Income and Spending

Chapter 3

- One of the central questions in macroeconomics is why output fluctuates around its potential level.

- In business cycle booms and recessions, output rises and falls relative to the trend of potential output.

- This chapter offers a first theory of these fluctuations in real output relative to trend. The cornerstone of this model is the mutual interaction between output and spending: **Spending determines output and income, but output and income also determine spending.**

- The Keynesian model develops the theory of AD
  - Assume that prices do not change at all and that firms are willing to sell any amount of output at the given level of prices $\rightarrow$ AS curve is flat
  - The key finding in this chapter is that because of the feedback between spending and output, increases in autonomous spending—increased government purchases, for example—generate further increases in aggregate demand.

AD and Equilibrium Output

AD is the total amount of goods demanded in the economy:

(1) $$AD = C + I + G + NX$$

Output is at its equilibrium level when the quantity of output produced is equal to the quantity demanded, or

(2) $$Y = AD = C + I + G + NX$$

When AD is not equal to output there is unplanned inventory investment or disinvestment: $IU = Y - AD$(3), where IU is unplanned additions to inventory

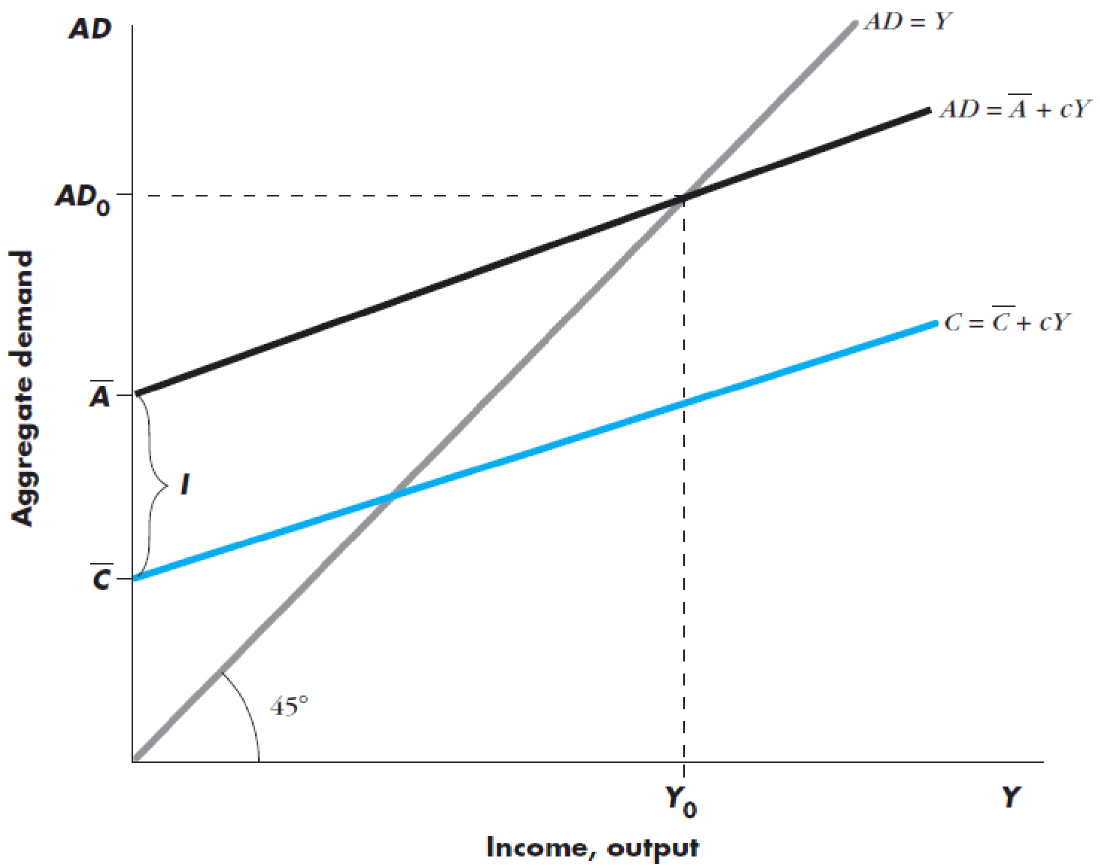
If IU > 0, firms cut back on production until output and AD are again in equilibrium. Conversely, if output is below aggregate demand, inventories are drawn down until equilibrium is restored.

The Consumption Function

Consumption is the largest component of AD. Consumption increases with income $\rightarrow$ the relationship between consumption and income is described by the consumption function

- If C is consumption and Y is income, the consumption function is $C = \overline{C} + cY$ (4), where $\overline{C} > 0$ and $0 < c < 1$
- The intercept of equation (4) is the level of consumption when income is zero $\rightarrow$ this is greater than zero since there is a subsistence level of consumption
- The slope of equation (4) is known as the marginal propensity to consume (MPC) $\rightarrow$ the increase in consumption per unit increase in income. In our case, the marginal propensity to consume is less than 1, which implies that out of a dollar increase in income, only a fraction, c , is spent on consumption.

The Consumption Function



Consumption and Savings

What happens to the rest of the dollar of income, the fraction (1 - c), that is not spent on consumption? If it is not spent, it must be saved. Income is either spent or saved; there are no other uses to which it can be put. It follows that any theory that explains consumption is equivalently explaining the behavior of saving.

More formally, look at equation (5), which states that income not spent on consumption is saved: $S \equiv Y - C$ (5)

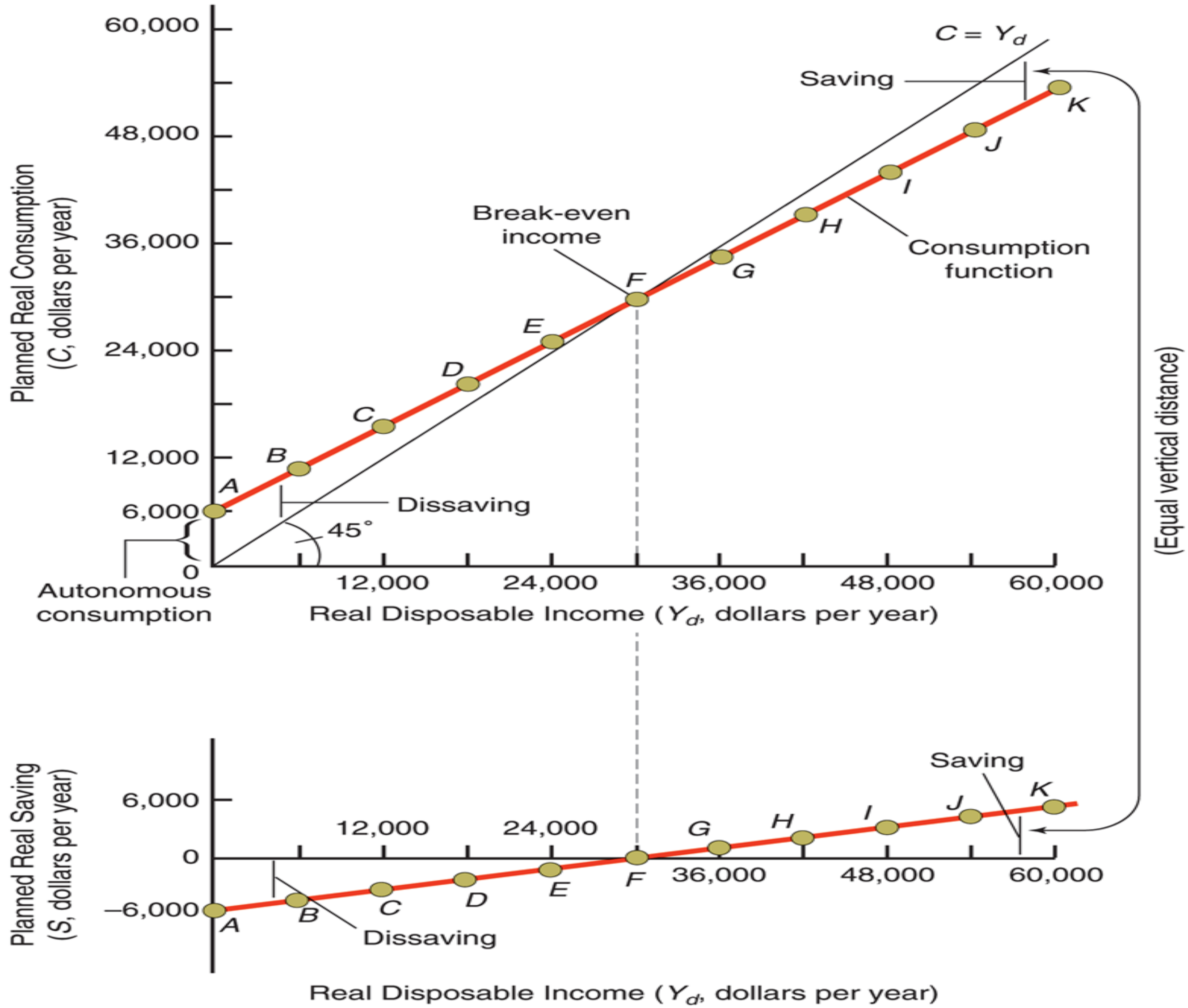
Equation (5) tells us that, by definition, saving is equal to income minus consumption. The consumption function in equation (4), together with equation (5), which we call the budget constraint , implies a savings function. The savings function relates the level of saving to the level of income. Substituting the consumption function in equation (4) into the budget constraint in equation (5) yields the savings function:

