

## Multiplier with Taxes

Let's add taxes and government spending into the multiplier formula!

First, we begin with:

$$Y = C + I + G \quad (1)$$

Then we take our consumption function:

$$C = a + bY_d \quad (2)$$

Only now we have to account for the fact that  $Y$  and  $Y_d$  are not equal

$$Y_d = Y - T \quad (3)$$

because disposable income is aggregate income less taxes. Since taxes can be determined by the tax rate times aggregate income:

$$T = tY \quad (4)$$

Then:

$$Y_d = Y - tY \quad (5)$$

Substituting equation (5) into the consumption function:

$$C = a + b(Y - tY) \quad (6)$$

And substituting equation (6) into equation (1):

$$Y = a + b(Y - tY) + I + G \quad (7)$$

We then solve for  $Y$ :

$$Y = a + bY - btY + I + G \quad (8)$$

$$Y - bY + btY = a + I + G \quad (9)$$

$$Y(1 - b + bt) = a + I + G \quad (10)$$

$$Y = \frac{1}{1 - b + bt} (a + I + G) \quad (11)$$

So the multiplier with taxes is:

$$\frac{1}{1 - b + bt} \quad (12)$$

And the multiplier times total injections ( $a + I + G$ ) will give us the equilibrium level of output and income.