

Automatic stabilizers

Economic instability can arise from unforeseen changes in autonomous consumption, gross investment, or net exports. Not only do these changes directly affect desired spending levels (hence production and employment) each of them is subject to the multiplier principle as well: any initial change in spending shifts the aggregate demand curve by a multiple amount. An “automatic stabilizer” can be thought of as any factor that reduces the size of this multiplier effect.

Consider the following simplified aggregate expenditure model. (We will hold the price level fixed, so that changes in equilibrium GDP can be interpreted as horizontal shifts in the aggregate demand curve.)

$$\begin{aligned} Y &= C + I_g + G + X_n \\ &= a + b(Y - T) + I_g + G + X_n \\ &= a + b(Y - tY) + I_g + G + X_n. \end{aligned}$$

From the model, it is apparent that total tax receipts are assumed to be proportional to GDP at a tax rate of $t \times 100\%$.

Solving this for Y_e , the equilibrium level of GDP, we begin by collecting all the terms containing Y on the left side to obtain $Y - bY + btY = a + I_g + G + X_n$. Next, we factor out the Y terms while collecting the b terms: $Y(1 - b(1 - t)) = A$, where $A = a + I_g + G + X_n$ is equal to all autonomous spending.

Dividing through by $(1 - b(1 - t))$, we get the result we seek: $Y_e = \frac{1}{1 - b(1 - t)}A$.

The multiplier in this model is $\frac{\Delta Y}{\Delta A} = \frac{1}{1 - b(1 - t)}$. In our previous model with fixed taxes, the

multiplier was simply $\frac{1}{1 - b}$. Comparing the two, it is clear that $\frac{1}{1 - b(1 - t)} < \frac{1}{1 - b}$ for any $0 < t < 1$.

That is, for any positive rate of taxation, any change in autonomous consumption, investment, or net exports will have a smaller impact on aggregate demand than if taxes are fixed.

What if taxes are not proportional to GDP, as in the previous model? Consider the more general tax system $T = f(Y)$ where $0 < f'(Y) < 1$ and $f''(Y) > 0$. The first condition, $0 < f'(Y) < 1$, simply states that the marginal tax rate is positive but less than 100%, so total taxes rise with income. The second condition, $f''(Y) > 0$, suggests that the marginal rate of taxation also rises with GDP so that the tax system is progressive. (A regressive tax system could be modeled by the condition $f''(Y) < 0$ —the marginal tax rate falls with income.) Substituting $f(Y)$ for T in the previous model, we obtain $Y - bY - bf(Y) = A$, an equation that implicitly defines the equilibrium value of Y .

As before, we are interested in the size of $\frac{dY}{dA}$, the multiplier. To find this, we begin by taking the total differential of our equation for Y : $dY - bdY + bf'(Y)dY = dA$. Now collect the dY and b terms to obtain $dY(1 - b(1 - f'(Y))) = dA$. Next, divide both sides by dA and $(1 - b(1 - f'(Y)))$ to get our final result: $\frac{dY}{dA} = \frac{1}{1 - b(1 - f'(Y))} < \frac{1}{1 - b}$ for $0 < f'(Y) < 1$. As with the proportional tax model, this more general model shows that for any positive marginal tax rate, the multiplier is reduced and the economy is automatically stabilized.

To consider how the progressiveness of the tax system affects the outcome, we need only consider how the size of the multiplier changes as GDP changes because an increase in GDP will change

the marginal tax rate, $f'(Y)$. What we require is $\frac{d\left(\frac{dY}{dA}\right)}{dY}$.

To simplify the task, let $Z = 1 - b(1 - f'(Y))$. Then $\frac{dY}{dA} = Z^{-1}$ and, using the chain rule,

$\frac{d\left(\frac{dY}{dA}\right)}{dY} = -Z^{-2} \frac{dZ}{dY}$. From the equation for Z , $\frac{dZ}{dY} = bf''(Y)$, so substituting back for Z and $\frac{dZ}{dY}$, we get

the result:
$$\frac{d\left(\frac{dY}{dA}\right)}{dY} = \frac{-bf''(Y)}{[1 - b(1 - f'(Y))]^2}.$$

The square on the bracketed term renders the denominator positive. Consequently, the sign of the derivative depends only on the sign of $f''(Y)$. If the tax system is progressive, $f''(Y) > 0$ and the size of the multiplier diminishes as income increases: automatic stabilization is enhanced. Alternatively, a regressive tax system increases the size of the multiplier as income increases, thereby diminishing automatic stabilization.