Keynes theory of national income determination

Continue…

- In the Keynesian model that we study in this chapter, all the firms are like your grocery store: They set their prices and sell the quantities their customers are willing to buy.
- If they persistently sell a greater quantity than they plan to and are constantly running out of inventory, they eventually raise their prices.
- And if they persistently sell a smaller quantity than they plan to and have inventories piling up, they eventually cut their prices.
-

Continue…

- But on any given day, their prices are fixed and the quantities they sell depend on demand, not supply.
- Because each firm's prices are fixed, for the economy as a whole:
  1. The *price level* is fixed, and
  2. *Aggregate demand* determines real GDP.
- The Keynesian model explains fluctuations in aggregate demand at a fixed price level by identifying the forces that determine expenditure plans.

Continue…

- Expenditure Plans
- Aggregate expenditure has four components: consumption expenditure, investment, government expenditure on goods and services, and net exports (exports *minus* imports).
- These four components of aggregate expenditure sum to real GDP.

Continue…

- Aggregate planned expenditure is equal to
- the sum of the *planned* levels of consumption expenditure, investment, government expenditure on goods and services, and exports minus imports.
- Two of these components of planned expenditure,
- consumption expenditure and imports, change when income changes and so they depend on real GDP.

A Two-Way Link Between Aggregate Expenditure and Real GDP

- There is a two-way link between aggregate expenditure and real GDP. Other things remaining the same,
  - An increase in real GDP increases aggregate expenditure, and
  - An increase in aggregate expenditure increases real GDP.

  WE are now going to study this two-way link.

Continue…

- Consumption and Saving Plans
- Several factors influence consumption expenditure and saving plans.
- The more important ones are 1.Disposable income 2. Real interest rate 3.Wealth 4. Expected future income

Continue…

- Disposable income is aggregate income minus taxes plus transfer payments.
- Aggregate income equals real GDP, so disposable income depends on real GDP.
- To explore the two-way link between real GDP and planned consumption expenditure,
- we focus on the relationship between consumption expenditure and disposable income when the other three factors listed above are constant.

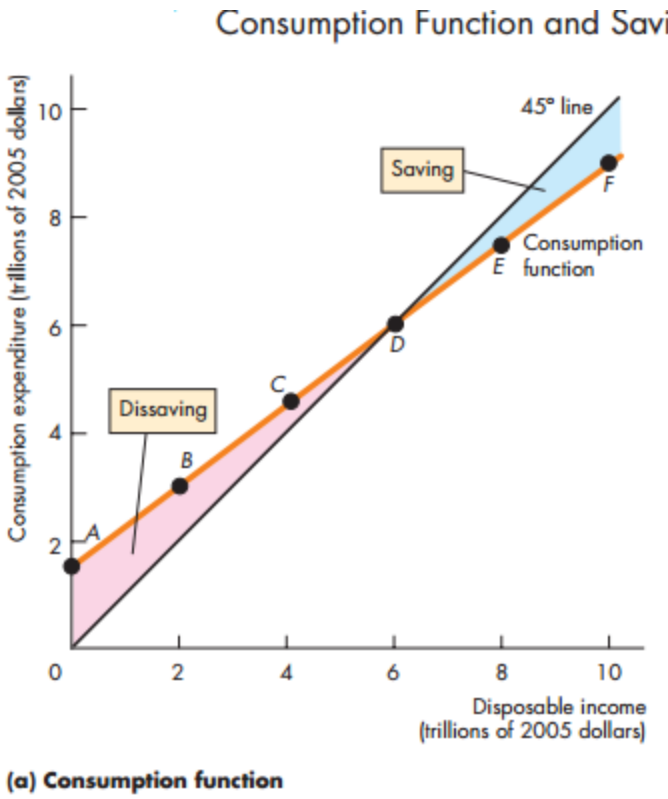
Continue…

- Consumption Expenditure and Saving
- Households can only spend their disposable income on consumption or save it, so planned consumption expenditure plus planned saving *always* equals disposable income.

Continue…

- Consumption function- The relationship between consumption expenditure and disposable income, other things remaining the same.
- saving function -The relationship between saving and disposable income, other things remaining the same.

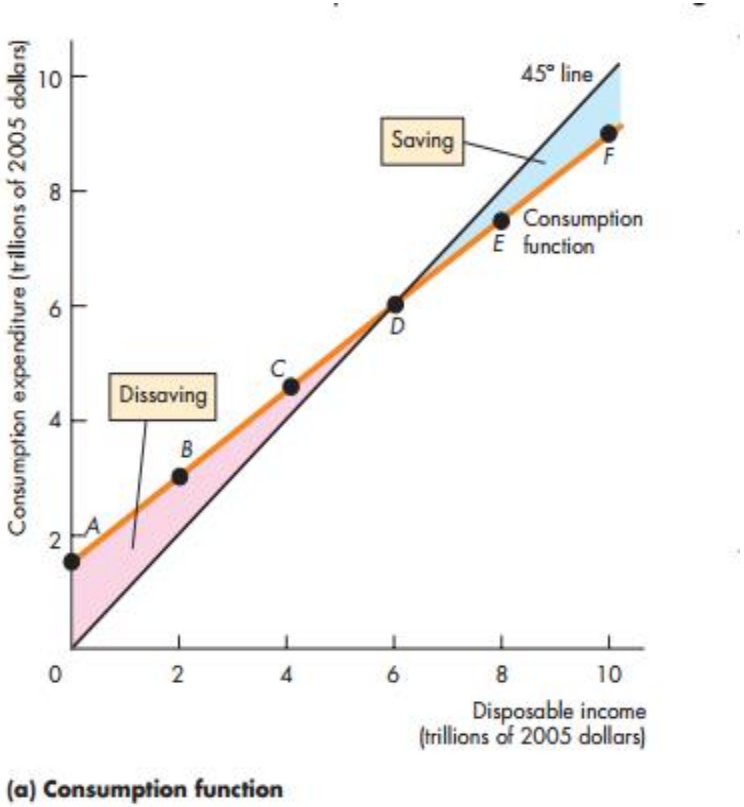
Consumption Function



(a) Consumption function

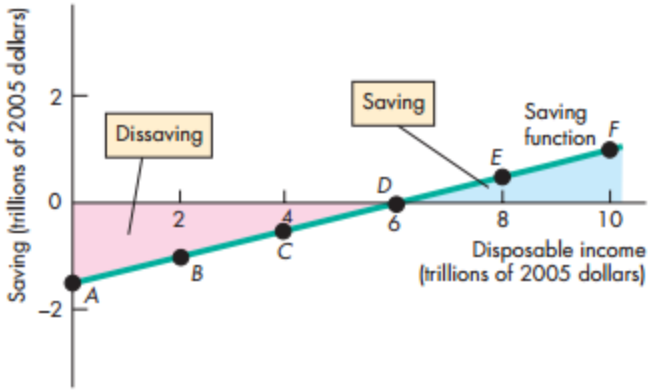
	Disposable income	Planned consumption expenditure	Planned saving
	(trillions of 2005 dollars)		
A	0	1.5	–1.5
B	2	3.0	–1.0
C	4	4.5	–0.5
D	6	6.0	0
E	8	7.5	0.5
F	10	9.0	1.0

Continue…



(a) Consumption function

- SAVING FUNCTION



(b) Saving function

APC +APS=1

- Average propensity to consume (APC)-the fraction of income that is consumed on good and services. $$APC = \frac{C}{Y}$$
- Average propensity to save- fraction of income that is saved. $$APS = \frac{S}{Y}$$
- SUM OF APC AND APS =1

$$C + S = Y$$

$$\frac{C}{Y} + \frac{S}{Y} = 1$$

$$APC + APS = 1$$

Continue…

- ## Marginal Propensities to Consume and Save

The **marginal propensity to consume** (*MPC*) is the fraction of a *change* in disposable income that is spent on consumption. It is calculated as the *change* in consumption expenditure (ΔC) divided by the *change* in disposable income (ΔYD). The formula is

$$MPC = \frac{\Delta C}{\Delta YD}.$$

In the table in Fig. 11.1, when disposable income increases by $2 trillion, consumption expenditure increases by $1.5 trillion. The *MPC* is $1.5 trillion divided by $2 trillion, which equals 0.75.

The **marginal propensity to save** (*MPS*) is the fraction of a *change* in disposable income that is saved. It is calculated as the *change* in saving (ΔS) divided by the *change* in disposable income (ΔYD). The formula is

$$MPS = \frac{\Delta S}{\Delta YD}.$$

In the table in Fig. 11.1, when disposable income increases by $2 trillion, saving increases by $0.5 trillion. The *MPS* is $0.5 trillion divided by $2 trillion, which equals 0.25.

Continue…

Because an increase in disposable income is either spent on consumption or saved, the marginal propensity to consume plus the marginal propensity to save equals 1. You can see why by using the equation:

$$\Delta C + \Delta S = \Delta YD.$$

Continue…

Divide both sides of the equation by the change in disposable income to obtain

$$\frac{\Delta C}{\Delta YD} + \frac{\Delta S}{\Delta YD} = 1.$$

$\Delta C/\Delta YD$ is the marginal propensity to consume (MPC), and $\Delta S/\Delta YD$ is the marginal propensity to save (MPS), so

$$MPC + MPS = 1.$$

Continue…

Slopes and Marginal Propensities

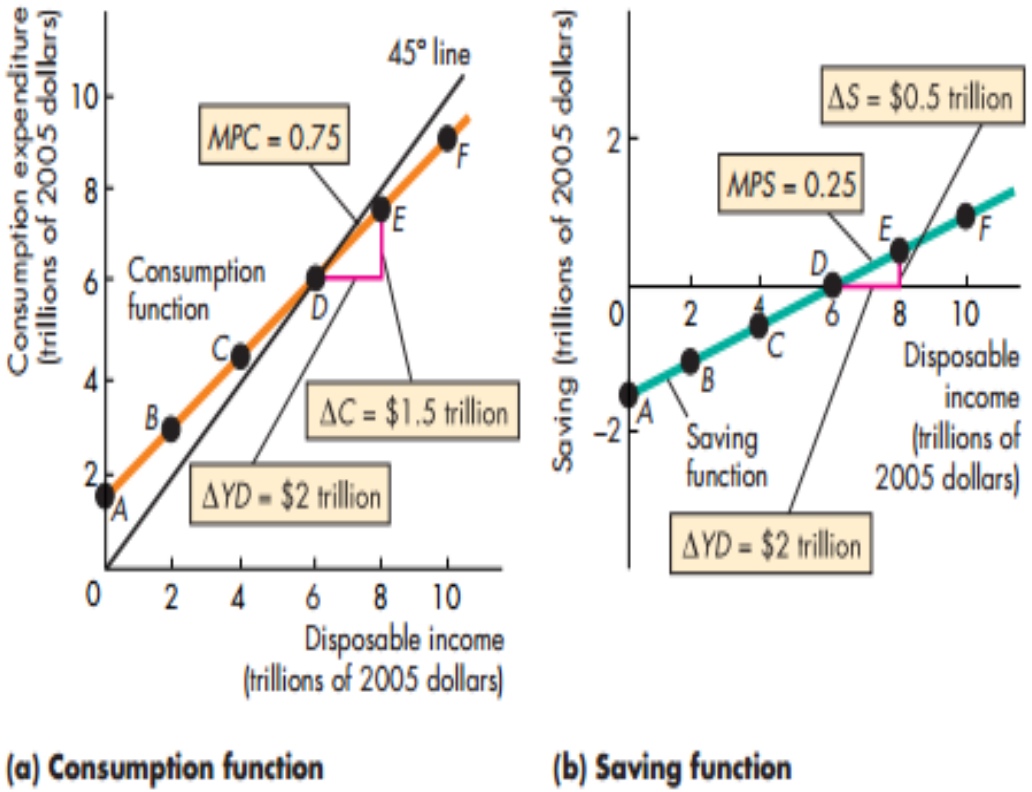
The slope of the consumption function is the marginal propensity to consume, and the slope of the saving function is the marginal propensity to save.

