

## **APPENDIX B: ESTIMATING THE ECONOMIC IMPACT OF TAX HIKES**

### **Implications**

The model implemented is based on neoclassical growth theory. The neoclassical growth model is the most widely taught model of capital accumulation and long-run growth, and is the workhorse of modern growth theory. The model is among the most widely used tools for empirical and theoretical research in macroeconomics. The neoclassical framework emphasizes economic agents' inter-temporal decisions in a general equilibrium setting. The advantage of these models is that they make the economic mechanisms at work within the model transparent and account for forward-looking behavior.

The estimated model can serve as a baseline to provide plausible counterfactual scenarios that describe how the economy will behave conditional on the outside influences affecting it.

Although arguments can be made that some of Pritzker's spending proposals – such as infrastructure and education – could yield some benefits, the model implemented takes into account the benefits of government spending in the sense that household income is augmented by lump sum transfers from the government sector. The model shows that any benefits from Pritzker's spending plans will be overwhelmingly offset by the negative effects of higher distortionary taxes. Pritzker's spending promises would have a large negative impact on economic prospects for all Illinoisans.

While tax hikes may initially cause tax revenues to increase, the effect is short-lived because of the decline in economic activity that ensues. Tax hikes reduce capital investments, which results in a decline in worker productivity. Slowing production results in decreased labor demand, wages and employment.

Not taking into account the behavioral responses of individuals to changes in tax policy would result in budget shortfalls. Raising the income tax to 8.39 percent from 4.95 percent to raise an additional \$13 billion would result in a shortfall in the long run of approximately \$430 million. Raising the income tax to 9.71 percent from 4.95 percent to raise an additional \$18 billion would result in a shortfall of approximately \$890 million.

These calculations illustrate why dynamic, not static, scoring should be used to inform tax policy decisions. While a growing number of federal agencies and some states are already using dynamic estimates, most states lag far behind on this issue.

The results also depend crucially on the assumed Frisch elasticity of labor supply. The Frisch elasticity of labor supply captures the responsiveness of hours worked to the after-tax wage rate, given a constant marginal utility of wealth. The higher this elasticity, the larger the decline in hours worked following a tax increase. The elasticity of labor supply chosen for this analysis is in line with the consensus among economists.<sup>1</sup>

The impact of Pritzker's tax hike may be even worse than the model predicts because the model assumes perfect competition. Perfect competition assumes that firms make zero profits since workers are paid the value of their contribution to output and investors receive the value of the capital used in production. In other words, personal income is simply the sum of labor income and capital income and all the spoils of production are redistributed to households.

By contrast, imperfect competition is the case where workers are paid less than the value of their contribution to production allowing firms to make a profit. To some extent, the real world more resembles the imperfect competition framework.

Relaxing the assumption of perfectly competitive markets to assume that profits accrue to firm owners, the tax increase would have a larger negative impact on economic activity because the feedback effects of tax changes are much larger (see Mankiw and Weinzierl, 2006).<sup>2</sup>

### The basic model

Time is discrete and lasts forever. Consider a small open economy populated by a large number of identical infinitely lived households that aim to maximize lifetime utility by solving the following problem:

$$\max_{c_t, n_t, k_{t+1}, b_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t \ln(c_t) - \kappa n_t^{1+\frac{1}{\varphi}} + \omega(g_t)$$

with  $\kappa > 0, k_o > 0, \varphi > 0$

subject to:

$$(1 + \tau_t^s)c_t + x_t + b_{t+1} - b_t \leq (1 - \tau_t^{inc})[w_t n_t + d_t k_{t-1}] + s_t + \pi_t + r_{t-1} b_t$$

$$k_t = x_t + (1 - \delta)k_{t-1}$$

where  $c_t, n_t, x_t, b_t, k_t$ , denote consumption of consumer goods, hours worked, investment, government bond and capital. Like Baxter and King (1993)<sup>3</sup> or McGrattan (1994)<sup>4</sup>, it is assumed that government spending may be valuable only insofar as it provides utility separably from consumption and leisure. The households receive wages  $w_t$ , dividends  $d_t$ , profits  $\pi_t$ , from the firm if any. Transfers (tax or fee if negative) from government are denoted by  $s_t$ . The household has to pay a tax on consumer goods  $\tau_t^s$  and an income tax  $\tau_t^{inc}$ .

The representative firm maximizes profits:

$$\max_{k_{t-1}, n_t} \zeta^t k_{t-1}^\theta n_t^{1-\theta} - d_t k_{t-1} - w_t n_t$$

where  $\zeta^t$  denotes the trend of total factor productivity.

The state government faces the budget constraint:

$$g_t + r_{t-1}D_t = TR_t + D_{t+1} - D_t$$

This equation implies that government spending plus interest payments on existing debt  $D_t$  cannot exceed tax revenue plus new debt issuance. We assume that the interest rate is exogenously fixed.

State government tax revenues are given by:

$$TR_t = \tau_t^s c_t + \tau_t^{inc} [w_t n_t + d_t k_{t-1}]$$

## The equilibrium

A competitive equilibrium is a set of prices  $\{w_t, d_t, w_t\}$  and allocations  $\{c_t, k_{t+1}, n_t, b_{t+1}, D_{t+1}\}$  such that household and firm optimality conditions hold, the firms hire all the labor and capital supplied by the household, the household and firm budget constraints hold with equality, and household bond-holdings equal government debt issuance in all periods. Lastly the resource constraint must hold with equality. That means income must be equal to private and public expenditures.

## Model baseline

The depreciation rate of capital  $\delta$  and the world interest rate  $r$  are based on the average annual depreciation rate taken from the Bureau of Economic Analysis,  $\delta = 0.091$  and  $r = 0.04$ .

The capital share  $\theta = 0.30$  is set to match the observed average labor share. In the present model, the labor share is given by the ratio of labor income to output, which is  $1 - \theta$  at all times.

Model Baseline

Variable	Value	Description	Restriction
$\tau^{inc}$	0.0240	Current effective income tax rate	COGFA
$\tau^{inc1}$	0.0851	Additional \$13 billion income tax rate	Estimated
$\tau^{inc2}$	0.0995	Additional \$18 billion income tax rate	Estimated
$\tau^c$	0.01	Effective sales tax rate	COGFA
$C/Y$	0.67	Consumption to GDP ratio	BEA
$I/Y$	0.20	Investment to GDP ratio	BEA
$G/Y$	0.10	Government spending to GDP ratio	BEA
$N$	0.20	Share of time spent in paid market work	BLS
$\chi$	10.4	Disutility of labor	Set to match hours worked
$r$	0.04	Avg. annual real interest rate	FRED
$\delta$	0.091	Annual depreciation rate of capital	BEA
$\sigma$	1	Elasticity of Labor Supply	Kimball and Shapiro (2008)

<sup>1</sup> Miles S. Kimball and Matthew D. Shapiro, "Labor Supply: Are the Income and Substitution Effects Both Large or Both Small?" NBER Working Paper 14208, 2008.

<sup>2</sup> N. Gregory Mankiw and Matthew Weinzierl, "Dynamic Scoring: A Back-of-the-Envelope Guide," *Journal of Public Economics* 90 8-9, September 2006: 1415-1433.

<sup>3</sup> Marianne Baxter and Robert G. King, "Fiscal Policy in General Equilibrium," *American Economic Review* 83, no. 3: 315-334, 1993.

<sup>4</sup> Ellen R. McGrattan, "The Macroeconomic Effects of Distortionary Taxation," *Journal of Monetary Economics* 33, no. 3: 573-601, 1994.