Chapter 10: Aggregate Demand I

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Plan

1. Look closely at the AD and the variables that shift it.
2. Explore the tools policymakers can use to affect the AD (monetary and fiscal policies).
3. Develop *IS–LM* model—determines the national income for a given price level.

The Goods Market and the *IS* Curve

IS curve shows the relationship between the real interest rate and the level of real income.

Start with the Keynesian cross.

We will distinguish between:

- Actual expenditure—the $ amount households, firms, and government spent on goods and services ($= GDP$).
- Planned expenditure—the $ amount households, firms, and the government would want to spend on goods and services.

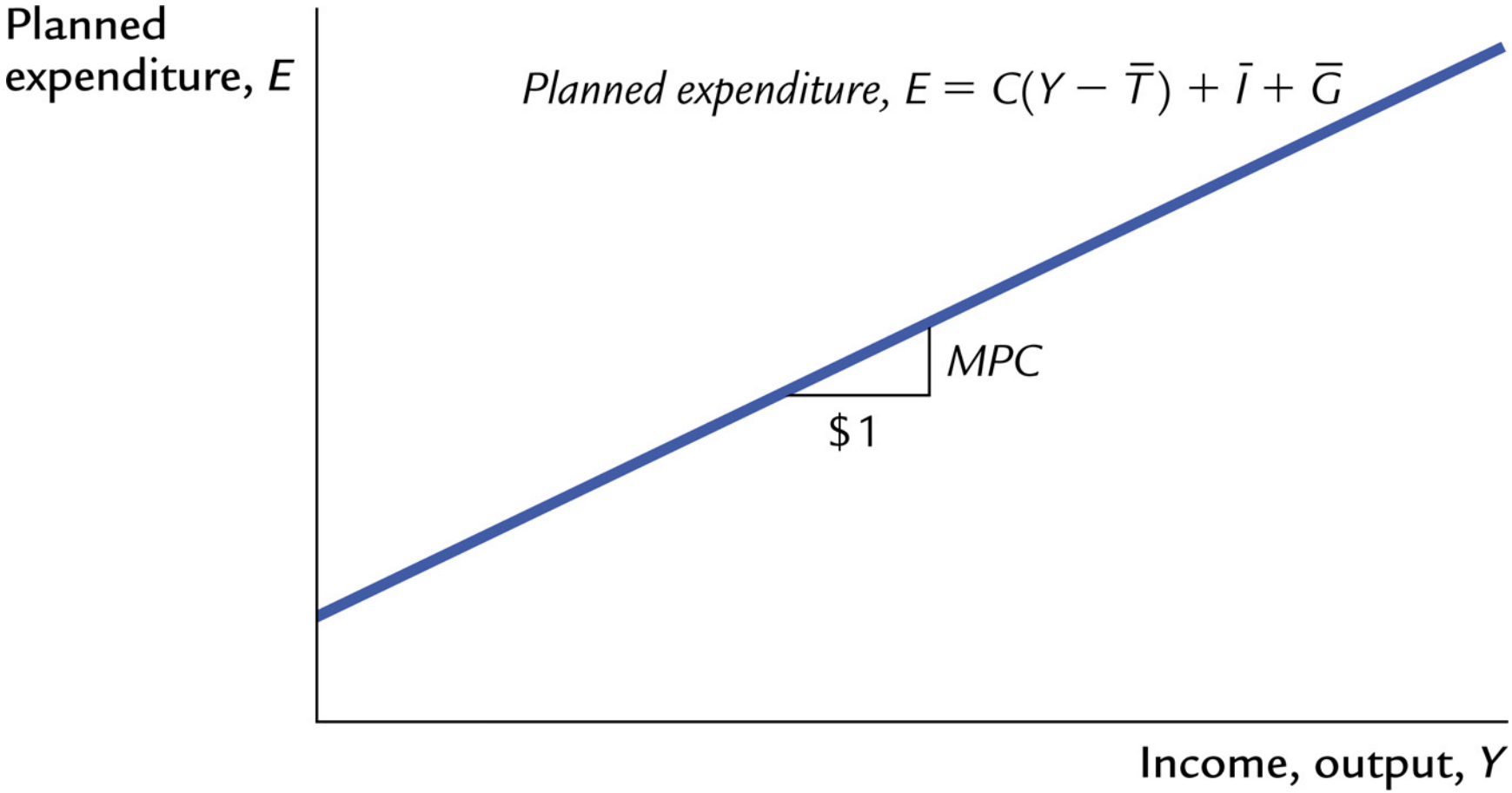
Actual expenditure can be different from planned expenditure if there are unplanned changes in inventories.