Figure 11.2(a) shows the *MPC* as the slope of the consumption function. An increase in disposable income of $2 trillion is the base of the red triangle. The increase in consumption expenditure that results from this increase in disposable income is $1.5 trillion and is the height of the triangle. The slope of the consumption function is given by the formula "slope equals rise over run" and is $1.5 trillion divided by $2 trillion, which equals 0.75—the *MPC*.

Figure 11.2(b) shows the *MPS* as the slope of the saving function. An increase in disposable income of $2 trillion (the base of the red triangle) increases saving by $0.5 trillion (the height of the triangle). The slope of the saving function is $0.5 trillion divided by $2 trillion, which equals 0.25—the *MPS*.

Continue…

FIGURE 11.2 The Marginal Propensities to Consume and Save



(a) Consumption function

(b) Saving function

The marginal propensity to consume, *MPC*, is equal to the change in consumption expenditure divided by the change in disposable income, other things remaining the same. It is measured by the slope of the consumption function. In part (a), the *MPC* is 0.75.

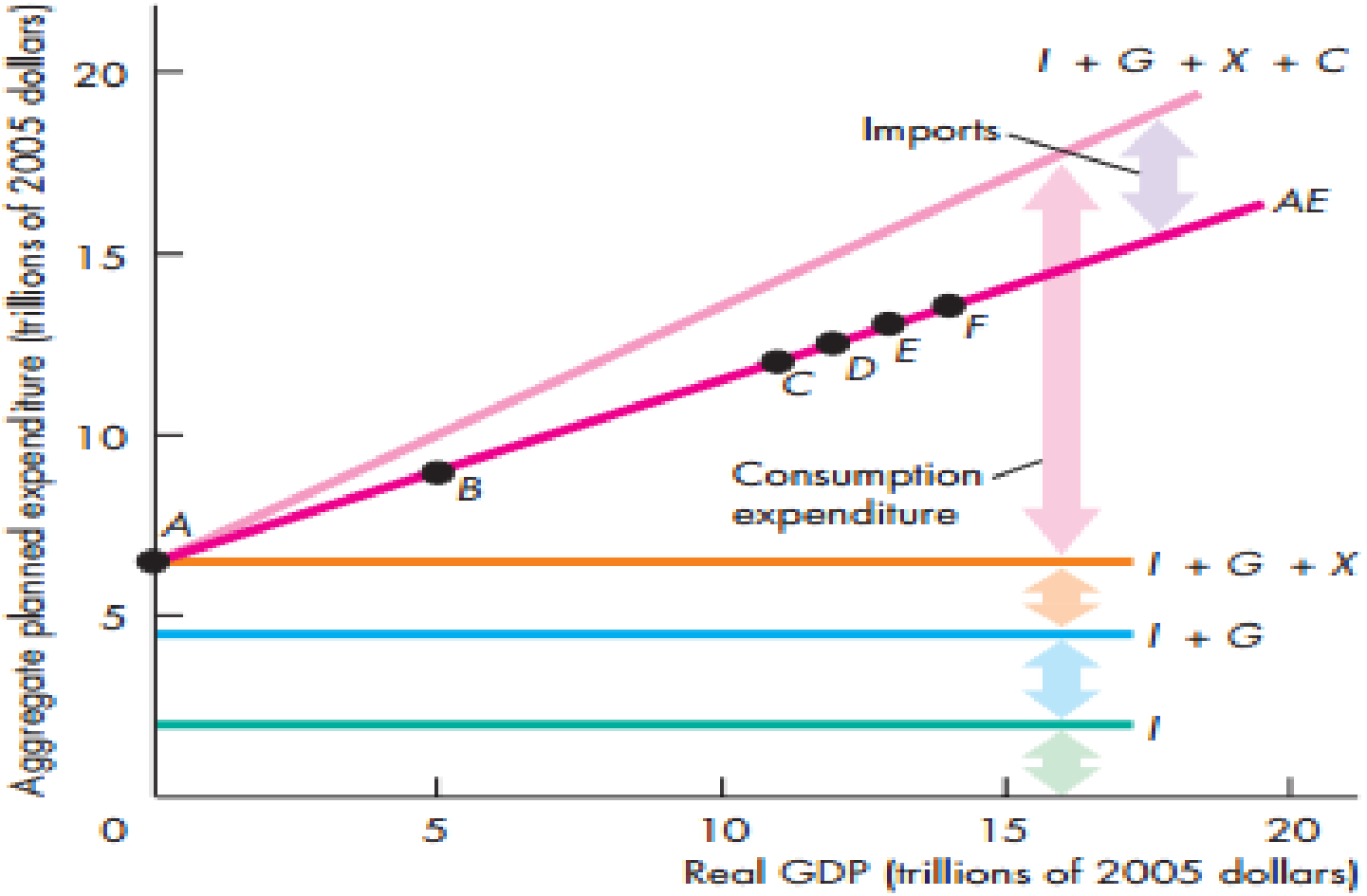
The marginal propensity to save, *MPS*, is equal to the change in saving divided by the change in disposable income, other things remaining the same. It is measured by the slope of the saving function. In part (b), the *MPS* is 0.25.

Continue…

Real GDP (trillions of 2005 dollars)

	Real GDP (Y)	Planned expenditure: Consumption expenditure (C)	Investment (I)	Government expenditure (G)	Exports (X)	Imports (M)	Aggregate planned expenditure (AE = C + I + G + X − M)
	(trillions of 2005 dollars)						
A	0	0	2.0	2.5	2.0	0.0	6.5
B	5	3.5	2.0	2.5	2.0	1.0	9.0
C	11	7.7	2.0	2.5	2.0	2.2	12.0
D	12	8.4	2.0	2.5	2.0	2.4	12.5
E	13	9.1	2.0	2.5	2.0	2.6	13.0
F	14	9.8	2.0	2.5	2.0	2.8	13.5

Continue…


Aggregate planned expenditure (trillions of 2005 dollars)
20
15
10
5
0
5
10
15
20
Real GDP (trillions of 2005 dollars)
I + G + X + C
Imports
AE
A
B
C
D
E
F
Consumption expenditure
I + G + X
I + G
I

Actual Expenditure, Planned Expenditure, and Real GDP

- *Actual* aggregate expenditure is always equal to real GDP,*.
- But aggregate *planned* expenditure is not always equal to actual aggregate expenditure and therefore is not always equal to real GDP.
- How can actual expenditure and planned expenditure differ?

Actual Expenditure, Planned Expenditure, and Real GDP

- The answer is that firms can end up with inventories that are greater or smaller than planned.
- People carry out their consumption expenditure plans, the government implements its planned expenditure on goods and services, and net exports are as planned.

Actual Expenditure, Planned Expenditure, and Real GDP

- Firms carry out their plans to purchase new buildings, plant, and equipment.
- But one component of investment is the change in firms' inventories.
- If aggregate planned expenditure is less than real GDP, firms sell less than they planned to sell and end up with unplanned inventories.
- If aggregate planned expenditure exceeds real GDP, firms sell more than they planned to sell and end up with inventories being too low.

Equilibrium Expenditure

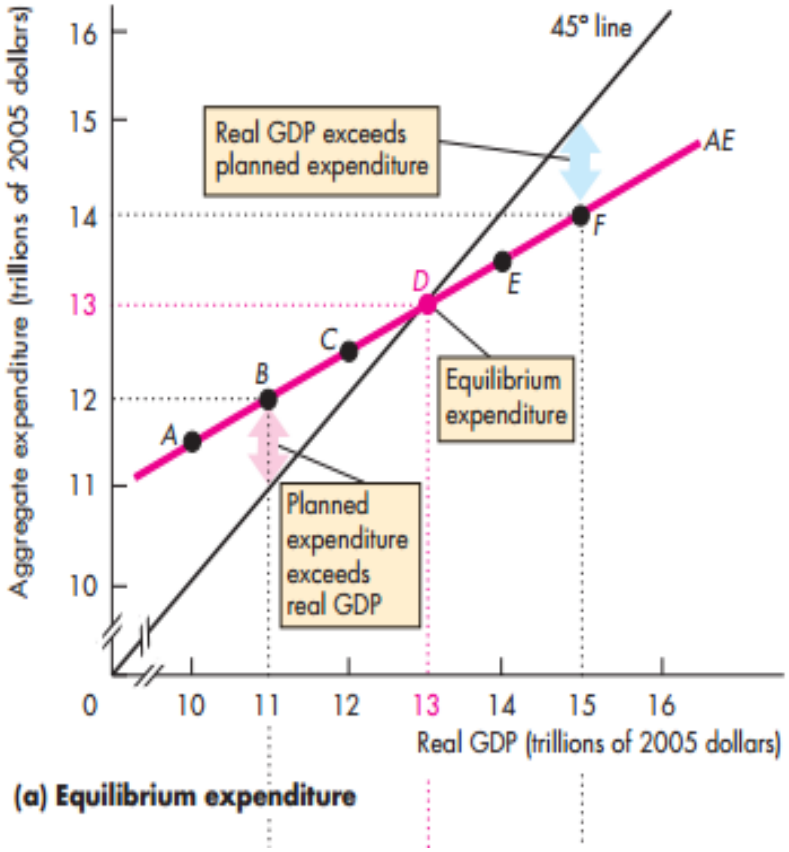
- Equilibrium expenditure is the level of aggregate expenditure that occurs when aggregate *planned* expenditure equals real GDP.
- Equilibrium expenditure is a level of aggregate expenditure and real GDP at which spending plans are fulfilled.
- At a given price level, equilibrium expenditure determines real GDP.

Equilibrium Expenditure

- When aggregate planned expenditure and actual aggregate expenditure are unequal, a process of convergence toward equilibrium expenditure occurs.
- Throughout this process, real GDP adjusts. Let's examine equilibrium expenditure and the process that brings it about.

Equilibrium Expenditure

FIGURE 11.4 Equilibrium Expenditure



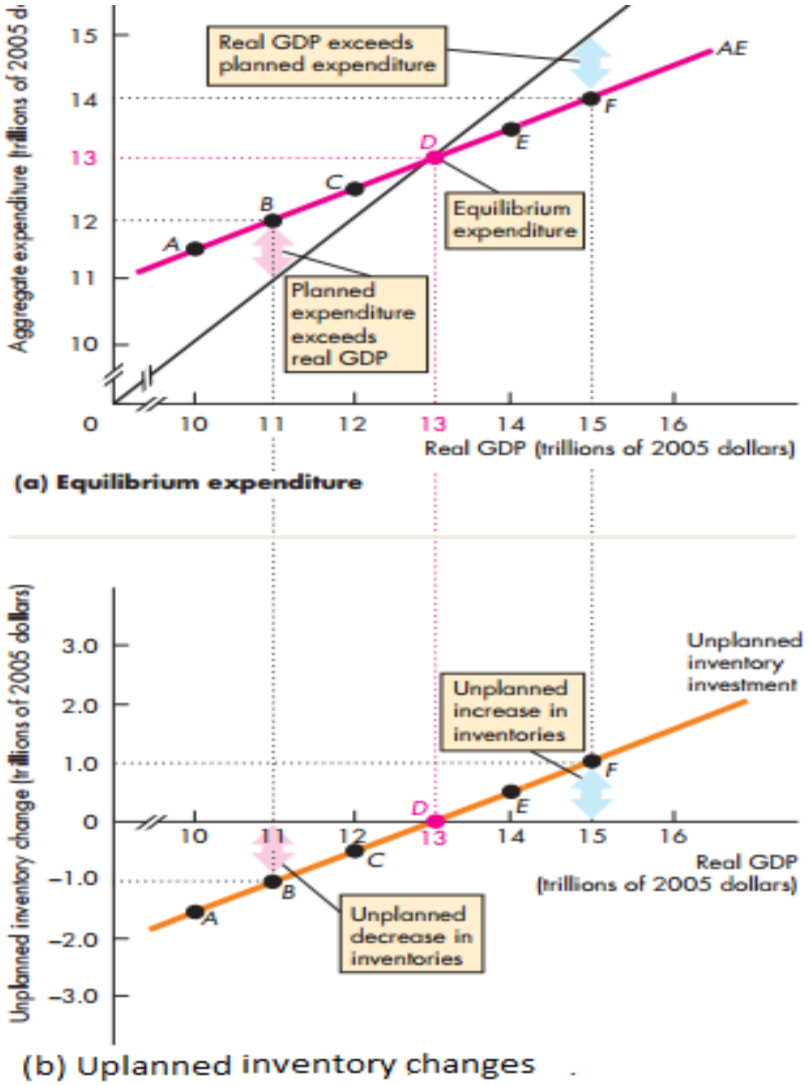
(a) Equilibrium expenditure

	Real GDP (*Y*)	Aggregate planned expenditure (*AE*)	Unplanned inventory change (*Y* – *AE*)
	(trillions of 2005 dollars)		
A	10	11.5	–1.5
B	11	12.0	–1.0
C	12	12.5	–0.5
D	**13**	**13.0**	**0**
E	14	13.5	0.5
F	15	14.0	1.0