$$S \equiv Y - C = Y - \overline{C} - cY = -\overline{C} + (1 - c)Y \qquad (6)$$

From equation (6), we see that saving is an increasing function of the level of income because the marginal propensity to save (MPS), s 1 - c , is positive.

In other words, saving increases as income rises. For instance, suppose the marginal propensity to consume, c , is 0.9, meaning that 90 cents out of each extra dollar of income is consumed. Then the marginal propensity to save, s , is 0.1, meaning that the remaining 10 cents of each extra dollar of income is saved.

Consumption and Savings



Example:

C = 100 + .75 (Yd)

Find Aut. Cons., MPC, MPS, and C and S when Yd=1000.

- Aut. Cons. = 100
- MPC = .75 MPS = .25
- C = 100 + .75 (1000) = 100 + 750 = 850
- S = 1000 – 850 = 150

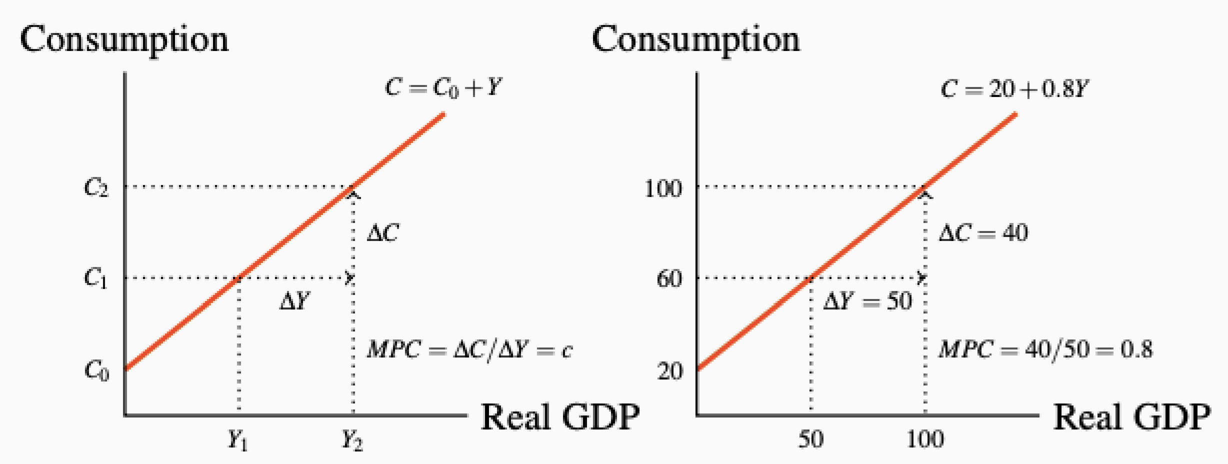
Example:

C = 150 + 0.80 Y (if Y = Yd)

S = -150 + 0.20Y

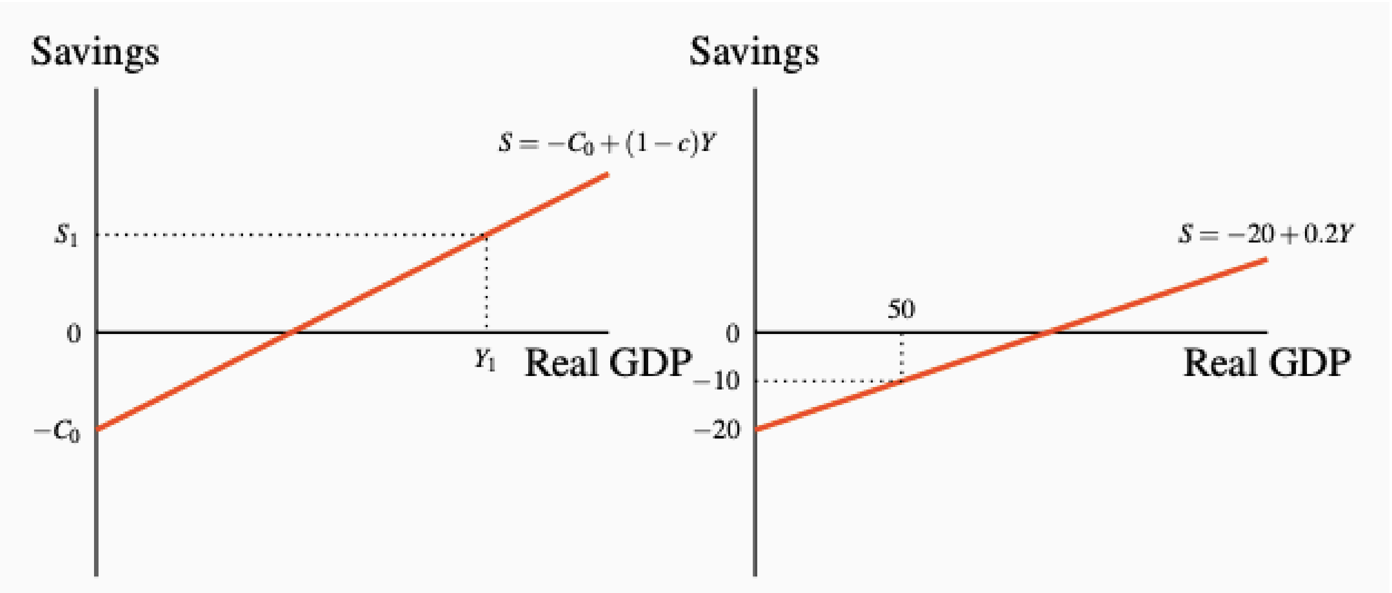
Assume:
Y = Yd

Consumption function:			$C = C_0 + cY$	
Saving function:			$S = -C_0 + (1-c)Y$	
For example:	$C = 20 + 0.8Y$		$S = -20 + 0.2Y$	
Y	C	$\Delta C/\Delta Y$	$S = Y - C$	$\Delta S/\Delta Y$
0	20	–	−20	–
50	60	0.8	−10	0.2
100	100	0.8	0	0.2
150	140	0.8	10	0.2
200	180	0.8	20	0.2



a) The Consumption Function
$C = C_0 + cY$

b) The Consumption Function
$C = 20 + 0.8Y$



Savings
$S = -C_0 + (1-c)Y$
S_1
0
$-C_0$
Y_1
Real GDP
Savings
$S = -20 + 0.2Y$
50
0
−10
−20
Real GDP

Consumption, AD, and Autonomous Spending

Now we incorporate the other components of AD: G, I, taxes, and foreign trade (assume autonomous). Consumption now depends on disposable income,

$$YD = Y - TA + TR \tag{7}$$

$$C = \overline{C} + cYD = \overline{C} + c(Y + TR - TA) \tag{8}$$

AD then becomes

$$\begin{aligned} AD &= C + I + G + NX \\ &= \overline{C} + c(Y - \overline{TA} + \overline{TR}) + \overline{I} + \overline{G} + \overline{NX} \\ &= \left[\overline{C} - c(\overline{TA} - \overline{TR}) + \overline{I} + \overline{G} + \overline{NX}\right] + cY \\ &= \overline{A} + cY \end{aligned} \tag{9}$$

where A is independent of the level of income, or autonomous.