The Keynesian Cross

Let E be planned expenditure. Then,

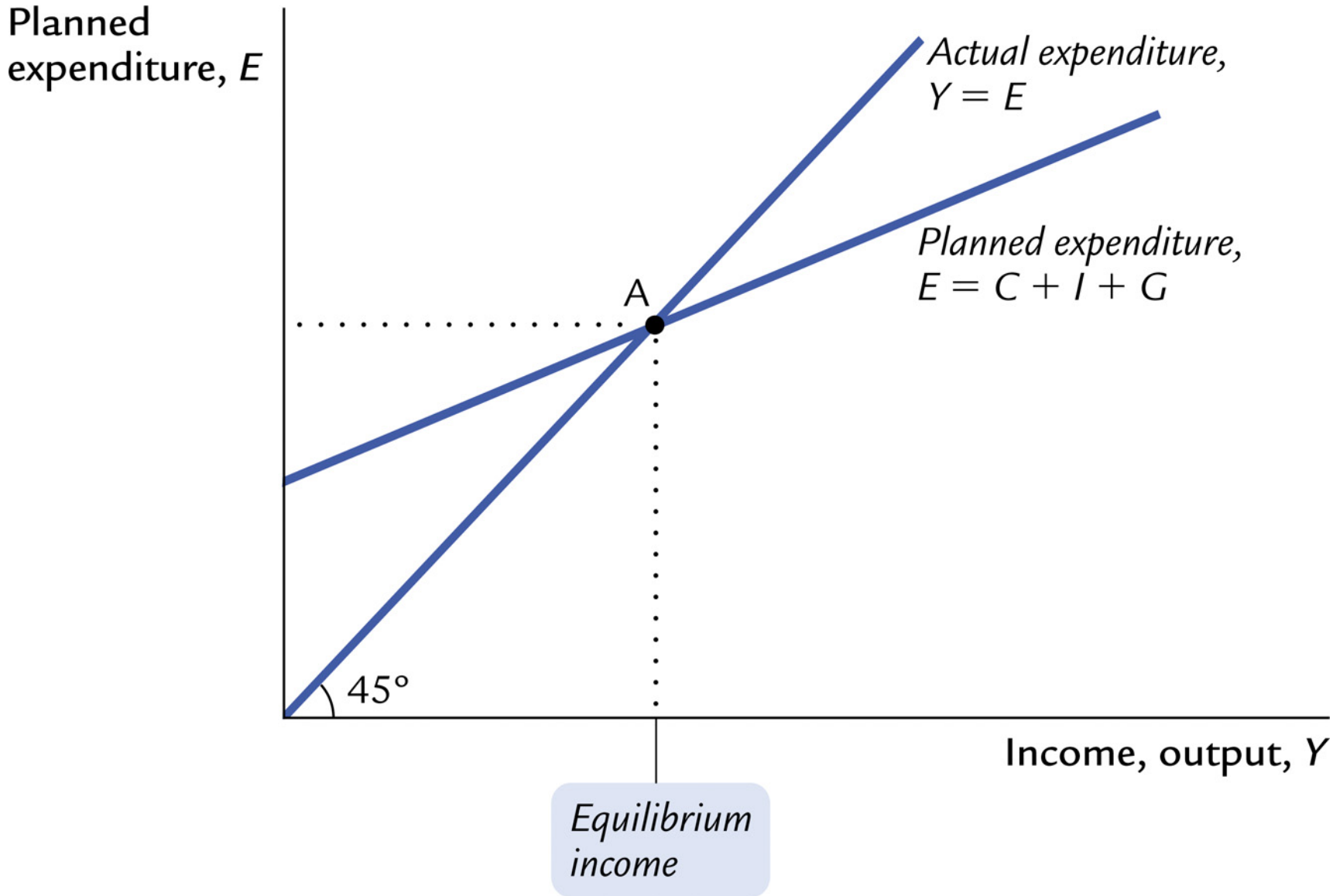
$$\begin{aligned} E &= C + I + G \\ &= C(Y - T) + I + G \\ &= C(Y - \overline{T}) + \overline{I} + \overline{G} \end{aligned}$$