CONVERGENCE TO EQUILIBRIUM

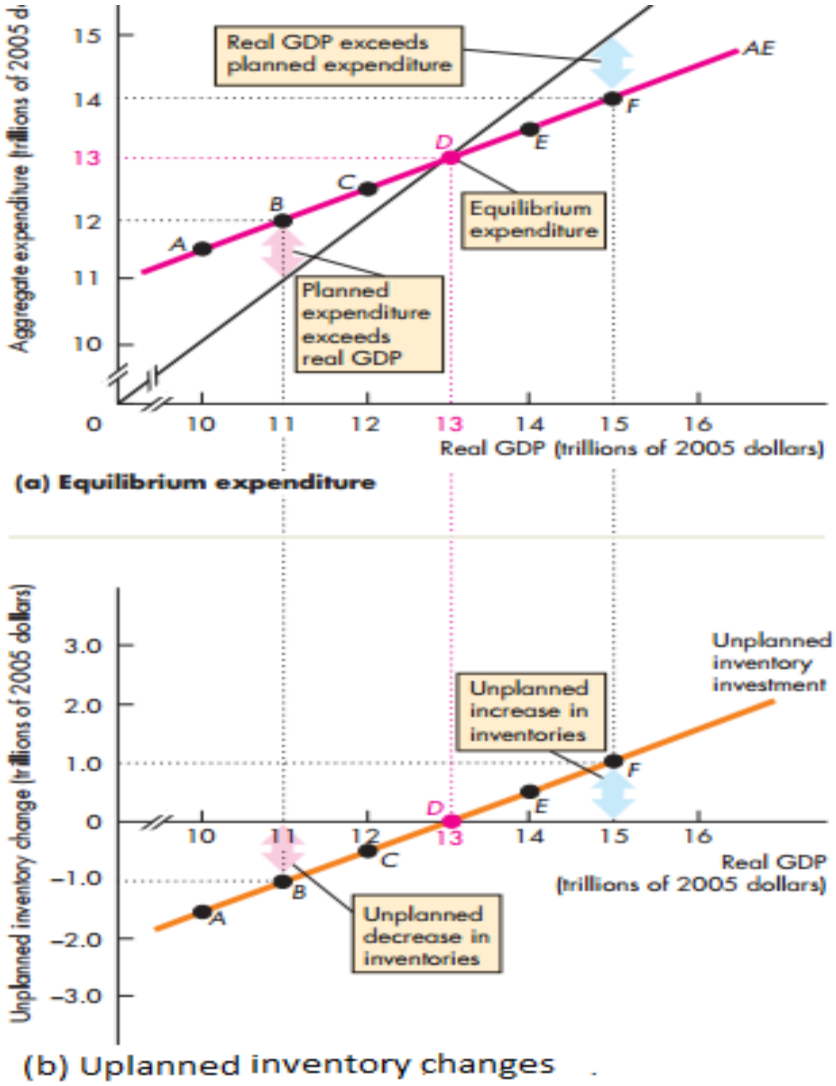
- What are the forces that move aggregate expenditure toward its equilibrium level?
- To answer this question, we must look at a situation in which aggregate expenditure is away from its equilibrium level.

FROM BELOW EQUILIBRIUM



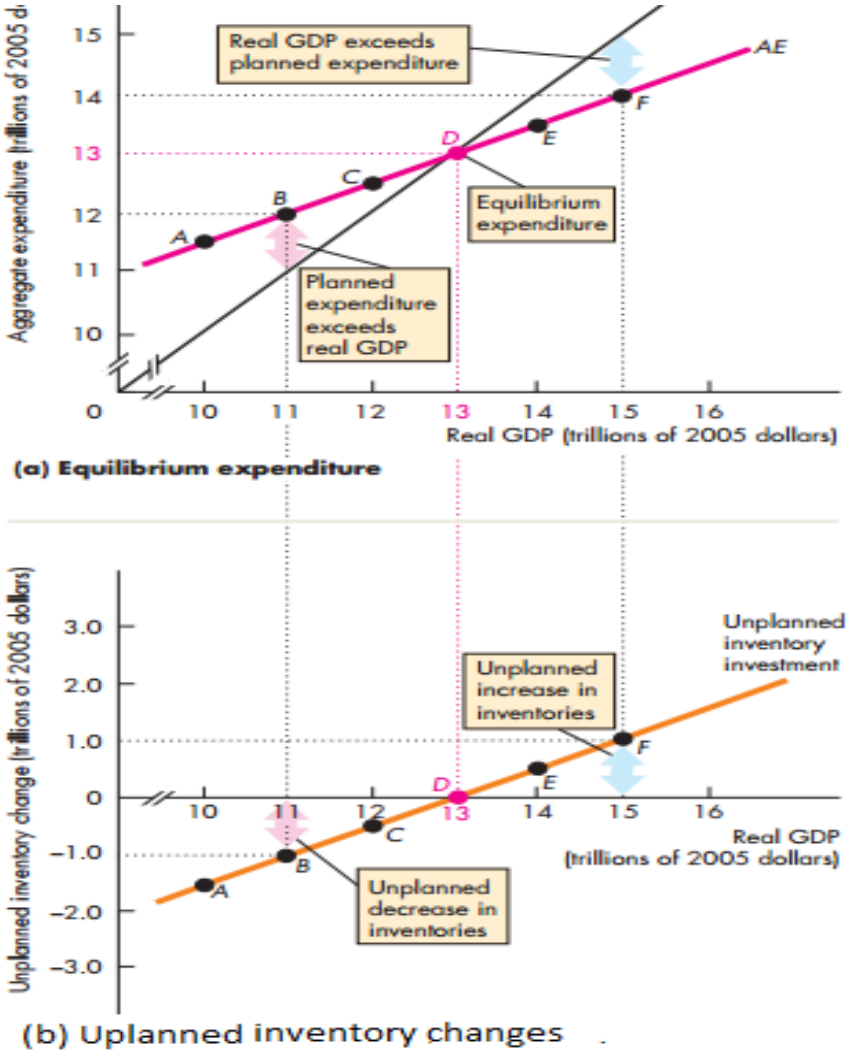
- Suppose that real GDP is $11 trillion.
- With real GDP at $11 trillion, actual aggregate expenditure is also $11 trillion.
- But aggregate *planned* expenditure is $12 trillion, point *B* in Fig. 11.4(a).
- Aggregate planned expenditure exceeds *actual* expenditure.

FROM BELOW EQUILIBRIUM



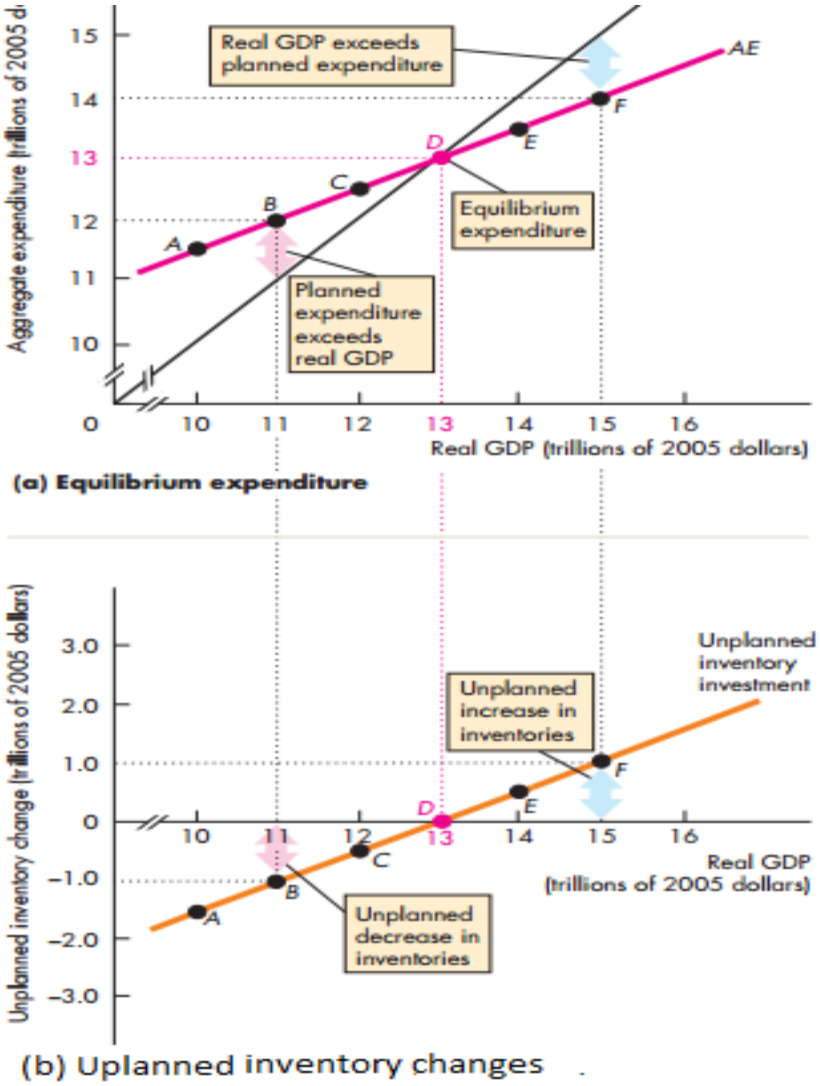
- When people spend $12 trillion and firms produce goods and services worth $11 trillion, firms' inventories fall by $1 trillion, point *B* in Fig. (b).
- Because the change in inventories is part of investment, *actual* investment is $1 trillion less than *planned* investment.

