentially volatile tax base, Washington policymakers should promote spending discipline, revenue stability, and a competitive tax environment to strengthen the state's long-term fiscal position and protect the economic base that finances civic priorities.

APPENDIX

Appendix A: STELA's Methodology

Economists at The Buckeye Institute developed and maintain a dynamic scoring model—STELA (state tax and economic long-run analysis model)—to analyze how changes to tax policy impact not only government revenues but also economic output, job creation, and business investment. Unlike static models that do not account for human or market responses to policy changes, STELA predicts how individuals, households, and businesses will alter their economic choices in response to changes in the private economy and public policy over time.

STELA is calibrated for the state being modeled using publicly available state and federal data and relies on a similar dynamic scoring framework used by federal agencies to evaluate federal tax proposals to predict how certain policy changes will affect gross domestic product (GDP), job creation or loss, and government revenue.

STELA has undergone a double-blind peer review and incorporated comments from those reviews consistent with current academic standards and methodologies. STELA's full technical description provided below will allow researchers to validate its accuracy and the conclusions that The Buckeye Institute draws in its research.

STELA's Framework

STELA provides a framework representing a generic state economy, with its parameters calibrated to the specific state being analyzed. It allows researchers to study the interaction of households' economic choices and firms' profit-maximizing decisions with a state government that pays for its budget by taxing households and businesses. STELA's framework is similar to those used to study national policy, modified with some conditions tailored to the specific economic conditions of a state. Because states have more limits to trade and debt relative to a national economy, for example, STELA includes a condition in which state governments satisfy a budget constraint where debt cannot increase beyond a certain level. STELA is comprised of the following three parts:

- 1) *The Household Problem*: Households choose how much to consume and how much to work based on their preferences and their budgets. Households can also choose to take on debt or invest in capital used by firms. Their budgets factor in sales and excise taxes on consumption, labor

income (both at the state and federal level), capital income (both at the state and federal level), and licensing. The parameters governing these taxes are estimated using state and federal data.

- 2) *The Firm Problem*: Firms choose labor and capital, supplied by the household, to maximize profits taking the costs of production (wages, the price of capital, and taxes) as given. Using state-level data, STELA simulates production within separate sectors. The output produced is used for consumption, government expenditures, or investments in factors of production.
- 3) *The Government Sector*: The government sets taxes to collect revenue to pay for its expenditures; however, deficits and surpluses are allowed to a limited degree. The state's trade balance is a mathematical output of what is consumed, invested in, and government expenditures less total production in the economy.

With this framework, Buckeye then explicitly defines how households and firms make their economic choices.

In STELA's environment, time is discrete and lasts forever. In every period, the economy is populated by heterogeneous households specialized in the production of one of s the types of goods. The Bureau of Economic Analysis (BEA) reports macroeconomic data for the 50 states in yearly intervals, so each period represents a year in this framework. Each sector s is populated by a large number of firms specialized in the production in their sector. The economy also features a government sector that collects taxes and purchases goods from all sectors. A share $q^e \in (0,1)$ of households has an earning ability $e = 1, \dots, E$. These shares are such that the total population is $\sum_{e=1}^E q^e = 1$. The share of households with the required skills to work in the sector s is $\mu_s \in (0,1)$ such that $\sum_{s=1}^S \mu_s = 1$. Buckeye then outlines each part of STELA: the household problem, the firm problem, and the government sector.

The Household Problem

The household has preferences between consumption and leisure. These preferences are represented by a period t utility function U_t , which takes the following form:

$$U_t = \sum_{s=1}^S \alpha_s \ln(c_{e,t}(s)) - \chi_e l_{e,t}(s)^{\left(1 + \frac{1}{\psi_e}\right)}$$

Taking the prices, taxes, and previous period $t - 1$ choices as given, each period t , household e chooses: how much to consume $c_{e,t}(s)$ from each sector s ; the amount of future capital stock $k_{e,t}(s)$ for each sector s ; investment $x_{e,t}(s)$ for each sector s ; how much to borrow in debt $d_{e,t}$; and how much to work $l_{e,t}(s)$ in each sector s . Households place a utility weight on consumption goods according to $\alpha_s \in (0,1)$ where α_s represents the share of total GDP in sector s . Period time is split between labor and leisure such that total time is normalized to 1. Leisure $h_{e,t}$ can be defined as:

$$h_{e,t} = 1 - \sum_{s=1}^S l_{e,t}(s)$$

where $h_{e,t} \in [0,1]$ and $l_{e,t}(s) \in [0,1]$. The parameter that regulates the Frisch elasticity of labor supply is denoted ψ_e . χ_e is a scaling factor that helps match hours worked observed in the data.

The household seeks to maximize its utility by solving the following problem:

$$V_{e,t}(s) = \max_{c_{e,t}(s), x_{e,t}(s), l_{e,t}(s), k_{e,t}(s), d_{e,t}} U(c_{e,t}) - \chi_e l_{e,t}(s)^{\left(1 + \frac{1}{\psi_e}\right)} + \beta E[V_{e,t+1}(s)]$$

The economic decisions for period t are subject to the following constraints:

$$\begin{aligned} d_{e,t} = & (1 + \tau_t^c + \tau_t^{ex}) \sum_{s=1}^S c_{e,t}(s) + \sum_{s=1}^S x_{e,t}(s) + (1 + i_{r,t-1})d_{e,t-1} + \tau_t^k \sum_{s=1}^S k_{e,t-1}(s) \\ & + \left[\frac{\phi}{2} \left(\sum_{s=1}^S k_{e,t}(s) - \sum_{s=1}^S k_{e,t-1}(s) \right)^2 \right] - (1 - (1 - \eta_{e,t}^{i,n})\tau_{e,t}^{i,n} - \tau_t^o \\ & - \tau_{e,t}^{i,n,f}) \sum_{s=1}^S w_{e,t}(s) l_{e,t}(s) - (1 - (1 - \eta_{e,t}^{i,r})\tau_{e,t}^{i,r} - \tau_t^o - \tau_{e,t}^{i,r,f} \\ & - \tau_t^{corp}) \sum_{s=1}^S r_{e,t}(s) k_{e,t-1}(s) \\ & k_{e,t}(s) = x_{e,t}(s) + (1 - \delta)k_{e,t-1}(s) \\ & c_{e,t}(s) \geq 0 \\ & k_{e,t}(s) \geq 0, k_{e,T+1}(s) = 0 \end{aligned}$$