(Continuing to assume that the government sector and foreign trade are exogenous)

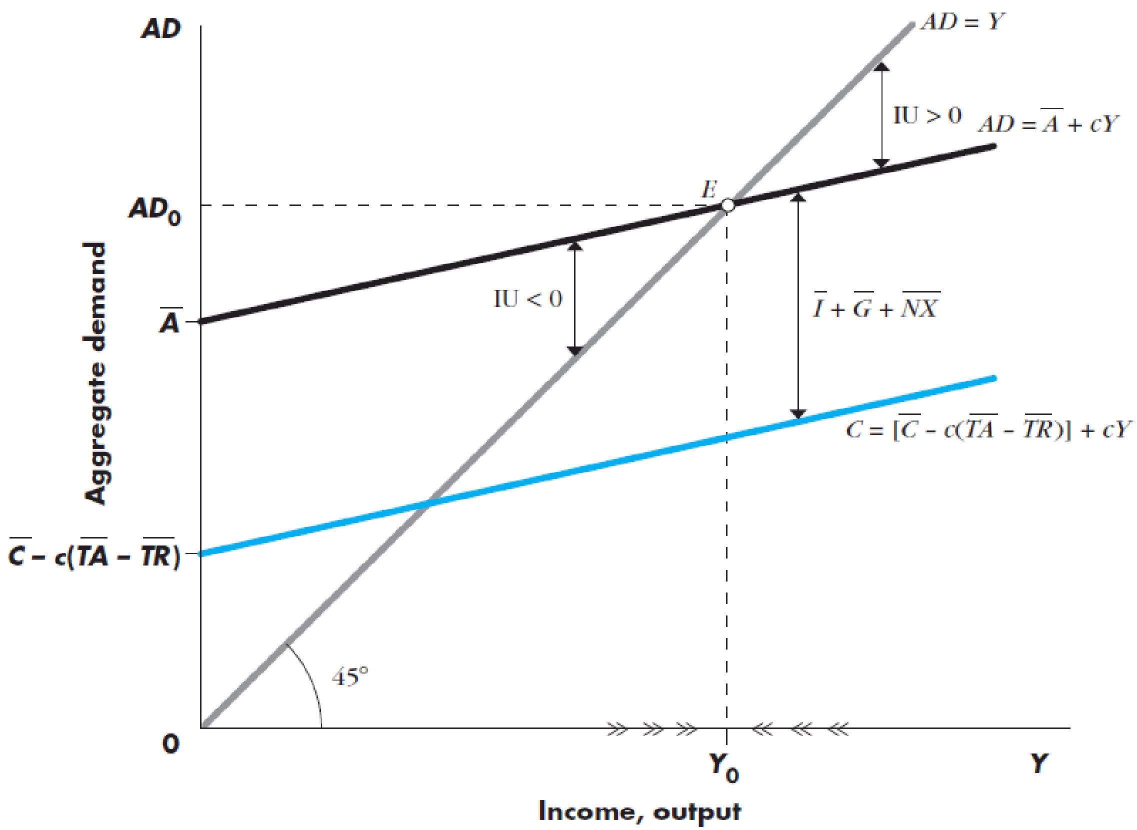
The aggregate demand function, equation (9), is shown in Figure 9-2 . Part of aggregate demand,

$$\overline{A} = \left[\overline{C} - c(\overline{TA} - \overline{TR}) + \overline{I} + \overline{G} + \overline{NX}\right]$$

is independent of the level of income, or autonomous. But aggregate demand also depends on the level of income. It increases with the level of income because consumption demand increases with income. The aggregate demand schedule is obtained by adding (vertically) the demands for consumption, investment, government spending, and net exports at each level of income. At the income level Y_0 in Figure 9-2 , the level of aggregate demand is AD_0 .

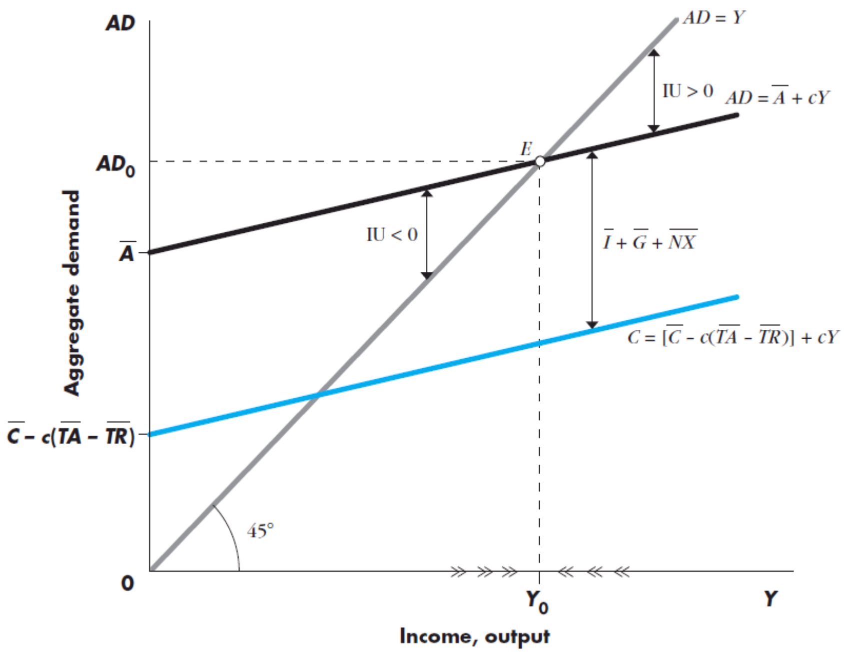
The next step is to use the aggregate demand function, AD , from Figure 9-2 and equation (9) to determine the equilibrium levels of output and income.

Figure 9-2



Equilibrium Income and Output

- Equilibrium occurs where Y=AD, which is illustrated by the 45° line → point E
- The arrows show how the economy reaches equilibrium
  - At any level of output below Y_0, firms' inventories decline, and they increase production
  - At any level of output above Y_0, firms' inventories increase, and they decrease production



The Formula for Equilibrium Output

Can solve for the equilibrium level of output, Y_0, algebraically:

- The equilibrium condition is Y = AD (10)
- Substituting (9) into (10) yields $Y = \overline{A} + cY$ (11)
- Solve for Y to find the equilibrium level of output:

$$Y - cY = \overline{A}$$

$$Y(1-c) = \overline{A} \qquad (12)$$

$$Y_0 = \frac{1}{(1-c)}\overline{A}$$

The equilibrium level of output is higher the larger the MPC and the higher the level of autonomous spending.

Given the intercept, a steeper aggregate demand function—as would be implied by a higher marginal propensity to consume—implies a higher level of equilibrium income. Similarly, for a given marginal propensity to consume, a higher level of autonomous spending—in terms of Figure 9-2 , a larger intercept—implies a higher equilibrium level of income. These results, suggested by Figure 9-2 , are easily verified using equation (12), the formula for the equilibrium level of income.