FROM BELOW EQUILIBRIUM



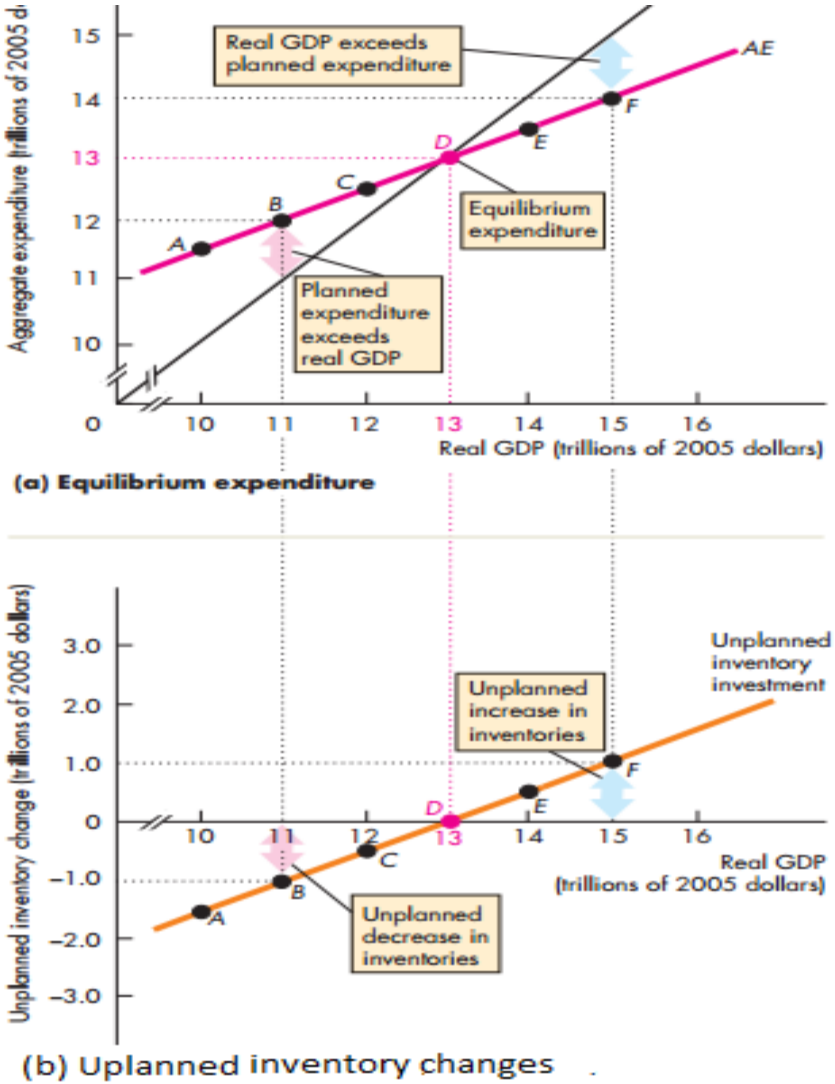
- Real GDP doesn't remain at $11 trillion for very long.
- Firms have **inventory targets based on their sales.**
- When inventories fall below target, firms increase production to restore inventories to the target level.
- To increase inventories, firms hire additional labor and increase production.
- Suppose that they increase production in the next period by $1 trillion.

FROM BELOW EQUILIBRIUM



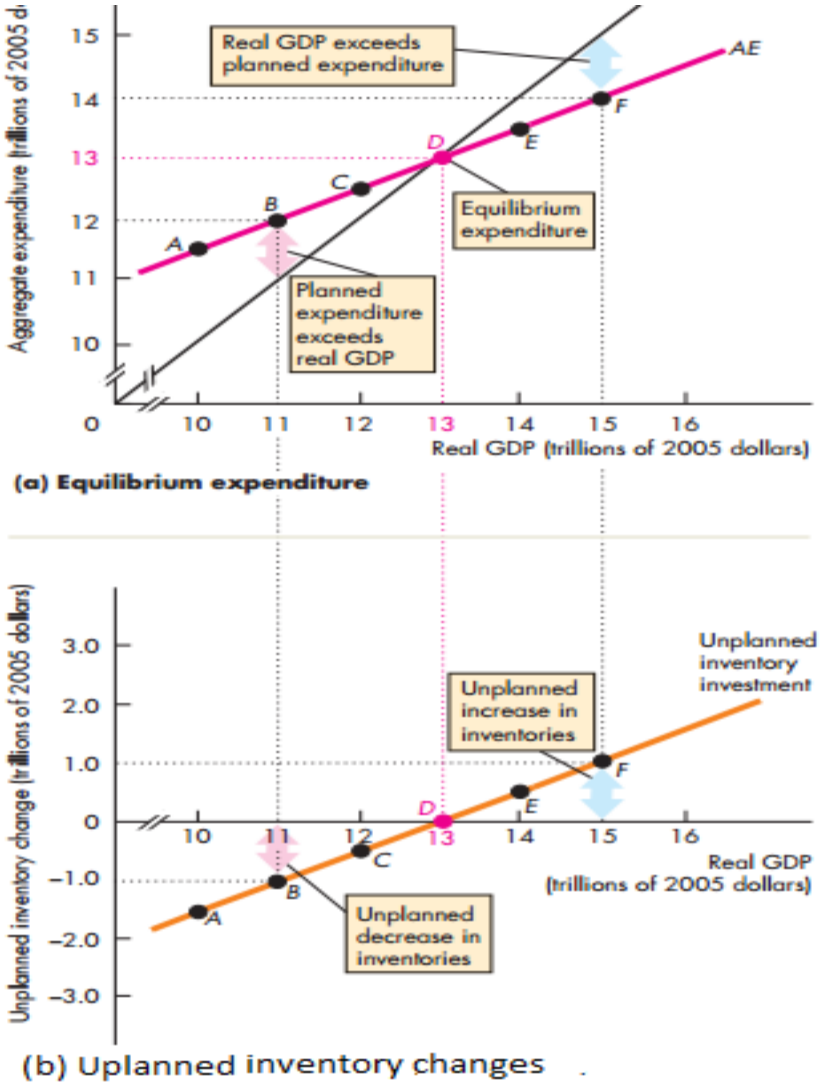
- Real GDP increases by $1.0 trillion to $12.0 trillion.
- But again, aggregate planned expenditure exceeds real GDP.
- When real GDP is $12.0 trillion, aggregate planned expenditure is $12.5 trillion, point *C* in Fig. (a).
- Again, inventories decrease, but this time by less than before.

FROM BELOW EQUILIBRIUM



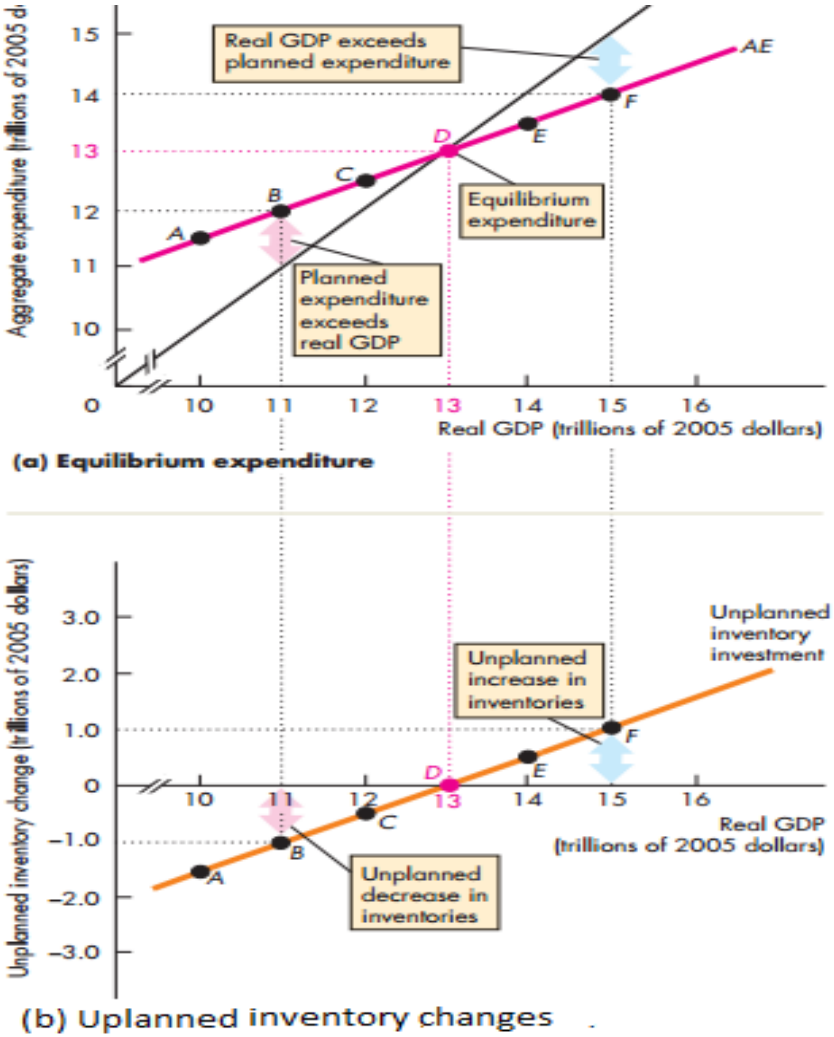
- With real GDP of $12.0 trillion and aggregate planned expenditure of $12.5 trillion, inventories decrease by $0.5 trillion, point *C* in Fig. (b).
- Again, firms hire additional labor and production increases; real GDP increases yet further.

FROM ABOVE EQUILIBRIUM



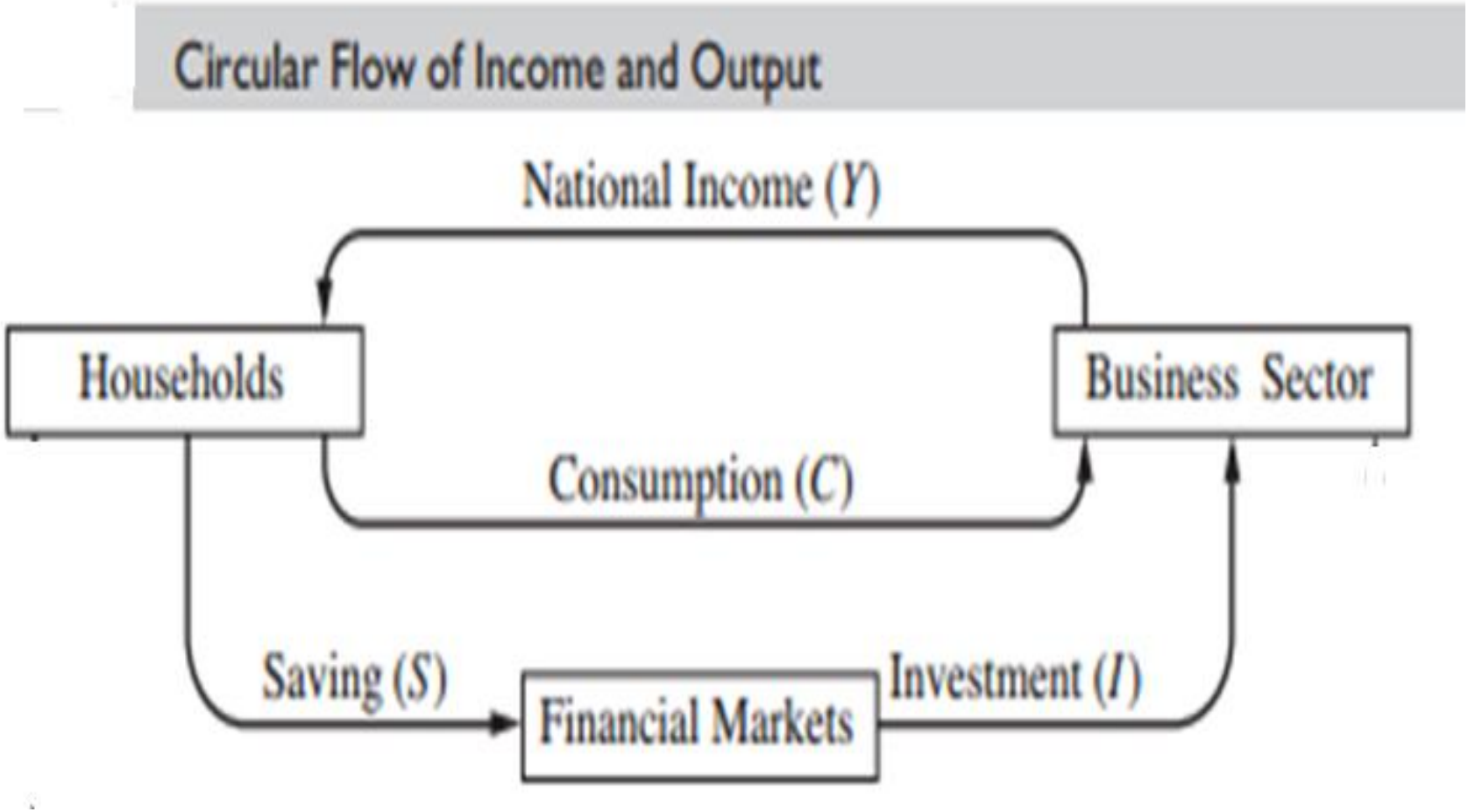
- From Above Equilibrium If real GDP is $15 trillion, the process that we've just described works in reverse.
- With real GDP at $15 trillion, actual aggregate expenditure is also $15 trillion.
  - But aggregate planned expenditure is $14 trillion, point *F* in Fig.(a).
- Actual expenditure exceeds planned expenditure.
- When people spend $14 trillion and firms produce goods and services worth $15 trillion, firms' inventories rise by $1 trillion, point *F* in Fig.(b).

