Public Affairs 854
Spring 2009
University of Wisconsin-Madison

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Social Sciences 7418

Tax Rate Change Multiplier

Equilibrium income, Y_0, is given by:

(1) $$\boxed{Y_0 = \left(\frac{1}{1-c(1-t)+m}\right)[\overline{A} + \overline{EXP} - \overline{IMP}]} \text{ let } \overline{\alpha} \equiv \left(\frac{1}{1-c(1-t)+m}\right)$$

where $\overline{A} \equiv \overline{CO} - c\overline{TA} + \overline{IN} + \overline{GO}$

Multipliers are given by the total differential of equation (1):

(2) $$\Delta Y = \overline{\alpha}[\Delta A + \Delta EXP - \Delta IMP]$$

Notice that if lump sum taxes rise, then:

(3) $$\Delta Y = -\overline{\alpha} c \Delta TA \text{ and hence } \frac{\Delta Y}{\Delta TA} = -\overline{\alpha} c$$

What happens if the marginal tax rate changes? Then one has to use the product and chain rules.

(4) $$\Delta Y = \overline{\alpha}\,\frac{\partial[\overline{A} + \overline{EXP} - \overline{IMP}]}{\partial t}\Delta t + \frac{\partial \overline{\alpha}}{\partial t}[\overline{A} + \overline{EXP} - \overline{IMP}]\Delta t$$

Note the first term is zero since the term in the brackets does not depend on t. Moreover, recalling $\overline{\alpha} = (1-c(1-t)+m)^{-1}$ then

$$\frac{\partial \overline{\alpha}}{\partial t} = (-1)\times\left(\frac{1}{1-c(1-t)+m}\right)^2 \times (c)$$

And hence:

(5) $$\Delta Y = \frac{\partial \overline{\alpha}}{\partial t}[\overline{A} + \overline{EXP} - \overline{IMP}]\Delta t = -c(\overline{\alpha}^2)[\overline{A} + \overline{EXP} - \overline{IMP}]\Delta t$$

So the multiplier is:

$$\frac{\Delta Y}{\Delta t} = -c(\overline{\alpha}^2)[\overline{A} + \overline{EXP} - \overline{IMP}]$$

This result can be interpreted graphically.

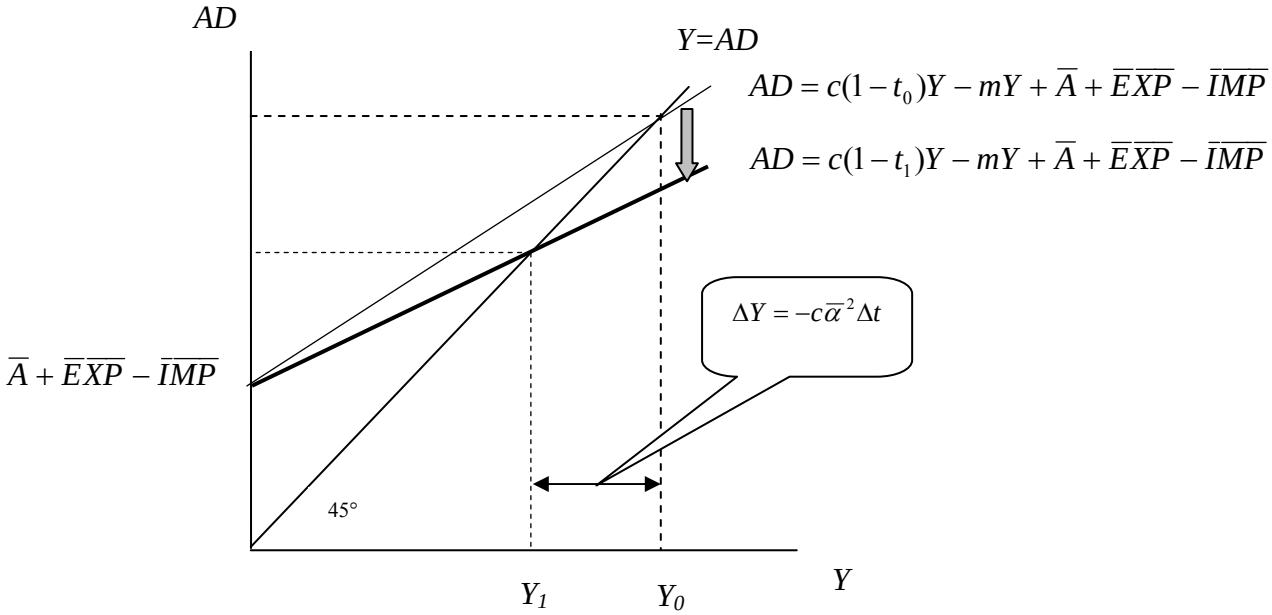

Figure 1: Change in income due to a change in marginal tax rate

Note that $t_1 = t_0 + \Delta t$.

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16.2.2009