$V_{e,t}(s)$ defines expected utility discounted at a patient factor $\beta \in [0,1]$. As in Mendoza (1991), ϕ denotes a capital adjustment cost. The return on capital lent to

firms is $r_{e,t}(s)$. The wage paid to workers of type e in sector s is $w_{e,t}(s)$. Future capital stock $k_{e,t}(s)$ is the sum of current capital stock $k_{e,t-1}(s)$, accounting for depreciation δ , and investment $x_{e,t}(s)$. $i_{r,t}$ denotes the interest rate at which domestic residents can borrow from international markets in period t , and $d_{e,t}$ is household debt.

Following Schmitt-Grohé and Uribe (2003), Buckeye assumes a debt elastic interest rate. This is modeled as $i_{r,t} = i_{r,w} + \zeta(e^{D_t-D} - 1)$ where $i_{r,w}$ is the world interest rate faced by domestic agents and is assumed to be constant and ζ and D are constant parameters that are calibrated to match the state's economy. $\zeta(e^{D_t-D} - 1)$ is the state specific interest rate premium that increases with the level of debt. D_t represents the aggregate state level of debt, such that $D_t = \sum_{e=1}^E d_{e,t}$.

τ_t^c is the tax on household consumption purchases, which includes general sales tax, and τ_t^{ex} is the excise tax rate. $\tau_{e,t}^{i,n}$ is the statutory individual labor income tax rate, and $\tau_{e,t}^{i,r}$ is the individual capital income tax rate. $\eta_{e,t}^{i,n}$ and $\eta_{e,t}^{i,r}$ are the proportions of labor income and capital income respectively that are deducted or otherwise exempt from income taxes. $\tau_{e,t}^{i,n,f}$ is the individual labor income tax collected by the federal government, and $\tau_{e,t}^{i,r,f}$ is the individual capital income tax collected by the federal government. Income tax rates depend on the individual earning ability e . τ_t^k is a tax on fixed assets owned by households. τ_t^{corp} is the corporate income tax faced by the owners of capital. τ_t^o is the share of income paid to all other taxes, fees, and revenue sources for the state government not included specifically in STELA.

The variables representing households' economic decisions for each period t and sector s can be summarized as the set: $\left\{ \{c_{e,t}(s), x_{e,t}(s), l_{e,t}(s), k_{e,t+1}(s)\}_{s=1}^S, d_{e,t} \right\}_{t=0}^\infty$. The household then maximizes the utility function subject to the resource constraint and a no-Ponzi scheme constraint that implies that the household's debt position must be expected to grow at a rate lower than the interest rate in the long-run.

The Firm Problem

In each sector s , a large number of competitive firms produce goods according to the following constant elasticity of substitution (CES) production function:

$$y_t(s) = a_t \left(\sum_{e=1}^E \left((\theta_s) (k_{e,t-1}(s))^{-\rho} + (1 - \theta_s) (z_e l_{e,t}(s))^{-\rho} \right)^{\frac{1}{\rho}} \right)$$

where a_t is total factor productivity (TFP), θ_s is associated with the capital share of total output in sector s , and $\sigma_{CES} = \frac{1}{1-\rho}$ is the constant elasticity of substitution between capital and labor. z_e is labor productivity specific to a household member's earning ability. These firms solve the following profit maximization problem:

$$\begin{aligned} \Pi_t = (1 - \tau_t^{CAT}) a_t & \left(\sum_{e=1}^E \left((\theta_s) (k_{e,t-1}(s))^{-\rho} + (1 - \theta_s) (z_e l_{e,t}(s))^{-\rho} \right)^{\frac{1}{\rho}} \right) \\ & - \sum_{e=1}^E w_{e,t}(s) l_{e,t}(s) - \sum_{e=1}^E r_{e,t}(s) k_{t-1}(s) \end{aligned}$$

It is important to note that the demand for labor and capital is sector s specific. τ_t^{CAT} is a commercial activity tax, modeled as a tax on a firm's revenues.

The representative firm in sector s hires labor according to the following condition:

$$\begin{aligned} (1 - \tau_t^{CAT}) (1 - \theta_s) a_t & \left((\theta_s) (k_{e,t-1}(s))^{-\rho} \right. \\ & \left. + (1 - \theta_s) (z_e l_{e,t}(s))^{-\rho} \right)^{\frac{1}{\rho}-1} (z_e l_{e,t}(s))^{-\rho-1} z_e = w_{e,t}(s), \end{aligned}$$

where $w_{e,t}(s)$ is the wage rate for type e in sector s . The demand for capital is such that:

$$\begin{aligned} (1 - \tau_t^{CAT}) (\theta_s) a_t & \left((\theta_s) (k_{e,t-1}(s))^{-\rho} + (1 - \theta_s) (z_e l_{e,t}(s))^{-\rho} \right)^{\frac{1}{\rho}-1} (k_{e,t-1}(s))^{-\rho-1} \\ & = r_{e,t}(s), \end{aligned}$$

Buckeye assumes a_t follows a stationary mean zero autoregressive process of order 1 in the log, which can be represented in the following way:

$$(a_t) = \rho_A (a_{t-1}) + \epsilon_{A,t}$$

The innovation shock $\epsilon_{A,t}$ is drawn from a standard normal distribution.

The Government Sector

The government sets taxes and collects revenue to make purchases. Its contribution to the rainy day fund RF_t is the excess of tax revenue plus federal

government transfers net of government spending added to the previous period's balance.

$$RF_t = TR_t + FF_t - g_t + (1 + i_{r,t})RF_{t-1}$$

Deficits—negative contributions—to the rainy day fund reduce the fund's balance.