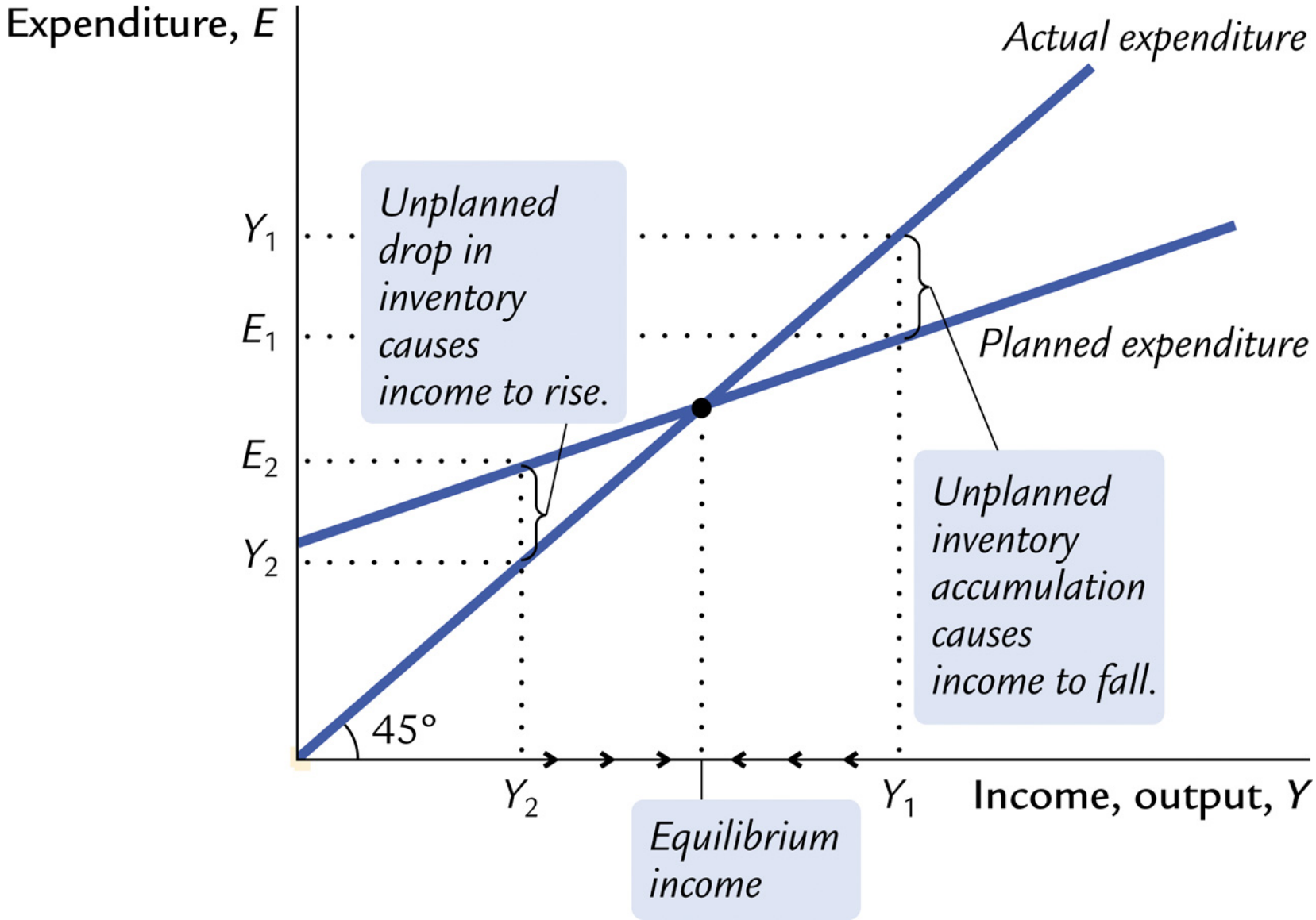
Planned expenditure, E, is a function of disposable real income. The slope of the function is the MPC—the change in planned expenditure due to a \$1 change in disposable income.