Thus, the equilibrium level of output is higher the larger the marginal propensity to consume, c , and the higher the level of autonomous spending, A .

Equation (12) shows the level of output as a function of the MPC and A (autonomous spending).

Frequently we are interested in knowing how a *change* in some component of autonomous spending would *change* output

Relate changes in output to changes in autonomous spending through

$$\Delta Y = \frac{1}{(1-c)}\Delta A \qquad (13)$$

Ex. If the MPC = 0.9, then 1/(1-c) = 10 $\rightarrow$ an increase in government spending by $1 billion results in an increase in output by $10 billion.

NOTES:

Equation (11) $Y = \bar{A} + cY$ → The position of the aggregate demand schedule is characterized by its slope, c (the marginal propensity to consume), and intercept, A (autonomous spending).

Given the intercept, a steeper aggregate demand function—as would be implied by a higher marginal propensity to consume—implies a higher level of equilibrium income.

Similarly, for a given marginal propensity to consume, a higher level of autonomous spending, a larger intercept—implies a higher equilibrium level of income.

These results, are easily verified using equation (12),

$$Y_0 = \frac{1}{(1-c)}\bar{A}$$

the formula for the equilibrium level of income. *Thus, the [illegible] level of output is higher the larger the marginal propensity to consume, c , and the higher the level of autonomous spending*, A .

The Multiplier

In this section we develop an answer to the following question: By how much does a $1 increase in autonomous spending raise the equilibrium level of income?

There appears to be a simple answer. Since, in equilibrium, income equals aggregate demand, it would seem that a $1 increase in (autonomous) demand or spending should raise equilibrium income by $1.

That answer is wrong. Let us now see why

Suppose first that output increased by $1 to match the increased level of autonomous spending. This increase in output and income would in turn give rise to further induced spending as consumption rises because the level of income has risen.

How much of the initial $1 increase in income would be spent on consumption? Out of an additional dollar of income, a fraction c is consumed.

Assume, then, that production increases further to meet this induced expenditure, that is, that output and thus income increase by 1+c. That will still leave us with an excess demand, because the expansion in production and income by 1 + c will give rise to further induced spending. This story could clearly take a long time to tell. Does the process have an end?

In Table 10-1 we lay out the steps in the chain more carefully. The first round starts off with an increase in autonomous spending, ΔA . Next, we allow an expansion in production to meet exactly that increase in demand. Production accordingly expands by ΔA. This increase in production gives rise to an equal increase in income and, therefore, via the marginal propensity to consume, c , gives rise in the second round to increased expenditures of size cΔA

TABLE 10-1 The Multiplier

ROUND	INCREASE IN DEMAND THIS ROUND	INCREASE IN PRODUCTION THIS ROUND	TOTAL INCREASE IN INCOME (ALL ROUNDS)
1	$\Delta \overline{A}$	$\Delta \overline{A}$	$\Delta \overline{A}$
2	$c\Delta \overline{A}$	$c\Delta \overline{A}$	$(1 + c)\Delta \overline{A}$
3	$c^2\Delta \overline{A}$	$c^2\Delta \overline{A}$	$(1 + c + c^2)\Delta \overline{A}$
4	$c^3\Delta \overline{A}$	$c^3\Delta \overline{A}$	$(1 + c + c^2 + c^3)\Delta \overline{A}$
...	...	...	...
...	...	...	...
...	...	...	$\frac{1}{1 - c}\Delta \overline{A}$

Assume again that production expands to meet this increase in spending. The production adjustment this time is $c\Delta A$, and so is the increase in income.

This gives rise to a third round of induced spending equal to the marginal propensity to consume times the increase in income, $c(c\Delta A) = c^2\Delta A$.

Since the marginal propensity to consume, c, is less than 1, the term c^2 is less than c, and therefore induced expenditures in the third round are smaller than those in the second round.

If we write out the successive rounds of increased spending, starting with the initial increase in autonomous demand, we have:

$$\Delta AD = \Delta\overline{A} + c\Delta\overline{A} + c^2\Delta\overline{A} + c^3\Delta\overline{A} + \ldots \qquad (15)$$

$$= \Delta\overline{A}(1 + c + c^2 + c^3 + \ldots)$$

This is a geometric series, where c < 1, that simplifies to:

$$\Delta AD = \frac{1}{(1-c)}\Delta\overline{A} = \Delta Y_0 \qquad (16)$$

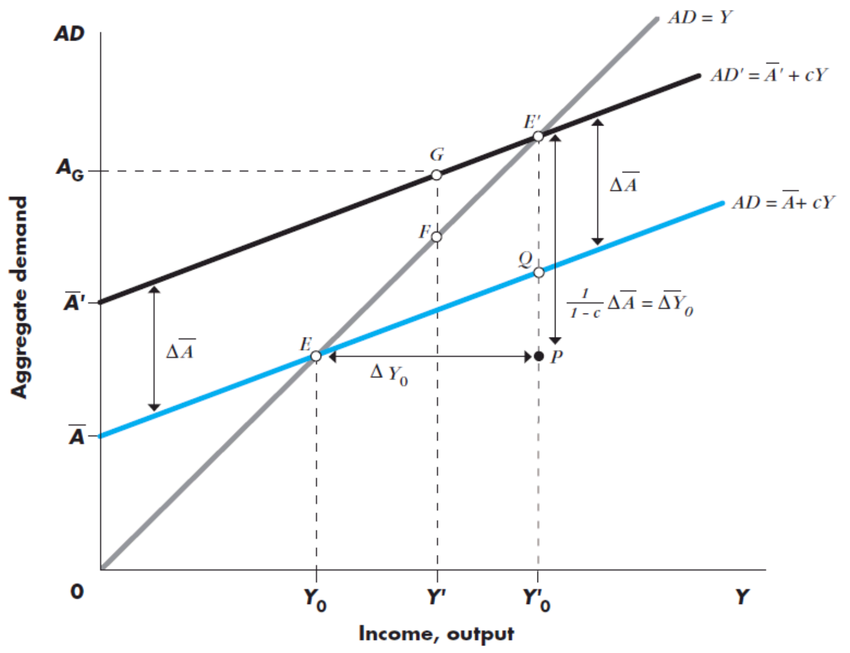
Multiplier = amount by which equilibrium output changes when autonomous aggregate demand increases by 1 unit

