

Supplemental material for Section VI.A

This material provides a slightly more detailed discussion of the reasoning behind equation (8) in the text.

Begin by considering the case where there are no lags. A variation of equation (1) in the text that encompasses simple versions of the extreme cases discussed in Section VI.A as well as the intermediate possibility is:

$$(A) \quad \Delta Y_t = a + b\Delta T_t + c\text{NEWS}_t + e_t.$$

Our approach implies $c = 0$, the permanent income hypothesis implies $b = 0$, and the intermediate possibility implies that both b and c are nonzero.

In models that emphasize substitution effects rather than income effects, the level of Y depends on the current tax rate and expected future tax rates. Most of the large tax changes we identify are announced only a fairly short time before they occur. So, while the exact predictions of models of intertemporal substitution would be fairly complicated, a simple specification that captures the basic ideas of intertemporal substitution effects and long-run effects of the level of the tax rate would make Y a function of the current tax rate and the rate it is expected to settle down to. If the relationship is linear, we have:

$$(B) \quad Y_t = \alpha + \phi t + \beta T_t + \gamma E_t[T^{SS}] + \omega_t,$$

where $E_t[T^{SS}]$ is the expected "steady state" tax rate (which in practice is usually quite similar to the rate a year or less from now). Here one would expect $\beta < 0$, $\gamma > 0$, and $\beta + \gamma < 0$. Taking differences gives

$$(C) \quad \Delta Y_t = \phi + \beta \Delta T_t + \gamma \text{NEWS}_t + \varepsilon_t,$$

where $\varepsilon_t = \omega_t - \omega_{t-1}$. In this case, NEWS is the change in expectations of the "steady state" tax rate. This is of the same form as (A).

Finally, news of a tax increase may improve people's expectations about the government's fiscal health. This could have a positive impact on confidence, and hence on spending and output. Like the intertemporal substitution effect, this effect goes in the opposite direction from the permanent income effect. This view also points to a specification like (A) or (C).

So far, we have not considered lags. To fix ideas, consider a very stylized example. Suppose output responds only to news, and that the response occurs with a one-quarter lag. Suppose also that half of tax changes are implemented immediately and half are implemented with a one-quarter lag, with the choice made at random. Thus, the true model is $\Delta Y_t = a + c_1 \text{NEWS}_{t-1} + e_t$, with NEWS_{t-1} uncorrelated with e_{t+j} for $j \geq -1$. Now consider the regression equation $\Delta Y_t = a + b_0 \Delta T_t + b_1 \Delta T_{t-1} + c_0 \text{NEWS}_t + c_1 \text{NEWS}_{t-1} + e_t$. Given our assumptions, there is variation in the

right-hand side variables, and they are uncorrelated with e_t . Thus, the regression can be estimated by OLS.

More generally, adding lags of tax changes, news, and output growth to (A) or (C) above (to reflect habits, effects on other sectors, and other dynamics) suggests equation (8) in the text:

$$(8) \quad \Delta Y_t = a + \sum_{i=0}^M b_i \Delta T_{t-i} + \sum_{j=0}^M c_j \text{NEWS}_{t-j} + \sum_{k=1}^N d_k \Delta Y_{t-k} + e_t.$$