Planned expenditure, E
Planned expenditure, $E = C(Y - \bar{T}) + \bar{I} + \bar{G}$
MPC
$1
Income, output, Y

Equilibrium of Planned and Actual Expenditure

1. In equilibrium, actual expenditure, Y, is equal to planned expenditure, E.
2. All points on the 45 degree line qualify for an equilibrium. (I.e., all points on the curve $Y = E$.)
3. If Y is such that $Y > E$, actual production is higher than planned spending by households and the government, and so (unplanned) inventories$\uparrow \Rightarrow$Firms lay off workers and cut production$\Rightarrow$Lower real income and output Y.
4. If Y is such that $Y < E$, actual production is lower than planned spending by households and the government, and so inventories$\downarrow \Rightarrow$Firms hire workers and increase production$\Rightarrow$Higher real income and output Y.


Planned expenditure, E
Actual expenditure, Y = E
Planned expenditure, E = C + I + G
A
45°
Income, output, Y
Equilibrium income


Expenditure, E
Actual expenditure
Planned expenditure
Unplanned drop in inventory causes income to rise.
Unplanned inventory accumulation causes income to fall.
Y1
E1
E2
Y2
45°
Y2
Y1
Income, output, Y
Equilibrium income

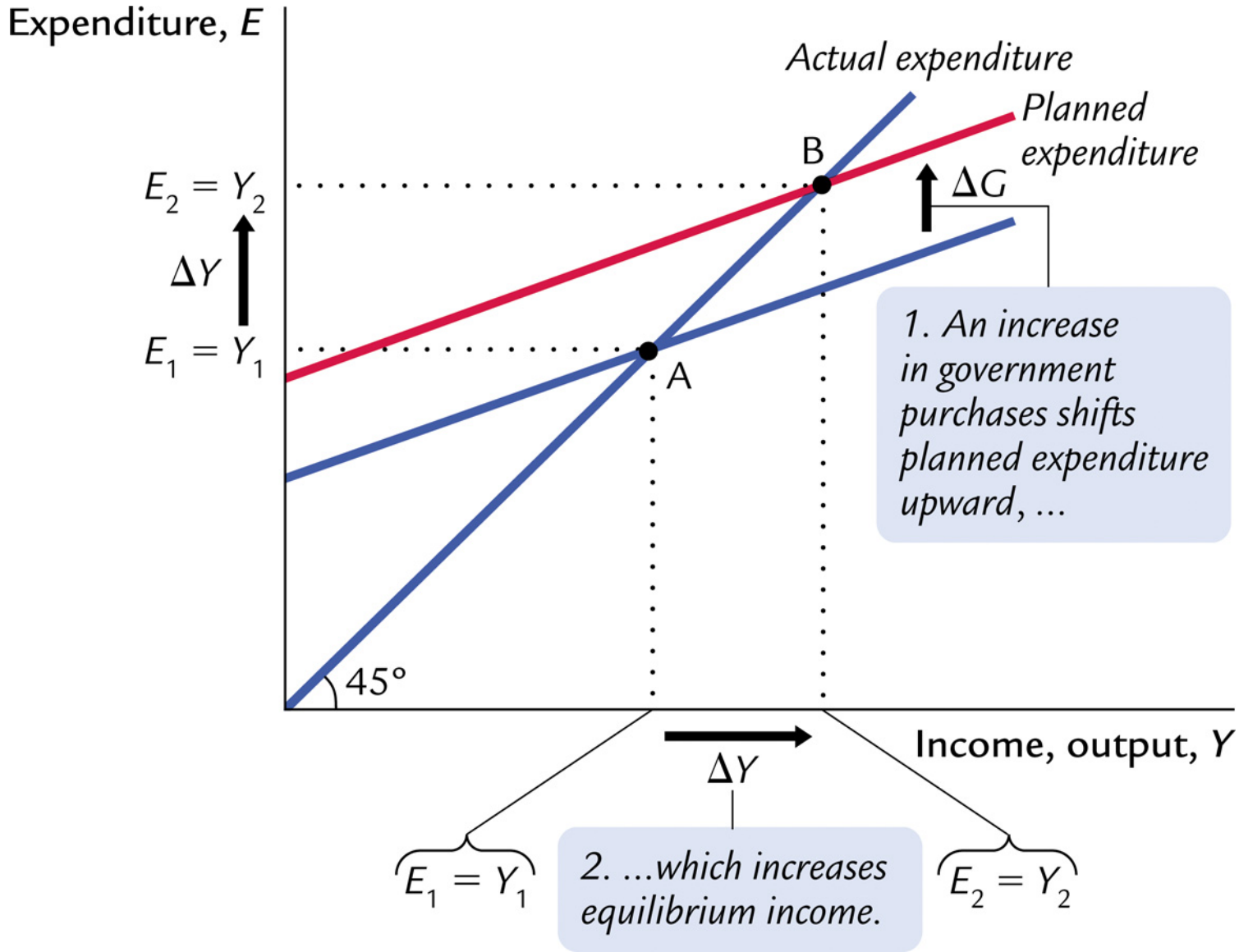
Fiscal Policy and the Multiplier: ΔG

$$Y = C(Y - T) + G + I = E.$$

When G changes, output changes by more than the change in G $(= \Delta G)$.

$$\begin{aligned}
\Delta Y &= \Delta G \\
&\quad + MPC \times \Delta G \\
&\quad + MPC^2 \times \Delta G \\
&\quad + MPC^3 \times \Delta G \\
&\quad + MPC^4 \times \Delta G \ldots \\
&= (1 + MPC + MPC^2 + MPC^3 + MPC^4 + \ldots) \times \Delta G \\
&= \frac{1}{1 - MPC} \times \Delta G.
\end{aligned}$$

Example: if $MPC = 0.5$, $\Delta Y = \frac{1}{1-0.5} \times \Delta G = 2 \times \Delta G$.
Calculus: $\Delta Y = MPC \times \Delta Y + \Delta G + \Delta I = MPC \times \Delta Y + \Delta G$. Thus, $(1 - MPC) \times \Delta Y = \Delta G$, and $\Delta Y = \frac{1}{1-MPC} \times \Delta G$.