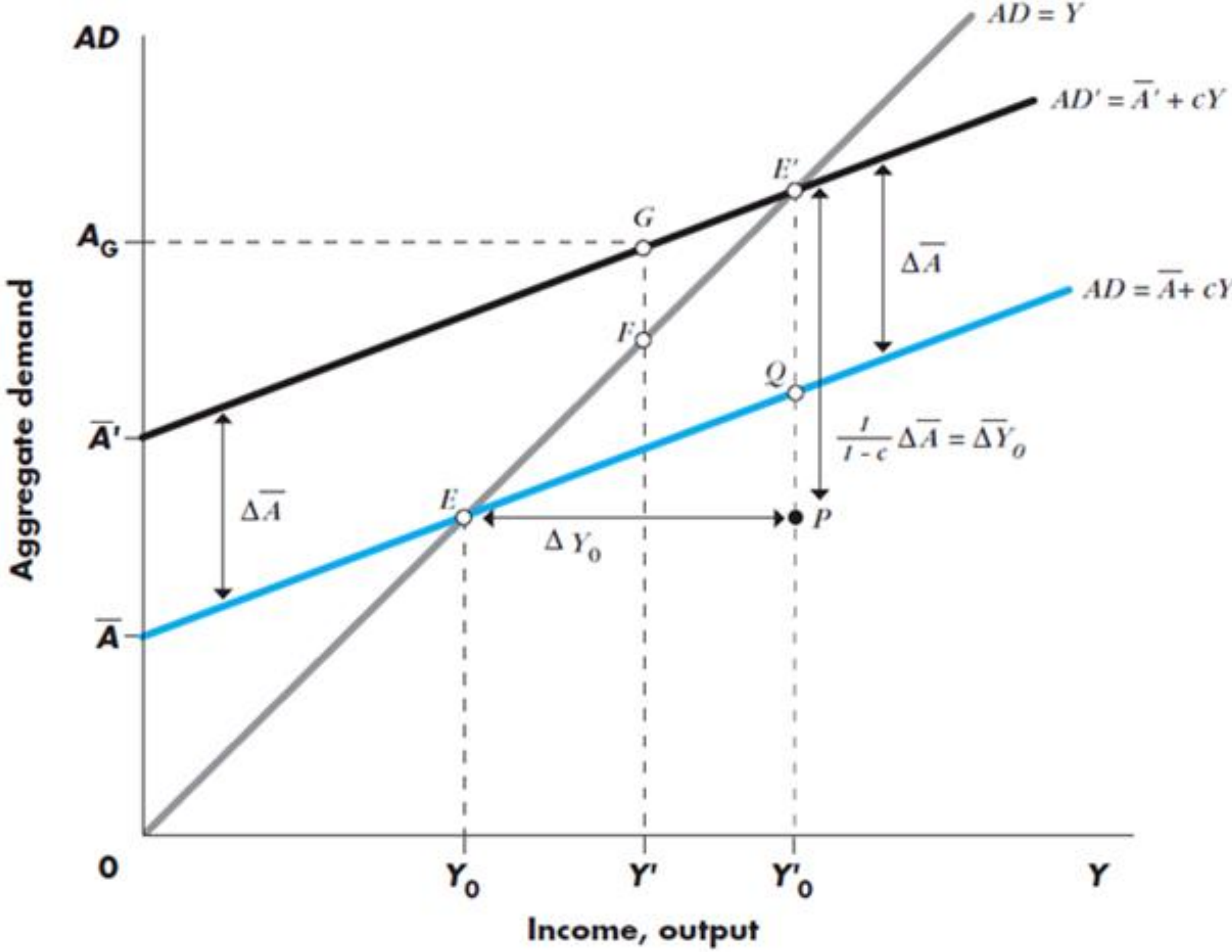
The general definition of the multiplier is

$$\frac{\Delta Y}{\Delta A} = \alpha = \frac{1}{(1-c)} \qquad (17)$$

The Multiplier

- Effect of an increase in autonomous spending on the equilibrium level of output:
  - The initial equilibrium is at point E, with income at Y_0
  - If autonomous spending increases, the AD curve shifts up by $\Delta\overline{A}$, and income increases to Y′
  - The new equilibrium is at E′ with income at $\Delta Y_0 = Y_0^{'} - Y_0$





AD
AD = Y
AD' = A̅' + cY
AD = A̅ + cY
E'
G
F
Q
E
P
A_G
A̅'
A̅
ΔA̅
ΔA̅
$\frac{1}{1-c}\Delta\overline{A} = \Delta\overline{Y}_0$
ΔY_0
Aggregate demand
0
Y_0
Y'
Y'_0
Y
Income, output

There are three points to remember from this discussion of the multiplier:

- An increase in autonomous spending raises the equilibrium level of income.
- The increase in income is a multiple of the increase in autonomous spending.
- The larger the marginal propensity to consume, the larger the multiplier arising from the relation between consumption and income.

The Government Sector

- The government affects the level of equilibrium output in two ways:
  1. Government expenditures (component of AD)
  2. Taxes and transfers
- Fiscal policy is the policy of the government with regards to G, TR, and TA
  – Assume G and TR are constant, and that there is a proportional income tax (t)
  – The consumption function becomes:

$$C = \overline{C} + c(Y + \overline{TR} - tY)$$
$$= \overline{C} + c\overline{TR} + c(1-t)Y \qquad (19)$$

The MPC out of income becomes c(1-t)

While the marginal propensity to consume out of disposable income remains c, the marginal propensity to consume out of income is now $c(1-t)$, where $1- t$ is the fraction of income left after taxes.

For example, if the marginal propensity to consume, c, is .8 and the tax rate is .25, the marginal propensity to consume out of income, $c(1- t)$, is .6 [= .8 x (1-.25)].

Combining (19) with AD:

$$
\begin{aligned}
AD &= C + I + G + NX \\
&= \left[\overline{C} + c\overline{TR} + c(1-t)Y\right] + \bar{I} + \overline{G} + \overline{NX} \\
&= A + c(1-t)Y
\end{aligned}
\qquad (20)
$$

The slope of the AD schedule is flatter because households now have to pay part of every dollar of income in taxes and are left with only 1- t of that dollar. Thus, as equation (20) shows, the marginal propensity to consume out of income is now c (1- t) instead of c .

Combining (19) with AD:

$$
\begin{aligned}
AD &= C + I + G + NX \\
&= \left[\overline{C} + c\overline{TR} + c(1-t)Y\right] + \overline{I} + \overline{G} + \overline{NX} \qquad (20) \\
&= A + c(1-t)Y
\end{aligned}
$$

Using the equilibrium condition, Y=AD, and equation (19), the equilibrium level of output is:

$$
\begin{aligned}
Y &= \overline{A} + c(1-t)Y \\
Y - c(1-t)Y &= \overline{A} \qquad (21) \\
Y\left[1 - c(1-t)\right] &= \overline{A} \\
Y_0 &= \frac{\overline{A}}{1 - c(1-t)}
\end{aligned}
$$

The presence of the government sector flattens the AD curve and reduces the multiplier to

$$
\frac{1}{(1 - c(1-t))}
$$

In comparing equation (21) with equation (12),

$$Y = \overline{A} + c(1-t)Y$$
$$Y - c(1-t)Y = \overline{A}$$
$$Y\left[1 - c(1-t)\right] = \overline{A}$$
$$Y_0 = \frac{\overline{A}}{1 - c(1-t)}$$

$$Y - cY = \overline{A}$$
$$Y(1-c) = \overline{A}$$
$$Y_0 = \frac{1}{(1-c)}\overline{A}$$

we see that the government sector makes a substantial difference. It raises autonomous spending by the amount of government purchases, G, and by the amount of induced spending out of net transfers, c TR ; in addition, the presence of the income tax lowers the multiplier.

Income Taxes as an Automatic Stabilizer

- The proportional income tax is one example of the important concept of automatic stabilizers. An automatic stabilizer is any mechanism in the economy that automatically—that is, without case-by-case government intervention— reduces the amount by which output changes in response to a change in autonomous demand.

- One explanation of the business cycle is that it is caused by shifts in autonomous demand, especially investment. Sometimes, it is argued, investors are optimistic and investment is high—and so, therefore, is output. . But sometimes they are pessimistic, and so both investment and output are low.

Swings in investment demand have a smaller effect on output when automatic stabilizers—such as a proportional income tax, which reduces the multiplier—are in place. This means that in the presence of automatic stabilizers we should expect output to fluctuate less than it would without them.

The proportional income tax is not the only automatic stabilizer. Unemployment benefits enable the unemployed to continue consuming even though they do not have a job, so TR rises when Y falls. This means that demand falls less when someone becomes unemployed and receives benefits than it would if there were no benefits. This, too, makes the multiplier smaller and output more stable.