FROM ABOVE EQUILIBRIUM



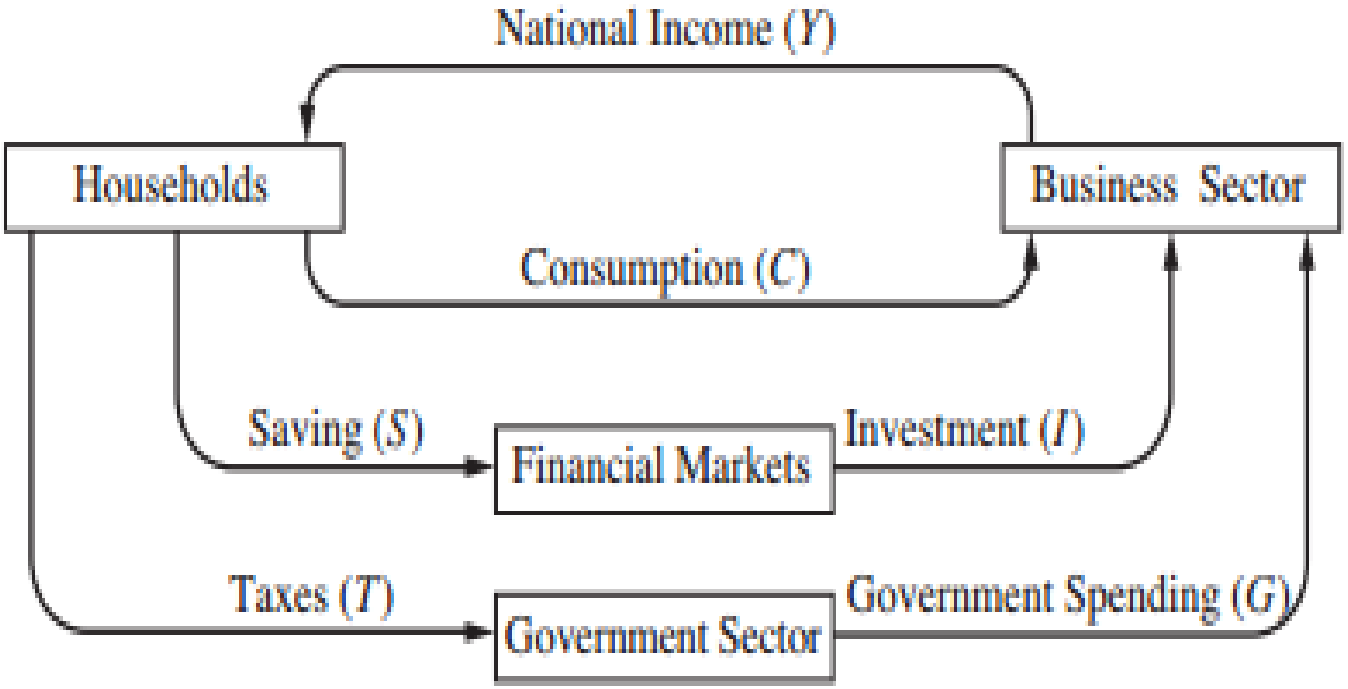
- Now, real GDP begins to fall.
- As long as actual expenditure exceeds planned expenditure, inventories rise, and production decreases.
- Again, the process ends when real GDP has reached $13 trillion, the equilibrium at which unplanned inventory changes are zero and firms do not change their production.

Circular flow of income two sectors Economy /Closed economy



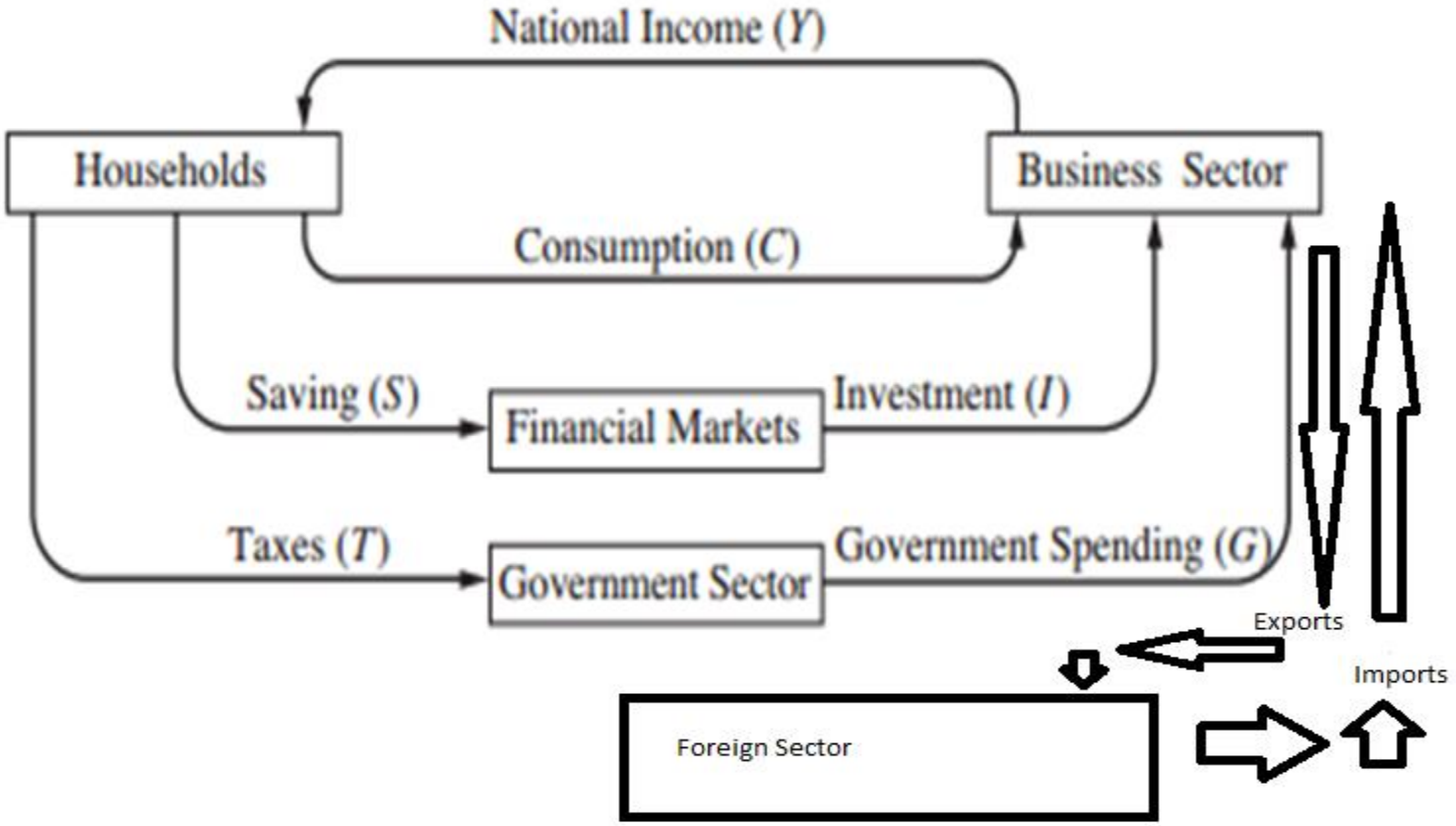
Circular flow of income three sectors Economy/Closed economy

FIGURE 5-2 Circular Flow of Income and Output

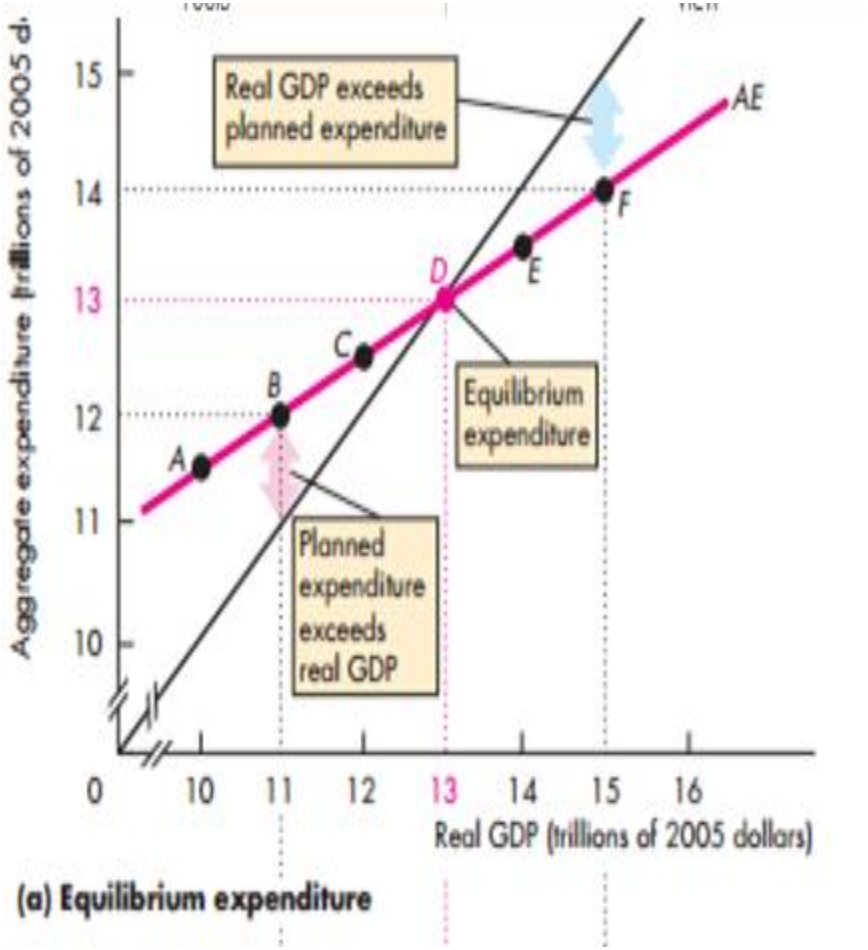


Circular flow of income in four sectors Economy/Open economy

FIGURE 5-2 Circular Flow of Income and Output



EQUILIBRIUM IN TWO SECTOR ECONOMY



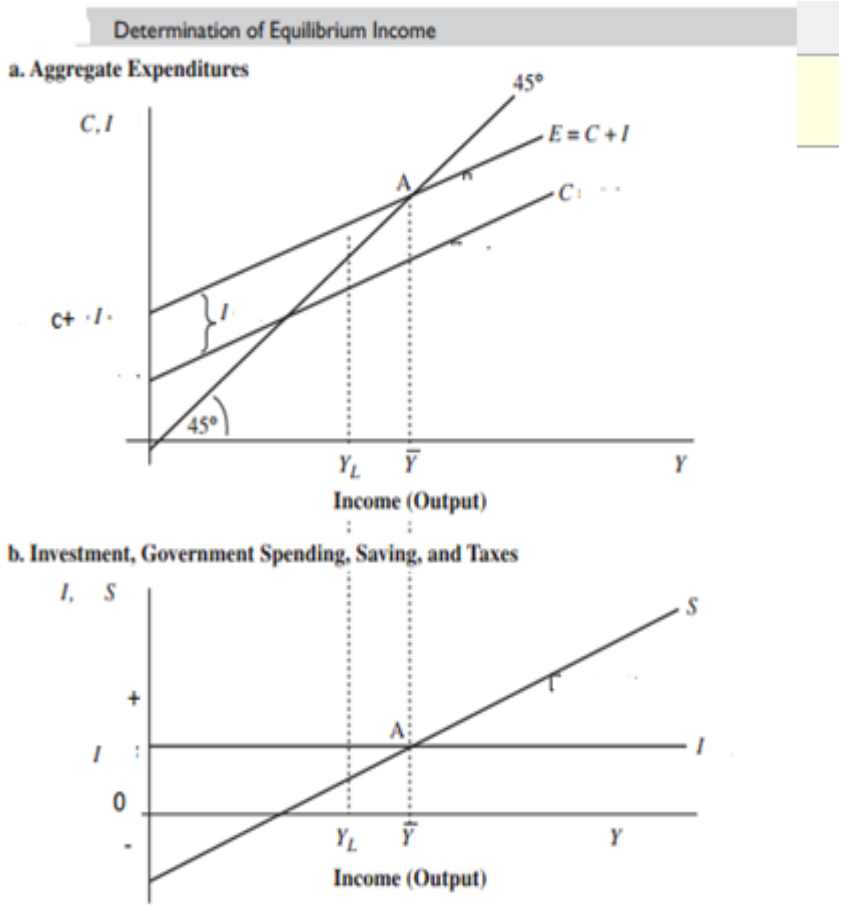
AGGREGATE DEMAND AND AGGREGATE SUPPLY APPROACH