The state government's tax revenues TR_t are given by:

$$TR_t = \sum_{s=1}^S \left(\sum_{e=1}^E \left(\tau_t^{\text{CAT}} y_{(e,t)}(s) + (\tau_t^c + \tau_t^{\text{ex}}) c_{e,t}(s) + (1 - \eta_{e,t}^{i,n}) \tau_{e,t}^{i,n} w_{e,t}(s) l_{e,t}(s) \right. \right. \\ \left. \left. + (1 - \eta_{e,t}^{i,r}) \tau_{e,t}^{i,r} r_{e,t}(s) k_{e,t-1}(s) + \tau_t^k k_{e,t-1}(s) \right) + \tau_t^o y_t(s) \right)$$

Government spending is proportional to GDP and is specified as $g_t = \hat{g}_t y_t$. This implies that government spending is assumed to grow as the economy grows. Spending policy $\hat{g}_t$ is assumed to evolve according to:

$$\hat{g}_t = (1 - \rho_{g,h})(\hat{g}) + \rho_{g,h}(\hat{g}_{t-1}) + \epsilon_g$$

where g is the state share of income spent by the government sector in the long-run, the steady-state equilibrium. Variables without the time subscript denote steady-state values.

The tax instruments follow the exogenous processes:

$$\begin{aligned} \tau_t^{i,n} &= (1 - \rho_{i,n})\tau^{i,n} + \rho_{i,n}\tau_{t-1}^{i,n} + \epsilon_{i,n} \\ \tau_t^{i,r} &= (1 - \rho_{i,r})\tau^{i,r} + \rho_{i,r}\tau_{t-1}^{i,r} + \epsilon_{i,r} \\ \tau_t^c &= (1 - \rho_c)\tau^c + \rho_c\tau_{t-1}^c + \epsilon_c \\ \tau_t^{\text{ex}} &= (1 - \rho_{\text{ex}})\tau^{\text{ex}} + \rho_{\text{ex}}\tau_{t-1}^{\text{ex}} + \epsilon_{\text{ex}} \\ \tau_t^{\text{corp}} &= (1 - \rho_{\text{corp}})\tau^{\text{corp}} + \rho_{\text{corp}}\tau_{t-1}^{\text{corp}} + \epsilon_{\text{corp}} \\ \tau_t^k &= (1 - \rho_k)\tau^k + \rho_k\tau_{t-1}^k + \epsilon_k \\ \tau_t^o &= (1 - \rho_o)\tau^o + \rho_o\tau_{t-1}^o + \epsilon_o \\ \tau_t^{i,n,f} &= (1 - \rho_{i,n,f})\tau^{i,n,f} + \rho_{i,n,f}\tau_{t-1}^{i,n,f} + \epsilon_{i,n,f} \\ \tau_t^{i,r,f} &= (1 - \rho_{i,r,f})\tau^{i,r,f} + \rho_{i,r,f}\tau_{t-1}^{i,r,f} + \epsilon_{i,r,f} \\ \eta_t^{i,n} &= (1 - \rho_{\eta,n})\eta^{i,n} + \rho_{\eta,n}\eta_{t-1}^{i,n} + \epsilon_{\eta,n} \\ \eta_t^{i,r} &= (1 - \rho_{\eta,r})\eta^{i,r} + \rho_{\eta,r}\eta_{t-1}^{i,r} + \epsilon_{\eta,r} \end{aligned}$$

As in Schmitt-Grohé and Uribe (2003), Buckeye writes the trade balance to GDP ratio (TB) in steady-state as:

$$TB = 1 - \frac{[c + x + g]}{y}$$

The Competitive Equilibrium

A competitive equilibrium is such that given the set of exogenous processes, households solve the household utility maximization problem, firms solve the profit maximization problem, and the capital and labor markets clear.

The Deterministic Steady-State

The characterization of the deterministic steady state is of interest for two reasons. First, the steady-state facilitates the calibration of STELA. This is because the deterministic steady-state coincides with the average position of the model economy to a first approximation. Because of this, matching average values of endogenous variables to their observed counterparts (e.g., matching predicted and observed average values of the labor share, the consumption shares, or the trade-balance-to-output ratio) can reveal information about structural parameters that can be used in the calibration of STELA. Second, the deterministic steady-state is often used as a convenient point around which to approximate equilibrium conditions of the stochastic economy (see Schmitt-Grohe and Uribe, 2003). For any variable, Buckeye denotes its steady-state value by removing the time subscript.

Using the solution from the households' and firms' choice problems, the steady-state implies that:

$$\begin{aligned} 1 &= \beta \left[(1 - (1 - \eta_e^{i,r}) \tau_e^{i,r} - \tau^o - \tau_e^{i,r,f} - \tau^{corp}) r_e(s) + 1 - \delta - \tau^k \right] \\ y(s) &= a \left(\sum_{e=1}^E \left((\theta_s) (k_e(s))^{-\rho} + (1 - \theta_s) (z_e l_e(s))^{-\rho} \right)^{\frac{1}{\rho}} \right) \\ (1 - \tau^{CAT}) a \left[\theta_s \left(\frac{k_e(s)}{l_e(s)} \right)^{-\rho} + (1 - \theta_s) z_e^{-\rho} \right]^{\frac{1}{\rho}-1} \theta_s \left(\frac{k_e(s)}{l_e(s)} \right)^{-\rho-1} &= r_e(s) \end{aligned}$$

These expressions deliver the steady-state capital-labor ratio, which Buckeye denotes $\omega_e(s)$

$$\omega_e(s) \equiv \frac{k_e(s)}{l_e(s)} = \left(1 - \theta_s\right)^{-\frac{1}{\rho}(z_e)} \left(\frac{\beta^{-1} - 1 + \delta + \tau^k}{a(1 - \tau^{CAT})\theta_s(1 - (1 - \eta_{e,t}^{i,r})\tau_e^{i,r} - \tau^o - \tau_e^{i,r,f} - \tau^{corp})} - \theta_s \right)^{\frac{1}{\rho}}$$

The steady-state level of capital is:

$$k_e(s) = \omega_e(s)l_e(s)$$

Finally, the steady-state level of consumption can be obtained by evaluating the resource constraint at the steady-state:

$$\sum_{e=1}^E c_e(s) = y(s) - \delta \sum_{e=1}^E k_e(s) - g\mu_s - TB y(s)$$

which implies: $y = c + x + g + TB y$

As for the parameter that dictates households' preference for leisure:

$$\chi_e = \frac{\alpha_s}{(1 + \tau^c + \tau^{ex})c_e(s)} \times \frac{(1 - (1 - \eta_{e,t}^{i,n})\tau_e^{i,n} - \tau^o - \tau_e^{i,n,f})w_e(s)}{\left(1 + \frac{1}{\psi_e}\right)l_e(s)^{\frac{1}{\sigma_e}}}$$

Data and Calibration

Buckeye's data for calibrating STELA come from publicly available federal and state data sources. First, Buckeye presents its sources for STELA's output variables. Then Buckeye presents the sources for STELA's parameters and Buckeye's empirical methodology for calibrating STELA.