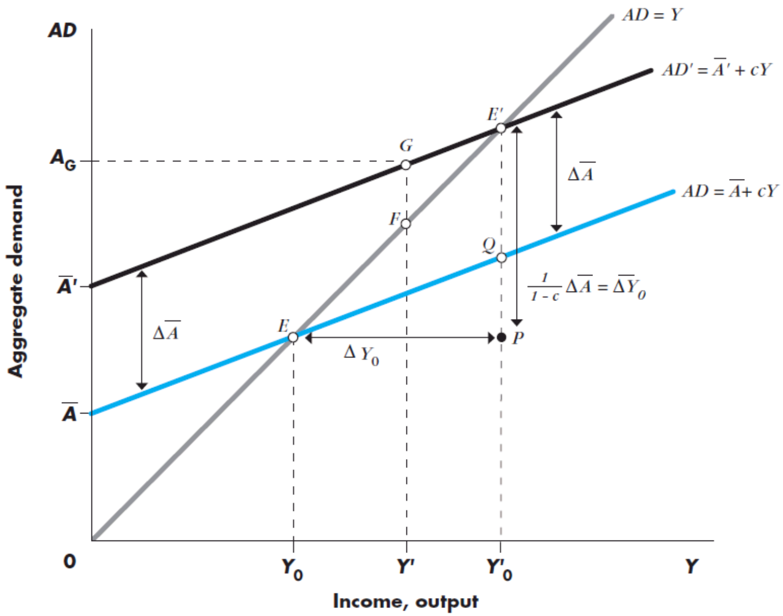
Effects of a Change in Fiscal Policy

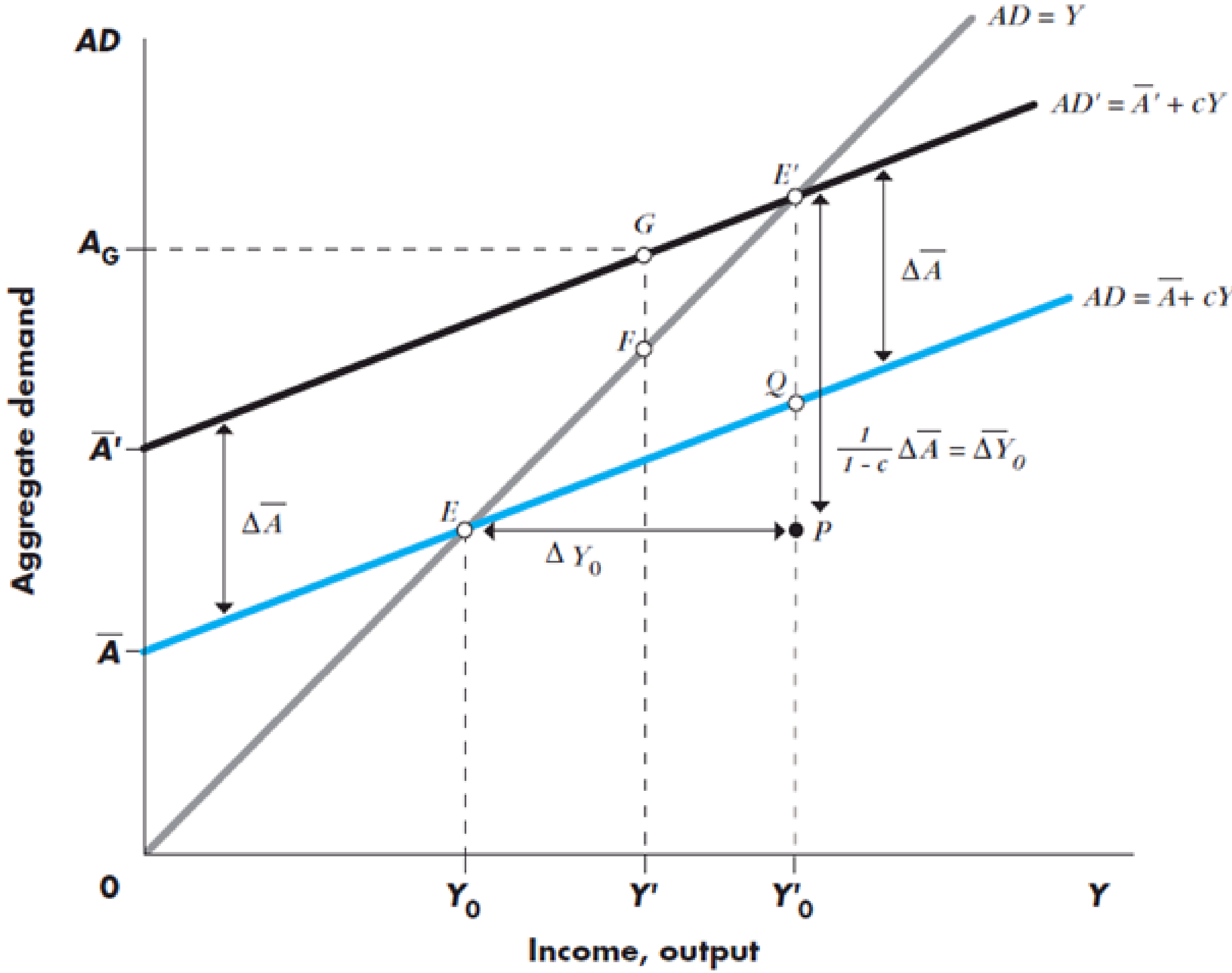
We now consider the effects of changes in fiscal policy on the equilibrium level of income. **Consider first a change in government purchases**. This case is illustrated in Figure 9-4 , where the initial level of income is Y_0 . An increase in government purchases is a change in autonomous spending; therefore, the increase shifts the aggregate demand schedule upward by an amount equal to the increase in government purchases.

Effects of a Change in Fiscal Policy

- Suppose government expenditures increase
  - Results in a change in autonomous spending and shifts the AD schedule upward by the amount of that change
  - At the initial level of output, Y_0, the demand for goods > output, and firms increase production until reach new equilibrium (E')
- How much does income expand? The change in equilibrium income is:

$$\Delta Y_0 = \frac{1}{1-c(1-t)}\Delta\overline{G} = \alpha_G \Delta\overline{G} \qquad (22)$$




AD
Aggregate demand
A_G
$\overline{A}'$
$\overline{A}$
0
Y_0
Y'
Y'_0
Y
Income, output
$AD = Y$
$AD' = \overline{A}' + cY$
$AD = \overline{A} + cY$
E'
G
F
Q
E
P
$\Delta\overline{A}$
$\Delta\overline{A}$
$\frac{1}{1-c}\Delta\overline{A} = \Delta\overline{Y}_0$
ΔY_0

Effects of a Change in Fiscal Policy

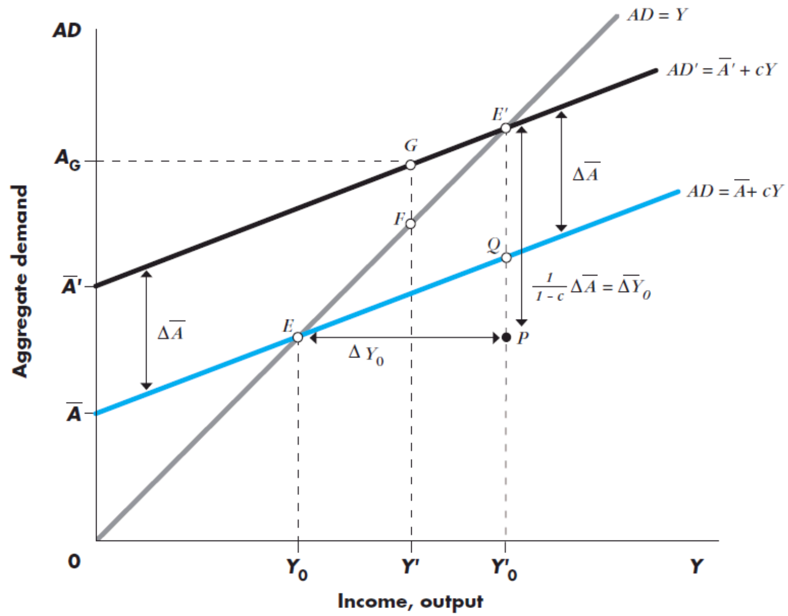
$$\Delta Y_0 = \frac{1}{1-c(1-t)}\Delta\overline{G} = \alpha_G \Delta\overline{G} \quad (22)$$