$$Y = AD = C + I$$

$$Y = AS = C + S$$

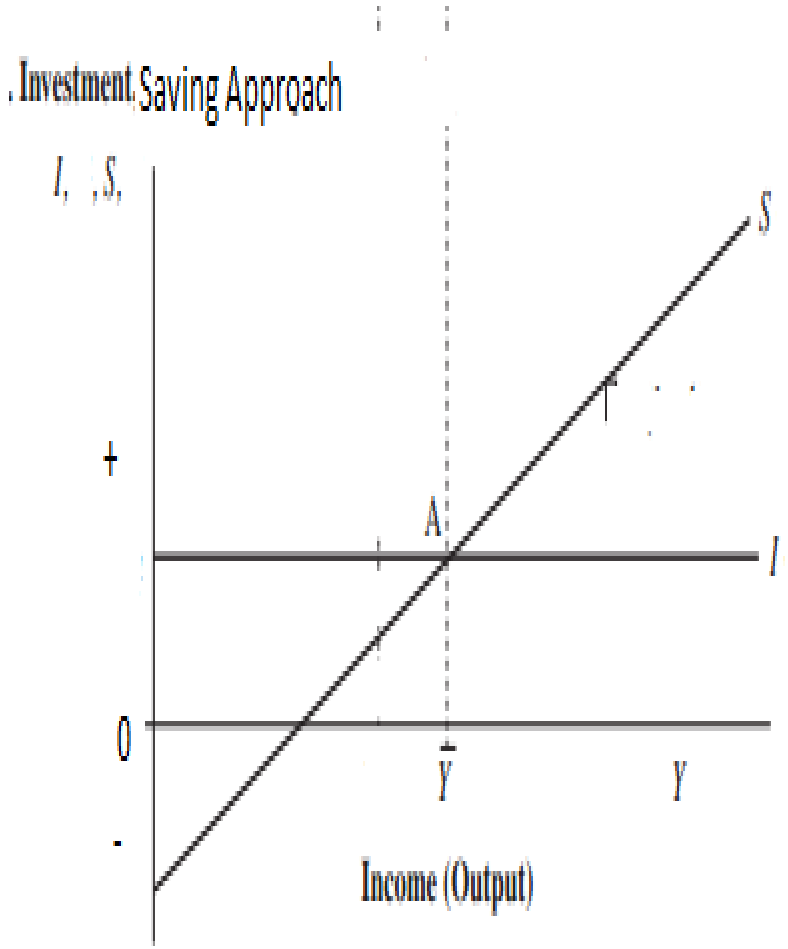
$$AD = AS$$

Equilibrium Expenditure in two sector economy



- Aggregate demand and aggregate supply approach
- Saving investment approach

EQUILIBRIUM IN TWO SECTOR ECONOMY



- LEAKAGE & Injection approach OR SAVING INVESTMENT APPROACH

$$Y = AD = C + I$$

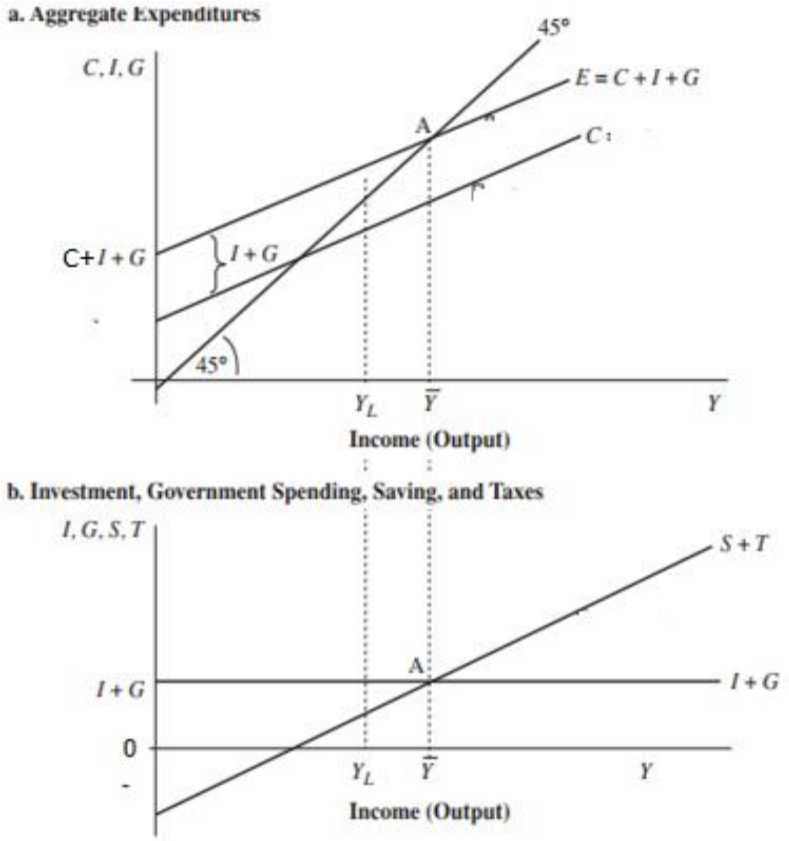
$$Y = AS = C + S$$

$$AD = AS$$

$$C + I = C + S$$

$$I = S$$

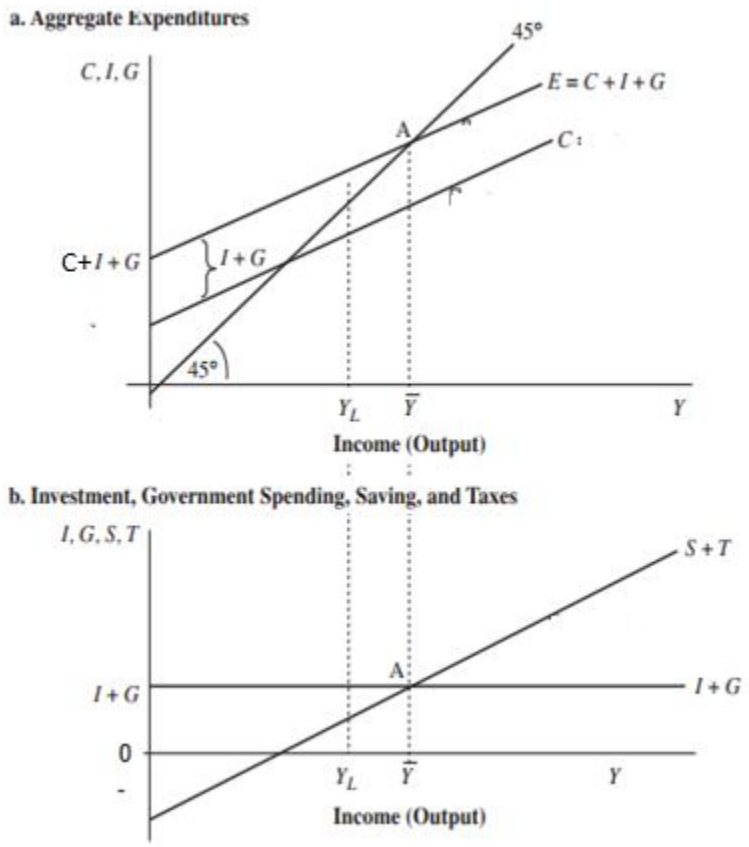
EQUILIBRIUM IN THREE SECTOR ECONOMY



- AGGREGATE DEMAND AND AGGREGATE SUPPLY APPROACH,

- INJECTION & LEAKAGE APPROACH

EQUILIBRIUM IN THREE SECTOR ECONOMY



- Leakages & Injections approach

$$Y = AD = C + I + G$$

$$Y = AS = C + S + T$$

$$AD = AS$$

$$C + I + G = C + S + T$$

$$I + G = S + T$$

EQUILIBRIUM IN FOUR SECTOR ECONOMY

Consumption as a Function of Real GDP

Consumption expenditure changes when disposable income changes and disposable income changes when real GDP changes. So consumption expenditure depends not only on disposable income but also on real GDP. We use this link between consumption expenditure and real GDP to determine equilibrium expenditure. But before we do so, we need to look at one further component of aggregate expenditure: imports. Like consumption expenditure, imports are influenced by real GDP.

Continue…

Import Function

Of the many influences on U.S. imports in the short run, U.S. real GDP is the main influence. Other things remaining the same, an increase in U.S. real GDP increases the quantity of U.S. imports.

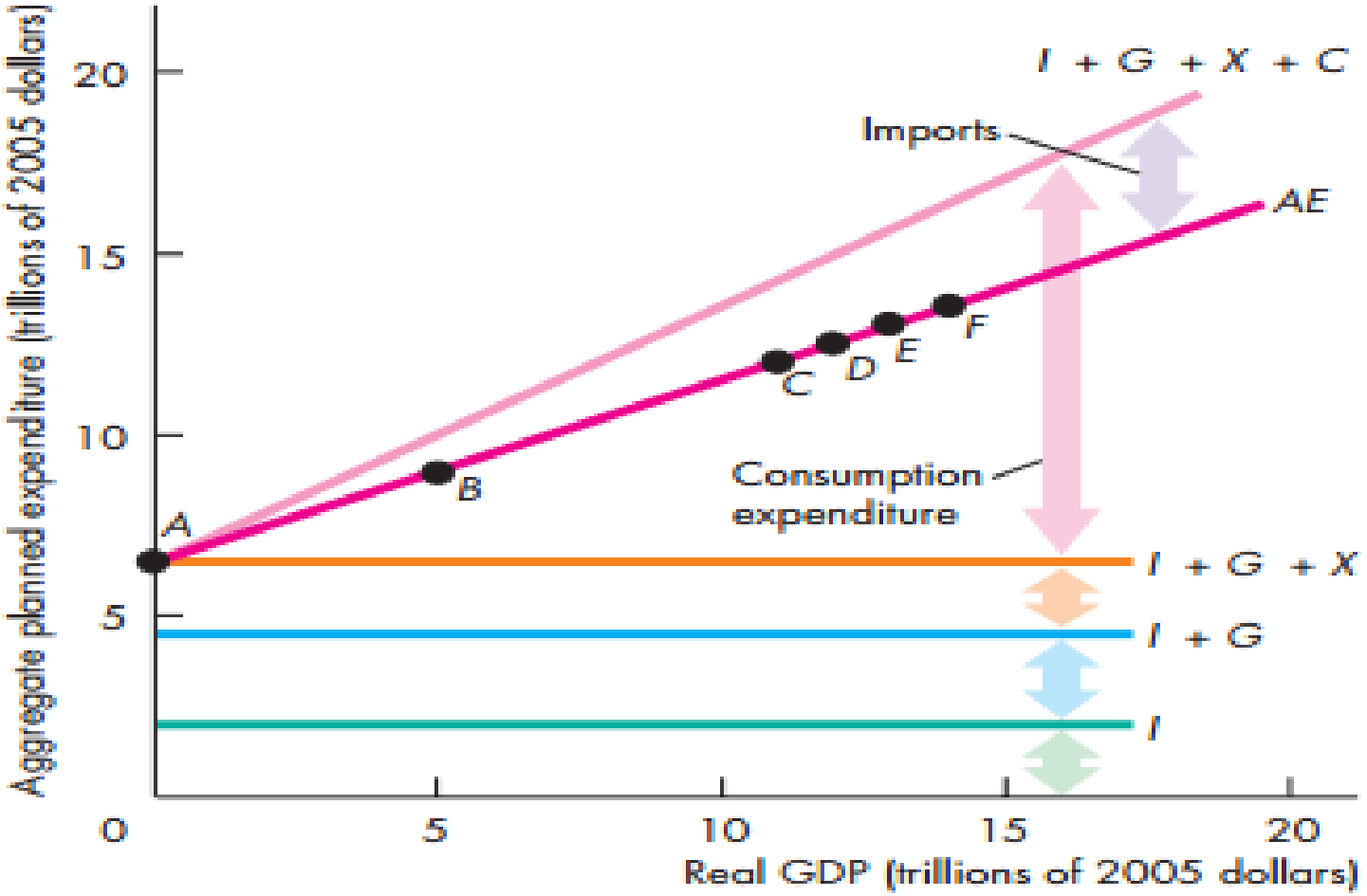
The relationship between imports and real GDP is determined by the **marginal propensity to import**, which is the fraction of an increase in real GDP that is spent on imports. It is calculated as the change in imports divided by the change in real GDP, other things remaining the same. For example, if an increase in real GDP of $1 trillion increases imports by $0.25 trillion, the marginal propensity to import is 0.25.