Output Variables

Primarily, Buckeye utilizes BEA Regional Economic Accounts for the state being modeled for its output. All GDP variables are reported in real 2025 dollars and, if not declared otherwise, Buckeye uses the most recently available data.

Buckeye's GDP projections use the latest GDP values and apply the state's long-run annual GDP growth rate.

For Buckeye's measures of consumption, consumption expenditures on durable goods are subtracted from total personal consumption expenditures (PCE). For purposes of STELA's calibration, Buckeye treats consumer durable goods as investment goods.

Because the BEA does not report private fixed investment at the state level, Buckeye uses the U.S. share of non-residential investment in GDP from the BEA and applies it to state GDP to estimate non-residential gross investment. The sum of non-residential investment and consumption expenditures on durable goods represents Buckeye's measure of investment. STELA excludes residential investment and changes in private inventories from its investment measure and from the adjusted GDP measure used for calibration.

Buckeye bases its employment data for the number of non-farm jobs on data from the Bureau of Labor Statistics. Buckeye calculates the employment shares per sector using data from the BEA Regional Economic Accounts. Buckeye takes the average weekly hours worked from the Annual Social and Economic Supplement of the Current Population Survey. The average weekly hours worked at all jobs is divided by the total number of hours per week (168 hours) to calculate average labor supply used for STELA's calibration. For the baseline projections, employment is assumed to grow at its annual growth rate for 1997-2022.

Buckeye uses the following methodology to estimate the effects of the tax policy scenarios on employment because STELA measures employment in hours worked (intensive margin). First, Buckeye uses employment multiplied by the average hours worked per year. This total number of hours worked per year is multiplied by the effect of the corresponding scenario in order to obtain the change in total hours worked for each scenario. Finally, the change in hours is converted into the number of full-time equivalent jobs gained or lost by dividing it by 2,080, which is the number of hours worked by a full-time equivalent employee according to the CBO's definition (Harris and Mok, 2015).

Migration and Employer Startup Sensitivity Analysis

STELA does not explicitly model interstate migration or employer startup formation within its core equilibrium framework. Buckeye therefore supplements STELA with separate sensitivity analyses that estimate how changes in state income-tax policy may affect the location of high-income taxpayers and the formation of new employer firms. These estimates combine behavioral responses identified in the empirical literature with state-specific taxpayer and business-formation data. Because these responses are estimated outside STELA, they are reported separately from the STELA's endogenous effects on output, employment, consumption, investment, and tax revenue.

Throughout the sensitivity analysis, changes in tax rates are measured in percentage points as the policy rate minus the baseline rate. A positive change in the tax rate therefore represents a tax increase, while a negative change represents a tax reduction.

Migration

Buckeye estimates the potential migration response of high-income taxpayers to changes in the applicable marginal individual income tax rate. Empirical research finds that state income-tax differentials can affect the location decisions of high-income taxpayers, although the magnitude of the response varies across taxpayer groups and policy settings.³⁵ To incorporate this behavioral response, Buckeye applies an empirically estimated migration parameter to the change in the applicable marginal tax rate and the baseline population of taxpayers affected by the policy.

The migration response is represented as:

$$\Delta N_M = N \left(\frac{m \Delta \tau_{PIT}}{100} \right)$$

³⁵ Joshua Rauh and Ryan Shyu, “**Behavioral Responses to State Income Taxation of High Earners: Evidence from California**,” *American Economic Journal: Economic Policy*, Volume 16, Issue 1 (February 2024), p. 34–86; Enrico Moretti and Daniel J. Wilson, “**The Effect of State Taxes on the Geographical Location of Top Earners: Evidence from Star Scientists**,” *American Economic Review*, Volume 107, Issue 7 (July 2017), p. 1,858–1,903; Cristobal Young, Charles Varner, Ithai Z. Lurie, and Richard Prisinzano, “**Millionaire Migration and Taxation of the Elite: Evidence from Administrative Data**,” *American Sociological Review*, Volume 81, Issue 3 (June 2016), p. 421–446.

where ΔN_M is the estimated number of affected high-income filers associated with the migration response, N is the baseline number of affected high-income filers, m is the empirical out-migration response to a one-percentage-point change in the marginal tax rate, and $\Delta\tau_{PIT}$ is the change in the applicable marginal individual income tax rate.

Under this convention, an increase in the tax rate produces a positive estimate of out-migration, while a tax-rate reduction produces an opposite response. Buckeye combines the estimated change in filers with the average adjusted gross income of the affected taxpayer group to approximate the amount of income associated with the migration response.

The resulting estimates measure the potential sensitivity of high-income taxpayers' locations and associated income to changes in state tax policy. They should be interpreted as behavioral sensitivity estimates rather than population or revenue forecasts generated within STELA.

Employer Startup Formation

Buckeye also estimates the potential response of employer startup formation to changes in state individual and corporate income tax rates. Empirical research finds that state tax policy can affect entrepreneurship, new-firm formation, and employment, with the magnitude of these responses differing across tax instruments.³⁶ Buckeye therefore distinguishes between the effects associated with individual and corporate income taxation.

The estimated percentage change in employer startup formation is represented as:

$$\% \Delta S = -(\beta_{PIT} \Delta\tau_{PIT} + \beta_{CIT} \Delta\tau_{CIT})$$

where $\% \Delta S$ is the estimated percentage change in employer startup formation; β_{PIT} and β_{CIT} are the empirical response parameters associated with individual and corporate income taxation; and $\Delta\tau_{PIT}$ and $\Delta\tau_{CIT}$ are the corresponding changes in those tax rates.