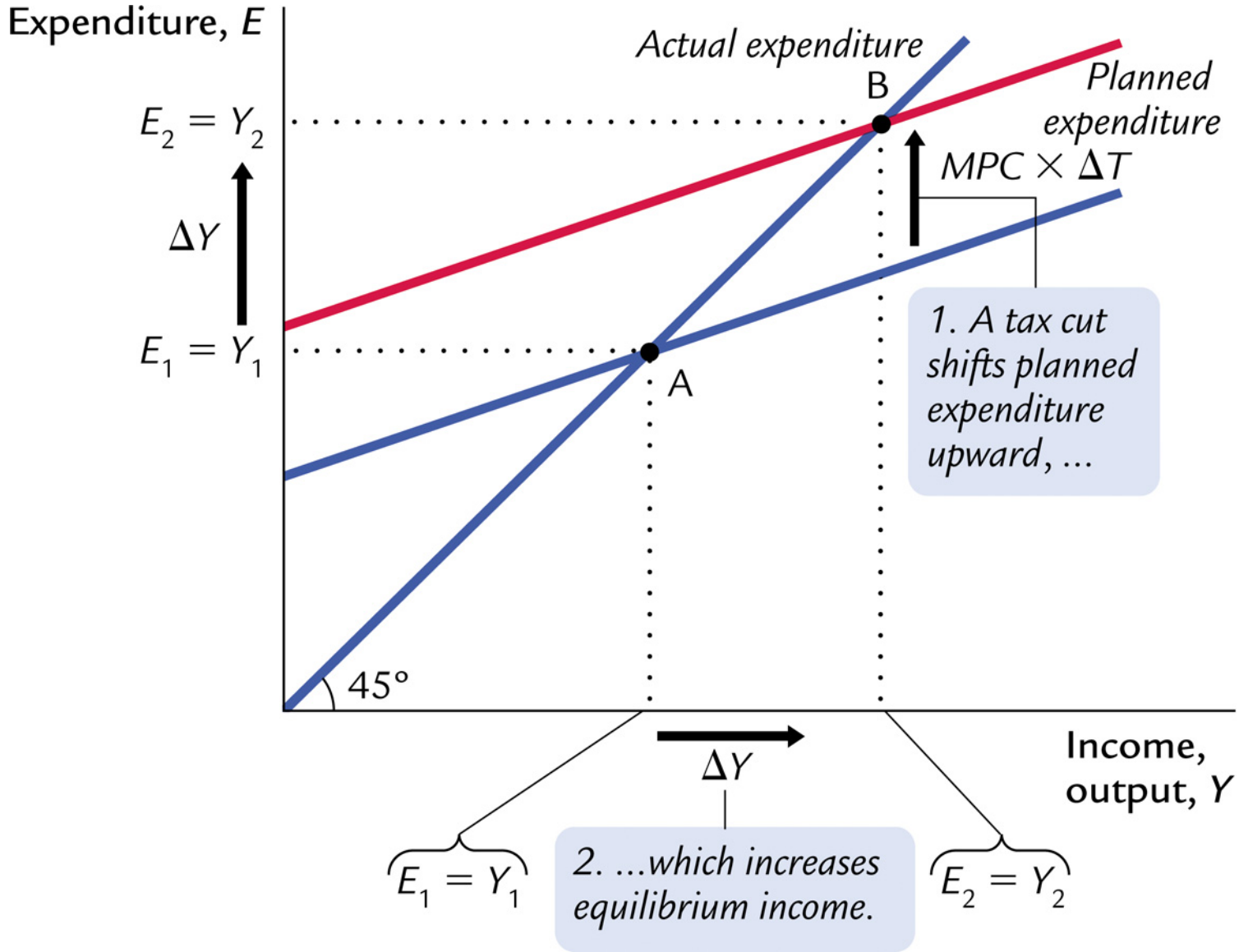

Expenditure, E
Actual expenditure
Planned expenditure
B
$E_2 = Y_2$
ΔG
ΔY
$E_1 = Y_1$
A
1. An increase in government purchases shifts planned expenditure upward, ...
45°
Income, output, Y
ΔY
$E_1 = Y_1$
2. ...which increases equilibrium income.
$E_2 = Y_2$

Fiscal Policy and the Multiplier: Changes in T

When T changes, and G, I don't change...

$$
\begin{aligned}
Y &= C(Y - T) + I + G \\
\Delta Y &= MPC \times \Delta Y - MPC \times \Delta T + \Delta I + \Delta G \\
(1 - MPC) \times \Delta Y &= -MPC \times \Delta T + 0 + 0 \\
\Delta Y &= -\frac{MPC}{1 - MPC} \times \Delta T.
\end{aligned}
$$

Example: if $MPC = 0.2$, $\Delta Y = -\frac{0.2}{1-0.2} \times \Delta T = -0.4 \times \Delta T$.


Expenditure, E
Actual expenditure
B
Planned expenditure
$E_2 = Y_2$
MPC × ΔT
ΔY
$E_1 = Y_1$
A
1. A tax cut shifts planned expenditure upward, ...
45°
ΔY
Income, output, Y
$E_1 = Y_1$
2. ...which increases equilibrium income.
$E_2 = Y_2$

IS Curve

Need to do better than the Keynesian cross by relaxing the assumption that planned I is fixed.

