

## Extra Credit Problem

## Answer Key

The economy is currently in equilibrium. The aggregate planned expenditure function is:

$$APE = C + I + G + NX$$

where  $NX$  are net exports, which are a part of the autonomous expenditure. Consumers pay taxes according to the following formula:

$$T = T_0 + s(Y - T_0)$$

where  $T_0$  is the autonomous tax,  $Y$  is income, and  $s$  is the tax rate on the income in excess of  $T_0$ . Assume that  $Y \geq T_0$ .

a) Derive the expression for the expenditure multiplier.

Disposable income:

$$YD = Y - T = Y - T_0 - s(Y - T_0) = (1 - s)Y - (1 - s)T_0$$

Consumption function:

$$C = a + b \cdot YD = a + b((1 - s)Y - T_0) = a + b(1 - s)Y - b(1 - s)T_0$$

Aggregate planned expenditure:

$$APE = \underbrace{a - b(1 - s)T_0 + I + G + NX}_{\text{autonomous expenditure}} + \underbrace{b(1 - s)Y}_{\text{slope}}$$

Multiplier is equal:

$$M = \frac{1}{1 - \text{slope of APE curve}} = \frac{1}{1 - b(1 - s)}$$

b) If the slope of the consumption function is 0.7, what will the change in the equilibrium GDP be if  $T_0$  increases by 10?

The slope of the consumption function is  $b = 0.7$ . The value for  $s$  is unknown. When  $T_0$  changes, equilibrium GDP will change by:

$$\Delta GDP = -b(1 - s)\Delta T_0 \cdot M = -\frac{b(1 - s)\Delta T_0}{1 - b(1 - s)} = -\frac{0.7(1 - s) \cdot 10}{1 - 0.7(1 - s)} = \boxed{-\frac{7(1 - s)}{0.3 + 0.7s}}$$

If  $T_0$  increases by 10, The GDP will fall by  $-\frac{7(1-s)}{0.3+0.7s}$ .