³⁶ Robert W. Fairlie, Frank M. Fossen, Andrew C. Johnston, and Ke Lyu, *Taxes, Incentives and Entrepreneurship: Evidence from the Universe of U.S. Startups*, working paper, University of California, Los Angeles; University of Nevada, Reno; and University of Texas at Austin, May 1, 2025, revised February 13, 2026; E. Mark Curtis and Ryan A. Decker, *Entrepreneurship and State Taxation*, working paper, Finance and Economics Discussion Series 2018-003, Board of Governors of the Federal Reserve System, January 2018; Xavier Giroud and Joshua Rauh, "State Taxation and the Reallocation of Business Activity: Evidence from Establishment-Level Data," *Journal of Political Economy*, Volume 127, Issue 3 (June 2019), p. 1,262–1,316.

The negative relationship reflects the empirical finding that higher income-tax rates are associated with lower employer startup formation. Thus, a tax-rate increase produces an estimated decline in startup formation, while a tax-rate reduction produces an estimated increase. When a policy changes only one tax instrument, the change in the unaffected tax rate is set equal to zero.

Buckeye applies the estimated percentage response to the state's baseline annual level of new employer-firm formation to estimate the number of startups associated with the tax-policy change. The startup response is then combined with the average employment associated with new employer firms to approximate the corresponding employment effect. For tax-increase scenarios, these estimates are reported as the number of employer startups and associated jobs potentially lost relative to the baseline.

Like the migration estimates, the startup results are supplemental behavioral sensitivity estimates and are not endogenous outcomes generated within STELA's core equilibrium framework.

STELA's Parameters and Calibration

Typically, a calibration assigns values to STELA's parameters by matching first and second moments of the data that STELA aims to explain. Buckeye utilizes moments in state and federal data to estimate STELA's parameters.

Because depreciation data are not reported at the state level by the BEA, Buckeye refers to data for the U.S. economy. The sum of current cost depreciation in nonresidential private fixed assets and consumer durable goods is divided by the sum of current cost net stock of nonresidential private fixed assets and consumer durable goods for the years 1997-2022. The average over this period represents the depreciation rate in STELA.

The world interest rate is taken as $i_{r,w} = 0.043$.

To compute the sector-specific labor shares, Buckeye uses data from the BEA Regional Income Division. Similar to Gomme and Rupert (2004), Buckeye divides the compensation of employees by the personal income for each sector. As personal income is not available for sectors, Buckeye constructs it by multiplying the earnings per sector by the total economy's personal income-to-earnings ratio, which is from the BEA Regional Income Division. The capital share is simply one minus the labor share. The values refer to the years 1997-2023. The sector specific parameter θ_s is set to match the observed average labor shares for each of the $S =$

9 production sectors.³⁷ In the present model, the labor share is given by the ratio of labor income to output, which is $1 - \theta_s$ at all times. To ensure that capital and investment are not being overstated (or understated), the parameter ν , a cost on holding capital, is applied to adjust the steady state rental rate of capital, calibrating it to match the state's investment share of GDP.³⁸

The earning ability for household types is based on the distribution of income and population. The share of household members by earning ability, q^e , is the share of returns per earning ability group. The labor productivity per earning ability, z_e , is the income per return for each earning ability, with the labor productivity for group 1 being normalized to one. Buckeye takes its Frisch elasticity estimate $\psi_e = 0.4$ from Reichling and Whalen (2012). The parameter D is set to match the observed average trade-balance-to-output ratio since $TB = i_{r,w} \frac{D}{y}$. Buckeye estimates tax rates similar to the methodology used by McDaniel (2007).³⁹

³⁷ See complete list of sectors in STELA's Parameters section.

³⁸ The holding cost of capital is incorporated mathematically in the following way to steady state rental rate of capital: $r_{e,s}^* = \frac{\frac{1}{\beta} + \tau_e^k + \nu - (1 - \delta)}{(1 - (1 - \eta_{e,t})\tau_e^{ir} - \tau_e^{irf} - \tau^{co} - \tau_s^s - \tau^o)}$.

³⁹ A complete explanation of the methodology is included in STELA's Parameters section.

Appendix B: STELA's Parameters

Tax Rate Estimates

The state tax rates calculated in this paper are average State tax rates. The general strategy employed is as follows. First, total income is categorized as labor income or capital income and private expenditures are categorized as consumption or investment. Second, tax revenues are classified as revenues generated from taxes on labor income, capital income, private consumption expenditures, or private investment. To find a given tax rate, The Buckeye Institute divided each category of tax revenue by the corresponding income or expenditure. Since The Buckeye Institute computes tax rates in the same fashion each year, time subscripts were dropped for the rest of this section.

Data on tax revenues come from U.S. Census Bureau Survey of State Government Tax Collections (STC) and the U.S. Internal Revenue Service for tax year 2020.⁴⁰ Data on income and expenditures come from regional BEA data. In any given year, total tax revenues collected by the government are the sum of taxes on production and imports (TPI), social security contributions, direct taxes on households (HHT), and direct taxes on corporations. The following sections detail the steps The Buckeye Institute takes to categorize these tax revenues and calculate average tax rates.

Share of the Income Tax that Falls on Labor

The average tax rate on labor income is found by dividing labor income tax revenues by economy-wide total wage and salary labor income. To compute the labor income tax rate, The Buckeye Institute calculates labor income tax revenues and labor income. Labor income tax revenues come from two sources: the household income tax and social security taxes. However, household income taxes represent taxes on total income. Since only a portion of this income is generated from labor, only a portion of these taxes reflects taxes on labor income.

Unfortunately, the STC and BEA do not break down household income taxes according to type of income. For this reason, papers calculating average tax rates on labor and capital income based on aggregate data, such as Mendoza et al. (1994), assume that the tax rate on household labor income is the same as the tax

⁴⁰ **2024 State Government Tax Tables**, U.S. Department of Commerce, U.S. Census Bureau (Last visited August 21, 2026); **SOI Tax Stats – Historic Table 2**, IRS.gov (last visited, August 21, 2026).

rate on household capital income.⁴¹ The Buckeye Institute makes the same assumption.