Continue…

Real GDP (trillions of 2005 dollars)

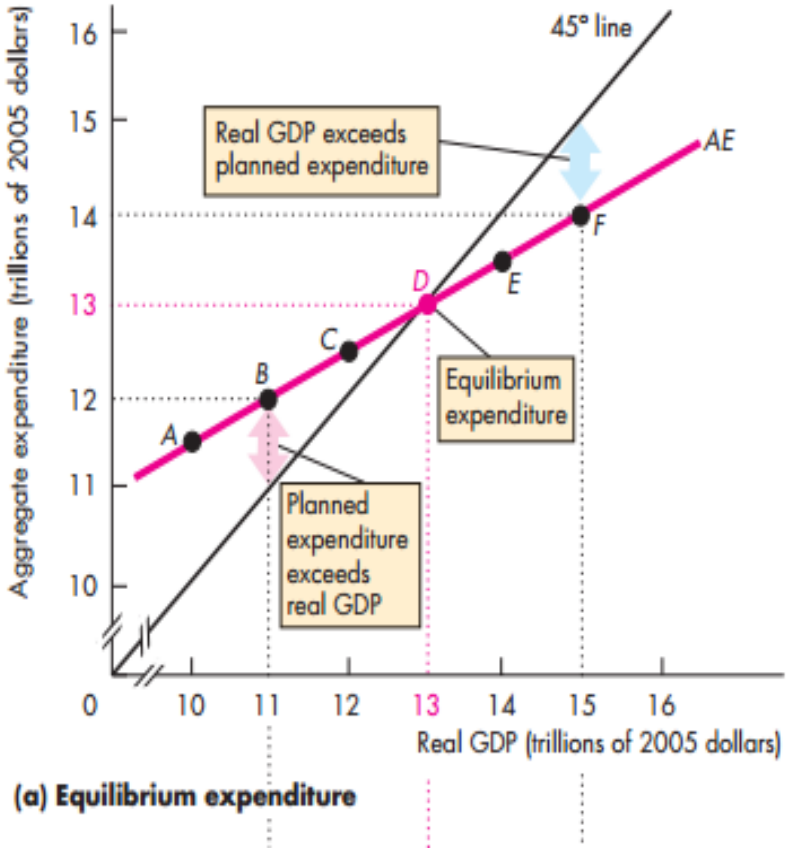
	Real GDP (Y)	Planned expenditure: Consumption expenditure (C)	Investment (I)	Government expenditure (G)	Exports (X)	Imports (M)	Aggregate planned expenditure (AE = C + I + G + X − M)
	(trillions of 2005 dollars)						
A	0	0	2.0	2.5	2.0	0.0	6.5
B	5	3.5	2.0	2.5	2.0	1.0	9.0
C	11	7.7	2.0	2.5	2.0	2.2	12.0
D	12	8.4	2.0	2.5	2.0	2.4	12.5
E	13	9.1	2.0	2.5	2.0	2.6	13.0
F	14	9.8	2.0	2.5	2.0	2.8	13.5

Continue…


Aggregate planned expenditure (trillions of 2005 dollars)
20
15
10
5
0
5
10
15
20
Real GDP (trillions of 2005 dollars)
I + G + X + C
Imports
AE
A
B
C
D
E
F
Consumption expenditure
I + G + X
I + G
I

Equilibrium Expenditure

FIGURE 11.4 Equilibrium Expenditure



(a) Equilibrium expenditure

	Real GDP (*Y*)	Aggregate planned expenditure (*AE*)	Unplanned inventory change (*Y* – *AE*)
	(trillions of 2005 dollars)		
A	10	11.5	–1.5
B	11	12.0	–1.0
C	12	12.5	–0.5
D	**13**	**13.0**	**0**
E	14	13.5	0.5
F	15	14.0	1.0

DETERMINATION OF NATIONAL INCOME

- TWO SECTOR ECONOMY

$$Y = C + I \quad WHERE \quad C = C_0 + cY \quad I = I_0$$

$$Y = C_0 + cY + I_0$$

$$Y - cY = C_0 + I_0$$

$$(1-c)Y = C_0 + I_0$$

$$Y = \frac{1}{(1-c)}(C_0 + I_0)$$

DETERMINATION OF NATIONAL INCOME

- TWO SECTOR ECONOMY
- Saving investment approach

$$S = I$$

$$Y - C = I_0$$

$$Y - (C_0 + cY) = I_0$$

$$Y - C_0 - cY = I_0$$

$$Y - cY = C_0 + I_0$$

$$(1 - c)Y = C_0 + I_0$$

$$Y = \frac{1}{(1-c)}(C_0 + I_0)$$

DETERMINATION OF NATIONAL INCOME

- THREE SECTOR

$$Y = C + I + G \;\; WHERE \;\; C = C_0 + cY_d \quad I = I_0, G = G_0, Y_d = Y - T, T = T_0$$

$$Y = C_0 + cY_d + I_0 + G_0$$

$$Y = C_0 + c(Y - T) + I_0 + G_0$$

$$Y = C_0 + c(Y - T_0) + I_0 + G_0$$

$$Y = C_0 + cY - cT_0 + I_0 + G_0$$

$$Y - cY = C_0 - cT_0 + I_0 + G_0$$

$$(1 - c)Y =_0 - cT_0 + I_0 + G_0$$

$$Y = \frac{1}{1 - c}(C_0 - cT_0 + I_0 + G_0)$$

DETERMINATION OF NATIONAL INCOME

- THREE SECTOR
- Saving investment equality approach

$$S + T = I + G \qquad where \quad S = Y_d - C, Y_d = Y - T, T = T_0, C = C_0 + cY_d$$

$$Y_d - C + T_0 = I_0 + G_0$$

$$(Y - T) - (C_0 + cY_d) + T_0 = I_0 + G_0$$

$$Y - T_0 - C_0 - c(Y - T) + T_0 = I_0 + G_0$$

$$Y - T_0 - C_0 - cY + cT_0 + T_0 = I_0 + G_0$$

$$Y - cY = C_0 - cT_0 + I_0 + G_0$$

$$(1 - c)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y = \frac{1}{(1 - c)}(C_0 - cT_0 + I_0 + G_0$$

- $\Delta y/\Delta t = -c/1-c$
- $\Delta y/\Delta t = -.75/1-.75$
- $= -3$

- $K=\Delta y/\Delta I=1/1-C=4$ WHEN $C=0.75$
- $\Delta y/\Delta I=1/1-C=5$ WHEN $C=0.80$

DETERMINATION OF NATIONAL INCOME

$$S + T = I + G \qquad where \quad S = Y_d - C, Y_d = Y - T, T = T_0, C = C_0 + cY_d$$

$$Y_d - C + T_0 = I_0 + G_0$$

$$(Y - T) - (C_0 + cY_d) + T_0 = I_0 + G_0$$

$$Y - T_0 - C_0 - c(Y - T) + T_0 = I_0 + G_0$$

$$Y - \cancel{T_0} - C_0 - cY + cT_0 + \cancel{T_0} = I_0 + G_0$$

$$Y - cY = C_0 - cT_0 + I_0 + G_0$$

$$(1 - c)Y = C_0 - cT_0 + I_0 + G_0$$

$$Y = \frac{1}{(1-c)}(C_0 - cT_0 + I_0 + G_0$$

NUMERICAL EXAMPLE

- Suppose the consumption function is $C = 50 + 0.60Y$
- Investment $I = 80$
- Then find
- (1)The equilibrium level of income (Y)
- (2)Equilibrium level of consumption (C)
- (3)Equilibrium level of saving (S)
- (4)Show that at the equilibrium aggregate demand equals aggregate supply and saving s equal to investment

CONTINUE…

- Example

$$Y = C + I \quad WHERE \quad C = 50 + 0.60Y \quad I = 80$$

$$Y = 50 + 0.60Y + 80$$

$$Y - 0.6Y = 50 + 80$$

$$(1 - 0.60)Y = 50 + 80$$

$$0.4Y = 130$$

$$Y = \frac{1}{0.4}(130)$$

$$Y = 325$$

- CONSUMPTION

$$C = 50 + 0.60 \times Y$$
$$C = 50 + 0.60 \times 325$$
$$C = 245$$

- SAVING $S=Y-C=325-245=80$
- AGGREGATE DEMAND =AGGREGATE SUPPLY
- $Y = C + I$ = $Y = C + S$

$$Y = 245 + 80$$
$$Y = 325$$

$$Y = 245 + 80$$
$$Y = 325$$

- SAVING INVESTMENT EQUALITY
- S=I
- 80=80

THREE SECTOR ECONOMY

- IN AN ECONOMY, Given

$$C = 50 + 0.80Y_d,$$
$$G = 50\ Crore,$$
$$T = 20\,Crore$$
$$I = 100\,Crore$$

- Find
- Equilibrium Y
- Equilibrium C & S
- Depicts injection leakage equality at the equilibrium

THREE SECTOR ECONOMY

- THREE SECTOR

$$Y = C + I + G$$

$$Y = 50 + 0.8Y_d + 100 + 50$$
$$Y = 50 + 0.8(Y - T) + 100 + 50$$
$$Y = 50 + 0.8(Y - 20) + 100 + 50$$
$$Y = 50 + 0.8Y - 16 + 100 + 50$$
$$Y - 0.8Y = 50 - 16 + 100 + 50$$
$$(1 - 0.8)Y = 50 - 16 + 100 + 50$$
$$0.2Y = 200 - 16$$
$$0.2Y = 184$$
$$Y = \frac{1}{0.2}(184)$$
$$Y = 920$$

THREE SECTOR ECONOMY

- CONSUMPTION

$$C = 50 + 0.8Y_d$$
$$C = 50 + 0.8(Y - T)$$
$$C = 50 + 0.8(920) - 16$$
$$C = 50 + 736 - 16$$
$$C = 770$$

- SAVINGS

S=Y-C-T

S=920-770-20

S=130

SAVING INVESTMENT EQUALITY

- AGGREGATE DEMAND=AGGREGATE SUPPLY
- $Y = C + I + G$
  $Y = 770 + 100 + 50$
  $Y = 920$

  =

  Y=C+S+T
  Y=770+130+20
  Y=920
- Leakage and injection approach

$$I + G = S + T$$

$$100 + 50 = 130 + 20$$

$$150 = 150$$

MULTIPLIER

- **Autonomous Investment multiplier-**gives the change in equilibrium output per unit change in autonomous investment (e.g. I_0).
- **Autonomous Expenditure multiplier-**gives the change in equilibrium output per unit change in autonomous expenditure (e.g. G_0).
-