- A $1 increase in G will lead to an increase in income in excess of a dollar
  - If c = 0.80 and t = 0.25, the multiplier is 2.5

  → A $1 increase in G results in an increase in equilibrium income of $2.50

  → ΔG, ΔY shown in Figure 10-3

<u>**Expansionary fiscal policy measure**</u>



Effects of a Change in Fiscal Policy

Suppose that instead of raising government spending on goods and services, G, the government increases transfer payments, TR. Autonomous spending would increase by only $c\Delta TR$, so output would increase by α_G $c\Delta TR$. The multiplier for transfer payments is smaller than that for G by a factor of c. Part of any increase in TR is saved (since considered income)

- **If the government increases marginal tax rates, two things happen:**
  - The direct effect is that AD is reduced since disposable income decreases, and thus consumption falls
  - The multiplier is smaller, and the shock will have a smaller effect on AD

The Budget

The budget surplus is the excess of the government's revenues, TA, over its initial expenditures consisting of purchases of goods and services and TR:

$$BS \equiv TA - G - TR \qquad (24)$$

A negative budget surplus is a budget deficit

- If TA = tY, the budget surplus is defined as:

$$BS \equiv tY - \overline{G} - \overline{TR} \qquad (24a)$$

Figure 10-6 plots the BS as a function of the level of income for given G, TR, and t

- At low levels of income, the budget is in deficit since spends more than it receives in income
- At high levels of income, the budget is in surplus since the government receives more in income than it spends

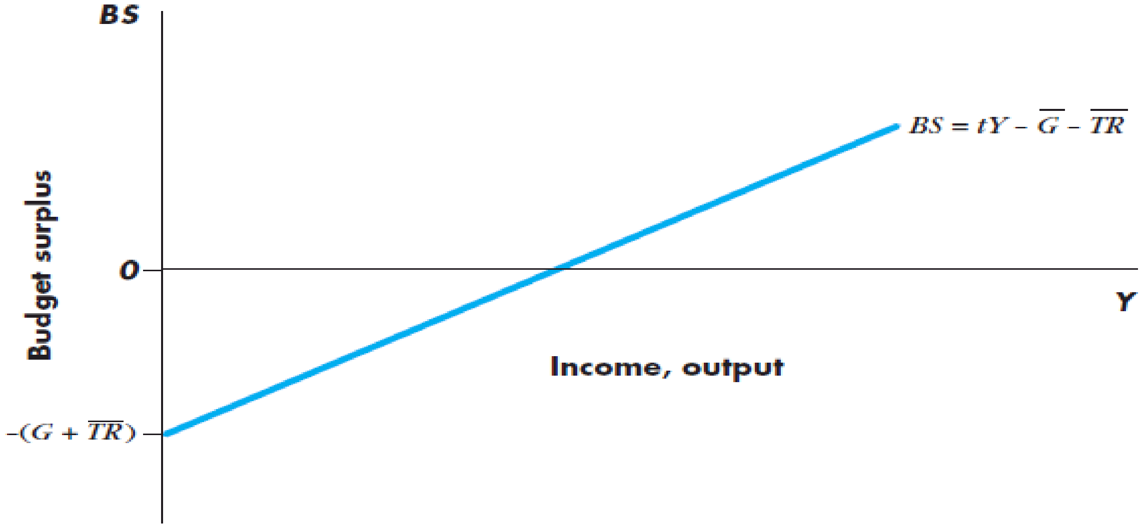
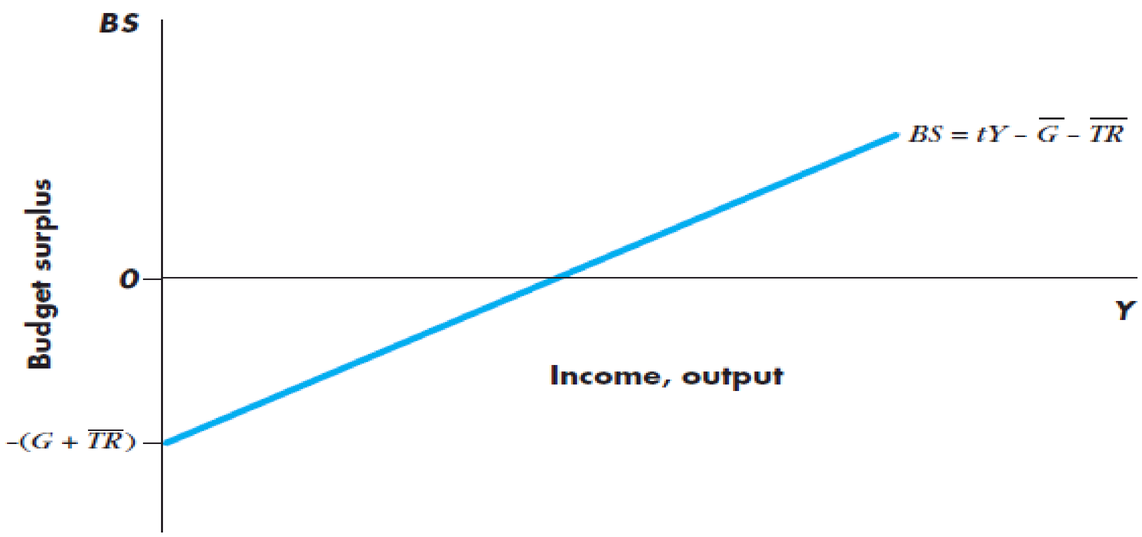


Figure 10-6 shows that the budget deficit depends on the government's policy choices (G, t, and TR) and also anything else that shifts the level of income

- Ex. Suppose that there is an increase in I demand that increases the level of output

$\rightarrow$ *budget deficit will fall as tax revenues increase*



The Budget

Budget Deficit : Expenditure > Revenue

— Negative budget surplus

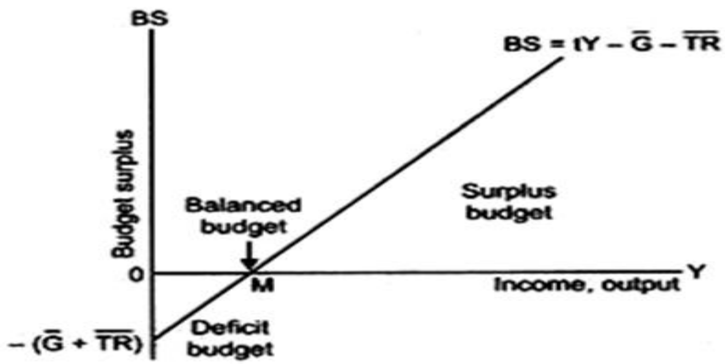


Figure 7.6

At low income level (income level less than M) →

There is Deficit budget because $\bar{G} + \overline{TR} > ty$

BS is negative

At income level (M) →

There is Balanced budget because $\bar{G} + \overline{TR} = ty$

BS = 0

At high income level (after M) →

There is Surplus budget because $\bar{G} + \overline{TR} < ty$

BS is positive

Fig. 7.6 shows that the budget deficit depends not only on ($\bar{G}$), ($\overline{TR}$) or (t) but also on any other factor that shifts

the equilibrium income level.

e.g., If Investment Demand (I) increases

Output level will increase.

Budget deficit will fall or BS will increase because tax revenue has increased. But the Government has done nothing to reduce the deficit.

Effects of Government Purchases and Tax Changes on the BS

Next we show how changes in fiscal policy affect the budget. In particular, we want to find out whether **an increase in government purchases must reduce the budget surplus**. At first sight, this appears obvious, because increased government purchases, from equation (24), are reflected in a reduced surplus or an increased deficit.

$$BS \equiv TA - G - TR$$

On further thought, however, the increased government purchases will cause an increase (multiplied) in income and therefore increased income tax collection.