The federal income tax rate is found by dividing total federal taxes on income of the household, $FHHT$, by total household income in each period. Household income is defined as gross domestic product less net taxes on production and imports, or $GDP - (TPI - Sub)$. The household income tax rate is therefore measured as:

$$\tau^{i,f} = \frac{FHHT}{GDP - (TPI - Sub)}$$

It remains to divide income into payment to capital and payment to labor. Let θ be the share of income attributed to capital, with the remaining $(1 - \theta)$ share attributed to labor. Total household income taxes paid on labor income are represented by

$$FHHT_L = \tau^{i,l,f} (1 - \theta) (GDP - (TPI - Sub))$$

The second source of tax revenue generated from taxes on labor income are social security taxes, SS . This corresponds to an exact entry in the BEA data, no further adjustment is required. Social security taxes combined with $FHHT_L$ represent total tax revenues that are classified as taxes paid on labor income, so the average tax rate on labor income is measured as:

$$\tau^{i,n,f} = \frac{SS + FHHT_L}{(1 - \theta) (GDP - (TPI - Sub))}$$

⁴¹ Enrique G. Mendoza, Assaf Razin, and Linda L. Tesar, “**Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption**,” *Journal of Monetary Economics*, Volume 34, Issue 3 (December 1994) p.297-323.

At the state level, we calculate income tax rates for a variety of earning groups. The state income tax rate is found by dividing total state taxes on income of the household, $SHHT_e$, by total household income in each period. Household income, total state taxes on income of the household, as well as population are distributed according to the distribution reported by the U.S. Internal Revenue Service for tax year 2020.⁴² Household income is defined as gross domestic product less net taxes on production and imports, or $GDP - (TPI - Sub)$. The household income tax rate is therefore measured as:

$$\tau^i = \frac{SHHT_e}{(GDP - (TPI - Sub))_i}$$

It remains to divide income into payment to capital and payment to labor. Let θ be the share of income attributed to capital, with the remaining $(1 - \theta)$ share attributed to labor. Total household income taxes paid on labor income are represented by

$$SHHT_{e,i} = \tau^{i,n}(1 - \theta)(GDP - (TPI - Sub))_i$$

The average state tax rate on labor income is measured as:

$$\tau^{i,n} = \frac{SHHT_{e,i}}{(1 - \theta)(GDP - (TPI - Sub))_i}$$

Consumption and Investment Tax Rates

Revenue collected from taxes levied on consumption and investment expenditures are included in taxes on production and imports, TPI . Consumption and investment expenditures are subsidized by the amount Sub . TPI includes general taxes on goods and services, excise taxes, import duties and property taxes. The task remains to properly allocate TPI to the relevant tax revenue category. This requires the proper division of TPI across consumption and investment. TPI includes the following components: Property taxes, general taxes on goods and services, excise taxes, taxes on specific services, and taxes on the use of goods to perform activities.

⁴² **SOI Tax Stats – Historic Table 2**, IRS.gov (last visited, August 21, 2026).

Some of the taxes included in TPI fall only on consumption expenditures. Others fall on both consumption and investment expenditures. Revenue from taxes that fall on both consumption and investment expenditures are assumed to be split between consumption tax revenue and investment tax revenue according to consumption and investment share in private expenditures. Taxes that fall strictly on consumption are excise taxes and taxes on specific services, reported as select sales taxes in the STC data.

Taxes that fall on both consumption and investment are general sales and use taxes, and taxes on use of goods to perform activities, which includes motor vehicle taxes, highway taxes, license taxes, etc. These goods are used in the production of both investment goods and consumption goods, and can be calculated by subtracting select sales taxes, total income taxes, and corporation license taxes from total taxes in the STC data.

After identifying taxes that fall strictly on consumption expenditures, we calculate λ , their share of TPI . Revenue collected from taxes levied on consumption expenditures is calculated as:

$$TPI_C = \left(\lambda + (1 - \lambda) \left(\frac{C}{C + I} \right) \right) (TPI - Sub)$$

Consumption expenditures are reported in the national accounts gross of taxes. Taxable consumption expenditures are then $C - TPI_C$ and the consumption tax is measured as:

$$\tau^C = \frac{TPI_C}{C}$$

Since TPI_C represents revenue from consumption taxes, the remaining portion of $TPI - Sub$ is attributed to taxes on investment.

$$TPI_X = TPI - Sub - TPI_C$$

Share of the Income Tax that Falls on Capital

As calculated previously, income paid to capital in the economy is $\theta(GDP - (TPI - Sub))$. $OSGOV$ is gross operating surplus earned by the government, and therefore is not subject to tax. Taxable capital income is therefore $\theta(GDP - (TPI - Sub)) - OSGOV$. Capital tax revenues come from the following sources: the

household income tax, and taxes levied on corporate income. Federal household taxes on capital, $FHHT_K$, is then:

$$FHHT_K = \tau^{i,r,f} \theta(GDP - (TPI - Sub))$$

The federal household capital income tax rate is then:

$$\tau^{i,k,f} = \frac{FHHT_k}{\theta(GDP - (TPI - Sub)) - OSGOV}$$

Federal corporate tax data (FCT) is only available at the national level, therefore we first approximate the share of corporate tax paid by State.

The federal corporate tax rate is computed using national data as:

$$\tau^{CT,F} = \frac{FCT}{\theta(GDP - (TPI - Sub)) - OSGOV}$$

As owners of corporations, households are subject to all corporate taxation. The total federal capital income tax is then:

$$\tau^{i,r,f} = \tau^{CT,F} + \tau^{i,k,f}$$

At the state level household capital income tax is:

$$SHHT_{K,i} = \tau^{i,k} \left(\theta(GDP - (TPI - Sub))_i \right)$$

Where the household income and tax burden are once again distributed according to the distribution reported by the U.S. Internal Revenue Service for tax year 2020.⁴³

The state household capital income tax rate is then:

$$\tau^{i,r} = \frac{(SHHT_{K,i} + SCT_i)}{\theta(GDP - (TPI - Sub))_i - OSGOV_i}$$

⁴³ **SOI Tax Stats – Historic Table 2**, IRS.gov (last visited, August 21, 2026).