CONTINUE…

- The first term, 1 /(1 - *b*), is called the **autonomous INVESTMENT/expenditure multiplier** .
- Note that *b* is the fraction of any increment to disposable income that goes to consumption—the marginal propensity to consume (MPC).
- The term 1 /(1 - *b*) or 1/(1 - MPC) is then 1 divided by a fraction and, hence, some number greater than 1

CONTINUE…

- Multiplier

$$_c = 0.5: \quad \frac{1}{1 - _c} = \frac{1}{1 - 0.5} = \frac{1}{0.5} = 2$$

$$_c = 0.8: \quad \frac{1}{1 - _c} = \frac{1}{1 - 0.8} = \frac{1}{0.2} = 5$$

$$_c = 0.9: \quad \frac{1}{1 - _c} = \frac{1}{1 - 0.9} = \frac{1}{0.1} = 10$$

MULTIPLIER IN TWO SECTOR ECONOMY

- Derivation of multiplier

- SUBTRACTING 1 FROM 2

$$Y = \frac{1}{(1-c)}(C_0 + I_0) \quad (1)$$

$$Y + \Delta Y = \frac{1}{(1-c)}(C_0 + I_0 + \Delta I_0) \quad (2)$$

$$Y + \Delta Y = \frac{1}{(1-c)}(C_0 + I_0 + \Delta I_0) \quad (2)$$

$$-$$

$$Y = \frac{1}{(1-c)}(C_0 + I_0) \qquad (1)$$

$$\Delta Y = \frac{1}{(1-c)}(\Delta I_0)$$

$$\frac{\Delta Y}{\Delta I_0} = \frac{1}{(1-c)}$$

$$k = \frac{\Delta Y}{\Delta I_0}$$

$$k = \frac{1}{(1-c)}$$

multipliere effect

$$\Delta Y = \frac{1}{(1-c)}\Delta I_0$$

multiplier

- $\Delta y/\Delta I = K = 1/1\text{-}c$ mpc=.75, mpc=.80, mpc=.65
- $\Delta y/\Delta I = K = 4$
- $\Delta y/\Delta I = K = 5$
- $\Delta y/\Delta I = K = 2.85$

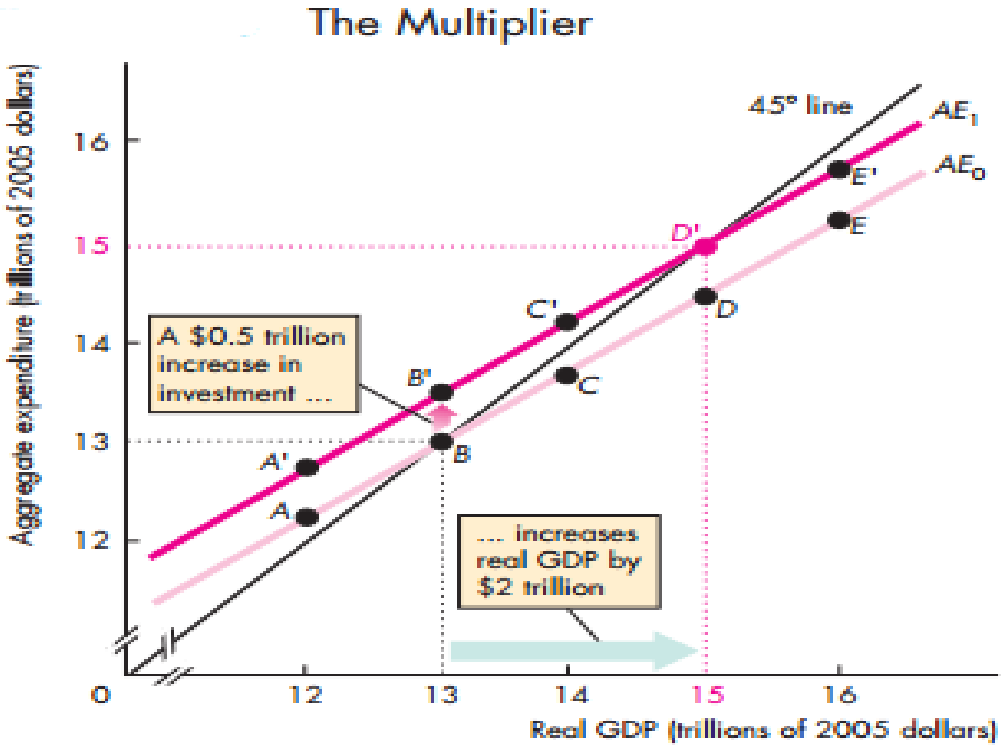
CONTINUE…

- TABLE

Real GDP (Y)	Aggregate planned expenditure: Original (AE_0)		New (AE_1)	
(trillions of 2005 dollars)				
12	*A*	12.25	*A'*	12.75
13	***B***	**13.00**	*B'*	13.50
14	*C*	13.75	*C'*	14.25
15	*D*	14.50	***D'***	**15.00**
16	*E*	15.25	*E'*	15.75

CONTINUE…

- MULTIPLIER



Tax multiplier

- Tax multiplier
- Subtracting 1 from3
- we get

$$Y = \frac{1}{1-c}(C_0 - cT_0 + I_0 + G_0) \quad (1)$$

$$Y + \Delta Y = \frac{1}{1-c}(C_0 - c(T_0 + \Delta T_0) + I_0 + G_0) \quad (2)$$

$$Y + \Delta Y = \frac{1}{1-c}(C_0 - cT_0 - c\Delta T_0) + I_0 + G_0) \quad (3)$$

$$Y + \Delta Y = \frac{1}{1-c}(C_0 - cT_0 - c\Delta T_0) + I_0 + G_0)$$

$$-$$

$$Y = \frac{1}{1-c}(C_0 - cT_0 + I_0 + G_0)$$

$$\Delta Y = \frac{1}{1-c}(-c\Delta T_0)$$

$$\frac{\Delta Y}{\Delta T_0} = \frac{1}{1-c}(-c)$$

$$\frac{\Delta Y}{\Delta T_0} = \frac{-c}{1-c}$$

- Suppose the consumption function is C=50+0.8 Yd and investment, I=100 crores, G=90 crores, where the tax function is T=0.10Y.
- Find the followings:
- EQUILINRIUM Y
- REVENUE FROM TAX equilibrium Y
- Suppose Investment increases to I=120 crores find EQUI. New Y & revenue from new Y

MATHEMATICAL EXAMPLE

- MATHI

$$Y = C + I + G \;\; WHERE \;\; C = 50 + 0.8Y_d \quad I = 100, G_0 = 90, Y_d = Y - T, T_0 = 0.1Y$$

$$Y = 50 + 0.8Y_d + 100 + 90$$
$$Y = 50 + 0.8(Y - O.1Y) + 100 + 90$$
$$Y = 50 + 0.8Y - 0.08Y + 100 + 90$$
$$Y - 0.8Y + 0.08Y = 50 + 100 + 90$$
$$(1 - 0.8 + 0.08)Y = 50 + 100 + 90$$
$$(0.28)Y = (50 + 100 + 90)$$
$$Y = \frac{1}{(0.28)}(240)$$
$$Y = 857$$

- TAX REVENUE

$$T_0 = 0.1(857) = 85.7$$

- NEW Y

$$Y = C + I + G \;\; WHERE \;\; C = 50 + 0.8Y_d \quad I = 120, G_0 = 90, Y_d = Y - T, T_0 = 0.1Y$$

$$Y = 50 + 0.8Y_d + 120 + 90$$
$$Y = 50 + 0.8(Y - O.1Y) + 120 + 90$$
$$Y = 50 + 0.8Y - 0.08Y + 120 + 90$$
$$Y - 0.8Y + 0.08Y = 50 + 120 + 90$$
$$(1 - 0.8 + 0.08)Y = 50 + 120 + 90$$
$$(0.28)Y = (50 + 120 + 90)$$
$$Y = \frac{1}{(0.28)}(260)$$
$$Y = 928.6$$

- TAX REVENUE

$$T = 0.1(928.6) = 92.86$$

EQUILIBRIUM NATIONAL INCOME IN FOUR SECTOR ECONOMY

- Equilibrium Y

$$Y = C + I + G + X_n \quad WHERE \quad C = C_0 + cY_d \quad I = I_0, G = G_0, Y_d = Y - T, T = T_0$$

$$X_n = X - M \qquad X = X_0, M = M_0 + mY$$

$$Y = C_0 + cY_d + I_0 + G_0 + X_0 - (M_0 + mY)$$

$$Y = C_0 + c(Y - T) + I_0 + G_0 + X_0 - M_0 - mY$$

$$Y = C_0 + c(Y - T_0) + I_0 + G_0 + X_0 - M_0 - mY$$

$$Y = C_0 + cY - cT_0 + I_0 + G_0 + X_0 - M_0 - mY$$

$$Y - cY + mY = C_0 - cT_0 + I_0 + G_0 + X_0 - M_0$$

$$(1 - c + m)Y = C_0 - cT_0 + I_0 + G_0 + X_0 - M_0$$

$$Y = \frac{1}{(1 - c + m)} C_0 - cT_0 + I_0 + G_0 + X_0 - M_0$$

Mathematical example

- The equation in an economy are given below
- C=200+0.8Yd, I_0=70, T_0=60, G_0=70, X_0=20
- M=10+0.1Y, Find
- (1) Equilibrium Y
- (2)Value of Foreign Trade Multiplier
- (3)Equilibrium level of imports

- EQUI

$$Y = C + I + G + X_n \quad WHERE \quad C = 200 + 0.8Y_d \quad I = 70, G_0 = 70, Y_d = Y - T, T_0 = 60$$
$$X_0 = 20, M = 10 + 0.1Y$$
$$Y = 200 + 0.8Y_d + 70 + 70 + 20 - (10 + 0.1Y)$$
$$Y = 200 + 0.8(Y - 60) + 70 + 70 + 20 - 10 - 0.1Y$$
$$Y = 200 - 48 + 70 + 70 + 20 - 10$$
$$Y - 0.8Y + .1Y = 200 - 48 + 70 + 70 + 20 - 10$$
$$(1 - 0.8 + .1)Y = 200 - 48 + 70 + 70 + 20 - 10$$
$$Y = \frac{1}{(1 - 0.8 + .1)}(200 - 48 + 170 + 70 + 20 - 10)$$
$$Y = \frac{1}{.3}(302)$$
$$Y = 1006.67$$

- FOREIGN TRADE MULTIPLIER

$$\frac{\Delta Y}{\Delta X} = 3.33$$

- EQUILIBRIUM LEVEL OF IMPORTS

$$M = 10 + 0.1(1006.67) = 110.67$$

FOREIGN TRADE MULTIPLIER

- FOREIGN TRADE MULTIPLIER

$$Y = \frac{1}{(1-c+m)} C_0 - cT_0 + I_0 + G_0 + X_0 - M_0 \qquad (1)$$

$$Y + \Delta Y = \frac{1}{(1-c+m)} C_0 - cT_0 + I_0 + G_0 + X_0 + \Delta X_0 - M_0 \qquad (2)$$

$$Y + \Delta Y = \frac{1}{(1-c+m)} C_0 - cT_0 + I_0 + G_0 + X_0 + \Delta X_0 - M_0$$

$$-$$

$$Y = \frac{1}{(1-c+m)} C_0 - cT_0 + I_0 + G_0 + X_0 - M_0$$

$$\Delta Y = \frac{1}{(1-c+m)} \Delta X_0$$

$$\frac{\Delta Y}{\Delta X_0} = \frac{1}{(1-c+m)}$$