This raises the interesting possibility that tax collection might increase by more than government purchases.

Possibility that increased tax collections > increase in G

A brief calculation shows that the first guess is right: Increased government purchases reduce the budget surplus.

From equation (22) we see that the change in income due to increased government purchases is equal to $\Delta Y_0 \equiv \alpha_G \Delta G$. A fraction of that increase in income is collected in the form of taxes, so tax revenue increases by $t\alpha_G \Delta G$

Effects of Government Purchases and Tax Changes on the BS

- The change in the budget surplus,

$$\begin{aligned}\Delta BS &= \Delta TA - \Delta G \\ &= t\alpha_G \Delta G - \Delta G \\ &= -\frac{(1-c)(1-t)}{1-c(1-t)}\Delta G\end{aligned} \qquad (25)$$

We have therefore shown that an increase in government purchases will reduce the budget surplus, although in this model by considerably less than the increase in purchases. For instance, for c .8 and t .25, a $1 increase in government purchases will create a $0.375 reduction in the surplus.

The change is
⇒ negative <u>OR</u>
reduces the surplus

$$\Delta BS = \Delta TA - \Delta\bar{G}$$

$$= t\Delta Y - \Delta\bar{G}$$

$$= t.\alpha_G.\Delta\bar{G} - \Delta\bar{G}$$

$$= \Delta\bar{G}\left[\frac{t}{1-c(1-t)} - 1\right]$$

$$= \Delta\bar{G}\left[\frac{t-1+c(1-t)}{1-c(1-t)}\right]$$

$$= -\Delta\bar{G}\left[\frac{1-t-c(1-t)}{1-c(1-t)}\right]$$

$$\boxed{\Delta BS = -\frac{(1-c)(1-t)}{1-c(1-t)}.\Delta\bar{G}}$$

Proof:

$\because$ TA = tY (Refer 7.2)

$\because \quad \Delta Y = \alpha_G \Delta G$

$\therefore \; t\Delta Y = t.\alpha_G \Delta G$

where $\alpha_G = \dfrac{1}{1-c(1-t)}$

$\therefore$ BS is negative which shows that, increase in Government purchases reduces BS.

e.g.

$$c = 0.8$$

$$t = 0.25$$

$$\Delta G = ₹\ 10$$

$$\Delta BS = -\frac{(1-.8)(1-.25)}{1-.8(1-.25)}.10$$

$$= -₹\ 3.75$$

Thus, increase in G by ₹ 10 will reduce BS by ₹ 3.75

In the same way, we can consider the effects of an increase in the tax rate on the budget surplus.

We know that the increase in the tax rate will reduce the level of income. It might thus appear that an increase in the tax rate, keeping the level of government spending constant, could reduce the budget surplus.

We mention here another interesting result known as the balanced budget multiplier. Suppose government spending and taxes are raised in equal amounts and thus in the new equilibrium the budget surplus is unchanged.

THE FULL-EMPLOYMENT BUDGET SURPLUS

The final topic to be treated here is the concept of the full-employment budget surplus. ***Recall that increases in taxes add to the surplus and that increases in government expenditures reduce the surplus.*** Increases in taxes have been shown to reduce the level of income; increases in government purchases and transfers, to increase the level of income. It thus seems that the budget surplus is a convenient, simple measure of the overall effects of fiscal policy on the economy. For instance, when the budget is in deficit, we would say that fiscal policy is expansionary, tending to increase GDP.

However, the budget surplus by itself suffers from a serious defect as a measure of the direction of fiscal policy.

The defect is that the surplus can change because of changes in autonomous private spending.

Thus, an increase in the budget deficit does not necessarily mean that the government has changed its policy in an attempt to increase the level of income.

Since we frequently want to measure the way in which fiscal policy is being used to affect the level of income, we require some measure of policy that is independent of the particular position of the business cycle—boom or recession—in which we may find ourselves.

Such a measure is provided by the full-employment budget surplus, which we denote by **BS ***. **The full-employment budget surplus measures the budget surplus at the full-employment level of income or at potential output (Y*).**

$$\boxed{BS^* = ty^* - \bar{G} - \overline{TR}}$$

Difference between actual budget surplus (BS) and full-employment budget surplus (BS*)

$$BS = ty - \bar{G} - \overline{TR} \quad ...(i)$$

Where → Y* full employment income level

$$BS^* = ty^* - \bar{G} - \overline{TR} \quad ...(ii)$$

Y → actual output

Subtracting (*i*) from (*ii*) we get:

$$BS^* - BS = t(y^* - y) \quad ...(iii)$$

— cyclical component of the budget.

The equation (*iii*) shows that the difference between BS* and BS is due to the tax collection, that is, due to the cyclical component of the budget.

If output is below full-employment level ($Y < Y^*$) – $BS^* > BS$

If output exceeds full-employment level ($Y > Y^*$ – $BS > BS^*$)

During recession—cyclical component shows a deficit

During boom – it shows a surplus.

Summary:

1. Government purchases and government transfer payments act like increases in autonomous spending in their effects on the equilibrium level of income. A proportional income tax has the same effect on the equilibrium level of income as a reduction in the propensity to consume. A proportional income tax thus reduces the multiplier.

2. The budget surplus is the excess of government receipts over expenditures. When the government is spending more than it receives, the budget is in deficit. The size of the budget surplus (or deficit) is affected by the government’s fiscal policy variables—government purchases, transfer payments, and tax rates.

3. The actual budget surplus is also affected by changes in tax collection and transfers resulting from movements in the level of income that occur because of changes in private autonomous spending. The full-employment (high-employment) budget surplus is used as a measure of the active use of fiscal policy. The full-employment surplus measures the budget surplus that would exist if output were at its potential (full-employment) level.

Example:

1. $C = 1{,}000 + 0.65Y$	Consumption function
2. $I = 1{,}500$	Planned investment function
3. $G = 1{,}500$	Government spending function
4. $NX = -500$	Net export function
5. $Y = C + I + G + NX$	Equilibrium condition

Solving the Model

- The first four equations can be used to form the aggregate expenditure function—the right hand side of the fifth equation.

- The fifth equation is the essential "equilibrium condition", representing the effect of the 45°-line.

- Substituting the first four equations into the fifth gives:

$$Y = 1{,}000 + 0.65Y + 1{,}500 + 1{,}500 - 500$$

Subtracting 0.65*Y* from both sides gives:

$$Y - 0.65Y = 1{,}000 + 1{,}500 + 1{,}500 - 500$$

Which simplifies to:

$$0.35Y = 3{,}500$$

$$Y = \frac{3{,}500}{0.35} = 10{,}000$$

General Aggregate Expenditure Equations

More generally, we could allow the parameters of the model to be represented by letters.

1. $C = \overline{C} + MPC(Y)$	Consumption function
2. $I = \overline{I}$	Planned investment function
3. $G = \overline{G}$	Government spending function
4. $NX = \overline{NX}$	Net export function
5. $Y = C + I + G + NX$	Equilibrium condition

Solving the General Aggregate Expenditure Equations

Solving now for equilibrium, we get

$$Y = \overline{C} + MPC(Y) + \overline{I} + \overline{G} + \overline{NX}$$

$$Y - MPC(Y) = \overline{C} + \overline{I} + \overline{G} + \overline{NX}$$

$$Y(1 - MPC) = \overline{C} + \overline{I} + \overline{G} + \overline{NX}$$

$$Y = \frac{\overline{C} + \overline{I} + \overline{G} + \overline{NX}}{1 - MPC} = (\overline{C} + \overline{I} + \overline{G} + \overline{NX}) \times \frac{1}{1 - MPC}$$

The last equation makes clear that:

Equilibrium GDP = Autonomous expenditure × Multiplier