Sectors

STELA uses nine production sectors. The BEA reports GDP for each two-digit North American Industry Classification System (NAICS) industries, which we use to calculate each sector's percentage in total GDP (see Table B-4). Some of our sectors are the same as reported by the BEA; the remaining sectors are constructed by combining several NAICS industries, as shown in Table B-1.

Table B-1: Definition of Sectors

Sector	NAICS Sectors
Agriculture, Forestry, Fishing, and Hunting	Agriculture, Forestry, Fishing, and Hunting
Mining	Mining
Utilities, Transportation, and Warehousing	Utilities Transportation and Warehousing
Construction	Construction
Manufacturing	Manufacturing
Trade	Wholesale Trade Retail Trade Information Finance and Insurance Professional, Scientific, and Technical Services Management of Companies and Enterprises Administrative and Waste Management Services Educational Services Arts, Entertainment, and Recreation Accommodation and Food Services Other Services
Real Estate, Rental, and Leasing	Real Estate Rental and Leasing
Health Care and Social Assistance	Health Care and Social Assistance

Parameters

The following tables present the calibrated parameters for STELA.

Table B-2: Household Parameters

Disutility of Labor	$\chi_e = 82.0$
Real Interest Rate	$i_{r,w} = 0.043$
Annual Depreciation Rate of Capital	$\delta = 0.1$
Frisch Elasticity of Labor Supply	$\psi_e = 0.4$
Holding Cost of Capital	$\nu = 0.0925$

The real interest rate is partially based on the difference between the nominal interest rate for three-month Treasury bill and the GDP deflator from 1950 to 2015 using St. Louis Federal Reserve Bank FRED data. The annual depreciation rate of capital is based on data from the BEA for the U.S. economy. It is the average of the sum of current cost depreciation in nonresidential private fixed assets and consumer durable goods divided by the sum of current cost net stock of nonresidential private fixed assets and consumer durable goods for the years 1963 to 2015. The Frisch elasticity of labor supply is based on the central estimate from Reichling and Whalen (2012).

Table B-3: Labor Productivity

Labor Productivity	Population Distribution
$z_1 = 1$	$q^1 = 0.081$
$z_2 = 3.41$	$q^2 = 0.128$
$z_3 = 7.32$	$q^3 = 0.209$
$z_4 = 12.11$	$q^4 = 0.156$
$z_5 = 17.05$	$q^5 = 0.108$
$z_6 = 24.31$	$q^6 = 0.143$
$z_7 = 34.61$	$q^7 = 0.060$
$z_8 = 57.44$	$q^8 = 0.093$
$z_9 = 130.47$	$q^9 = 0.016$
$z_{10} = 601.60$	$q^{10} = 0.006$

Table B-4: Sector Specific Parameters

Sector	Output Share	Employment Share	Capital Share
Agriculture, Forestry, Fishing, and Hunting	$\alpha_1 = 0.015$	$\mu_1 = 0.035$	$\theta_1 = 0.480$
Mining	$\alpha_2 = 0.001$	$\mu_2 = 0.002$	$\theta_2 = 0.550$
Utilities, Transportation, and Warehousing	$\alpha_3 = 0.043$	$\mu_3 = 0.048$	$\theta_3 = 0.549$
Construction	$\alpha_4 = 0.048$	$\mu_4 = 0.068$	$\theta_4 = 0.319$
Manufacturing	$\alpha_5 = 0.122$	$\mu_5 = 0.081$	$\theta_5 = 0.530$
Trade	$\alpha_6 = 0.165$	$\mu_6 = 0.158$	$\theta_6 = 0.543$
Services	$\alpha_7 = 0.389$	$\mu_7 = 0.427$	$\theta_7 = 0.451$
Real Estate, Rental, and Leasing	$\alpha_8 = 0.146$	$\mu_8 = 0.056$	$\theta_8 = 0.949$
Health Care and Social Assistance	$\alpha_9 = 0.070$	$\mu_9 = 0.127$	$\theta_9 = 0.203$

Table B-5: Federal Tax Parameters

Federal individual labor income tax rate for AGI 1	$\tau_1^{i,n,f} = 0.0014$
Federal individual capital income tax rate for AGI 1	$\tau_1^{i,r,f} = 0.0014$
Federal individual labor income tax rate for AGI 2	$\tau_2^{i,n,f} = 0.0154$
Federal individual capital income tax rate for AGI 2	$\tau_2^{i,r,f} = 0.0154$
Federal individual labor income tax rate for AGI 3	$\tau_3^{i,n,f} = 0.0484$
Federal individual capital income tax rate for AGI 3	$\tau_3^{i,r,f} = 0.0484$
Federal individual labor income tax rate for AGI 4	$\tau_4^{i,n,f} = 0.0729$
Federal individual capital income tax rate for AGI 4	$\tau_4^{i,r,f} = 0.0729$
Federal individual labor income tax rate for AGI 5	$\tau_5^{i,n,f} = 0.0904$
Federal individual capital income tax rate for AGI 5	$\tau_5^{i,r,f} = 0.0904$
Federal individual labor income tax rate for AGI 6	$\tau_6^{i,n,f} = 0.1166$
Federal individual capital income tax rate for AGI 6	$\tau_6^{i,r,f} = 0.1166$
Federal individual labor income tax rate for AGI 7	$\tau_7^{i,n,f} = 0.1166$
Federal individual capital income tax rate for AGI 7	$\tau_7^{i,r,f} = 0.1166$
Federal individual labor income tax rate for AGI 8	$\tau_8^{i,n,f} = 0.1695$
Federal individual capital income tax rate for AGI 8	$\tau_8^{i,r,f} = 0.1695$
Federal individual labor income tax rate for AGI 9	$\tau_9^{i,n,f} = 0.2270$
Federal individual capital income tax rate for AGI 9	$\tau_9^{i,r,f} = 0.2270$
Federal individual labor income tax rate for AGI 10	$\tau_{10}^{i,n,f} = 0.2444$
Federal individual capital income tax rate for AGI 10	$\tau_{10}^{i,r,f} = 0.2444$

Table B-6: State Income Tax Parameters I

State individual labor income tax rate for AGI 1	$\tau_1^{i,n} = 0.00$
State individual capital income tax rate for AGI 1	$\tau_1^{i,r} = 0.00$
State individual labor income tax rate for AGI 2	$\tau_2^{i,n} = 0.00$
State individual capital income tax rate for AGI 2	$\tau_2^{i,r} = 0.00$
State individual labor income tax rate for AGI 3	$\tau_3^{i,n} = 0.00$
State individual capital income tax rate for AGI 3	$\tau_3^{i,r} = 0.00$
State individual labor income tax rate for AGI 4	$\tau_4^{i,n} = 0.00$
State individual capital income tax rate for AGI 4	$\tau_4^{i,r} = 0.00$
State individual labor income tax rate for AGI 5	$\tau_5^{i,n} = 0.00$
State individual capital income tax rate for AGI 5	$\tau_5^{i,r} = 0.00$
State individual labor income tax rate for AGI 6	$\tau_6^{i,n} = 0.00$
State individual capital income tax rate for AGI 6	$\tau_6^{i,r} = 0.00$
State individual labor income tax rate for AGI 7	$\tau_7^{i,n} = 0.00$
State individual capital income tax rate for AGI 7	$\tau_7^{i,r} = 0.00$
State individual labor income tax rate for AGI 8	$\tau_8^{i,n} = 0.00$
State individual capital income tax rate for AGI 8	$\tau_8^{i,r} = 0.00$
State individual labor income tax rate for AGI 9	$\tau_9^{i,n} = 0.00$
State individual capital income tax rate for AGI 9	$\tau_9^{i,r} = 0.00$
State individual labor income tax rate for AGI 10	$\tau_{10}^{i,n} = 0.00$
State individual capital income tax rate for AGI 10	$\tau_{10}^{i,r} = 0.0062$

Table B-7: State Income Tax Parameters II

State individual labor income tax exemption rate for AGI 1	$\eta_1^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 1	$\eta_1^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 2	$\eta_2^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 2	$\eta_2^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 3	$\eta_3^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 3	$\eta_3^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 4	$\eta_4^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 4	$\eta_4^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 5	$\eta_5^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 5	$\eta_5^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 6	$\eta_6^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 6	$\eta_6^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 7	$\eta_7^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 7	$\eta_7^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 8	$\eta_8^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 8	$\eta_8^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 9	$\eta_9^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 9	$\eta_9^{i,r} = 0.0000$
State individual labor income tax exemption rate for AGI 10	$\eta_{10}^{i,n} = 0.0000$
State individual capital income tax exemption rate for AGI 10	$\eta_{10}^{i,r} = 0.0000$

Table B-8: Other State Tax Parameters

General sales tax rate (effective rate)	$\tau^c = 0.0633$
Excise tax rate (effective rate)	$\tau^{ex} = 0.0122$
Corporate income tax rate (effective rate)	$\tau_1^{corp} = 0.0000$
State tax revenues proportion of GDP	$\frac{TR}{Y} = 0.0455$
Other state tax collections rate	$\tau^o = 0.0106$
Transfers from the federal government	$\frac{FF}{Y} = 0.1282$

Appendix C: Glossary of Terms

Calibrated – Matching the simulated model to the observable, real-life data by adjusting parameters to ensure the model represents the economy.

Capital adjustment cost – The time and monetary costs of changing the capital a firm uses, such as installing new machinery at a factory.

Capital share – Relative to labor, the proportion of output attributable to capital.

Cobb-Douglas production function – A simple production function in which different combinations of labor and capital quantities are used to obtain a certain quantity of product.

Comparative statics – A method of comparing different economic outcomes before and after a specified change.

Constant elasticity of substitution production function – A production function that assumes the elasticity of substitution is constant, meaning that a change in input factors will result in a constant change in output.

Debt elastic interest rate – An economy-wide interest rate that changes based on the economy's foreign debt holdings.

Depreciation rate – The rate at which capital, such as a car or computer, loses value over time.

Discrete – Measured as separate, distinct points in time, e.g., a person's age in years.

Dynamic scoring – A model that evaluates how changes in policy will change people's economic behavior, or the secondary impacts of a change (e.g., examining the employment and GDP changes that occur as a result of a policy change).

Elasticity – A measure of how the demand of a good responds to a price change for that good.

Employment share – The proportion of the working population employed in each sector of the economy.

Exogenous processes – External factors that influence household decisions.

Lagrangian function – A function that allows you to optimize a variable dependent on constraints, effectively combining a function being optimized with constraint functions.

Markets clear – The result when producers use the price that consumers are willing to pay for a product and there is no shortage or extra product.

Output share – The proportion of the total output of the economy produced by each sector.

Ponzi scheme – An investment fraud in which old investors are paid with money from new investors. Scammers often promise high returns with little or no risk.

Production function – An equation that shows how much product can be made from every combination of input factors, such as capital and labor.

Return on capital – Reveals how well a company is using its capital to make a profit.

Static analysis – A policy analysis that does not consider the economic behavior changes that may occur as a result of a policy change. Primarily, such analysis focuses solely on the changes to tax revenue due to a policy change without factoring in the human response to that change.

Steady-state capital-labor ratio – The ratio of the amount of capital to the amount of labor utilized for production when all markets clear in an economy.

Steady-state equilibrium – The economic choices and prices when market supply and demand are balanced and constant over time.

Stochastic economy – An economy that is affected by random, outside effects.

Tax instruments – The different ways that a government can levy a tax, or different types of taxes (e.g., corporate income tax, sales tax, and property tax).

Utility – The total gratification received from a person consuming a good or service. Economists use utility to capture individual's preferences for differing goods and services. It is assumed that people want to maximize their utility.

ABOUT THE AUTHORS



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Hederman graduated from Georgetown Public Policy Institute with a Master of Public Policy degree and holds a Bachelor of Arts from the University of Virginia.



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Washington's Tax Gamble: An Evaluation of Washington's Income Tax Hike

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