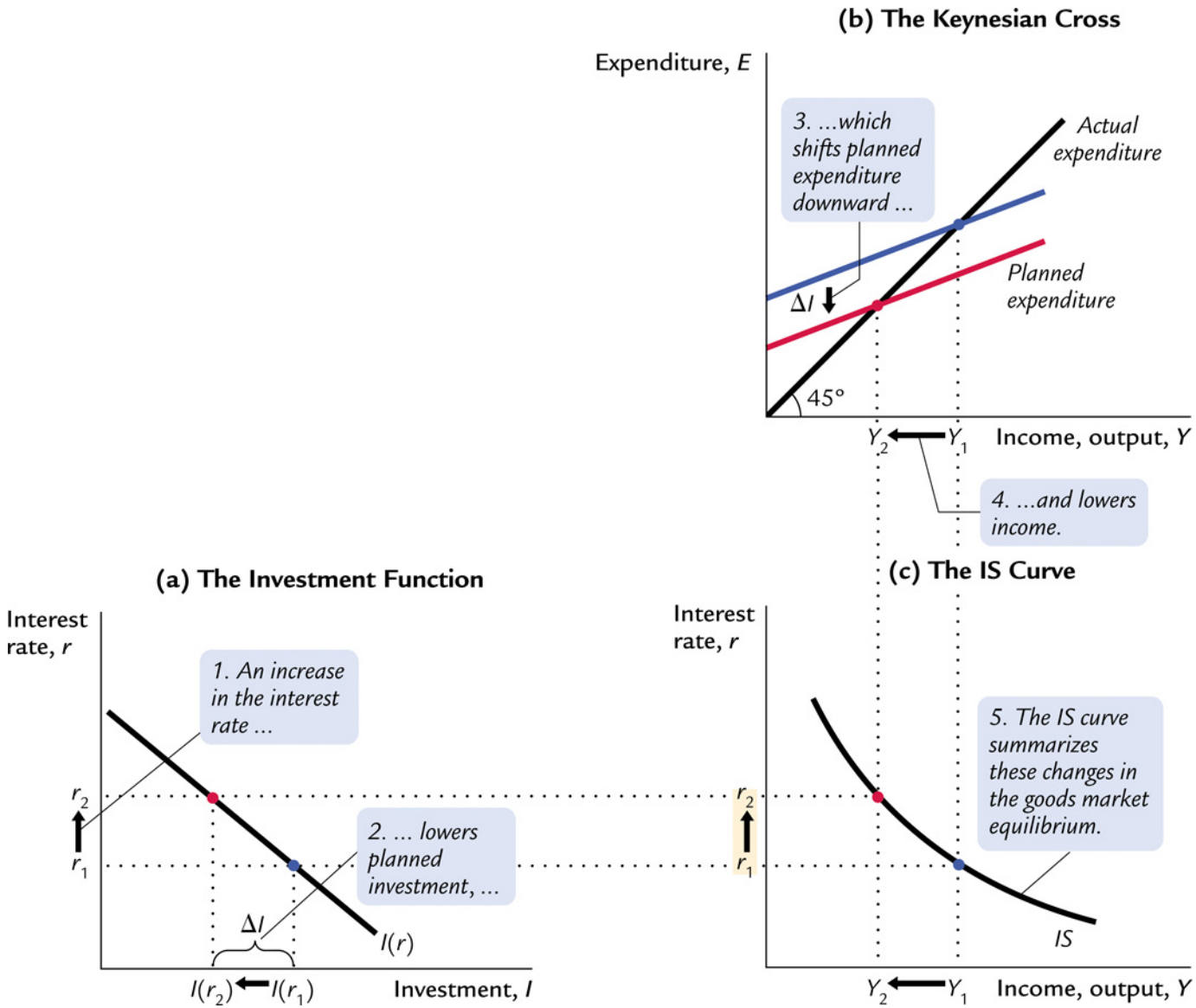
$$I = I(r).$$

Combine the investment function and the Keynesian cross—obtain the *IS* curve.

- $r\uparrow \Longrightarrow I\downarrow \Longrightarrow E$ shifts down$\Longrightarrow Y\downarrow$.

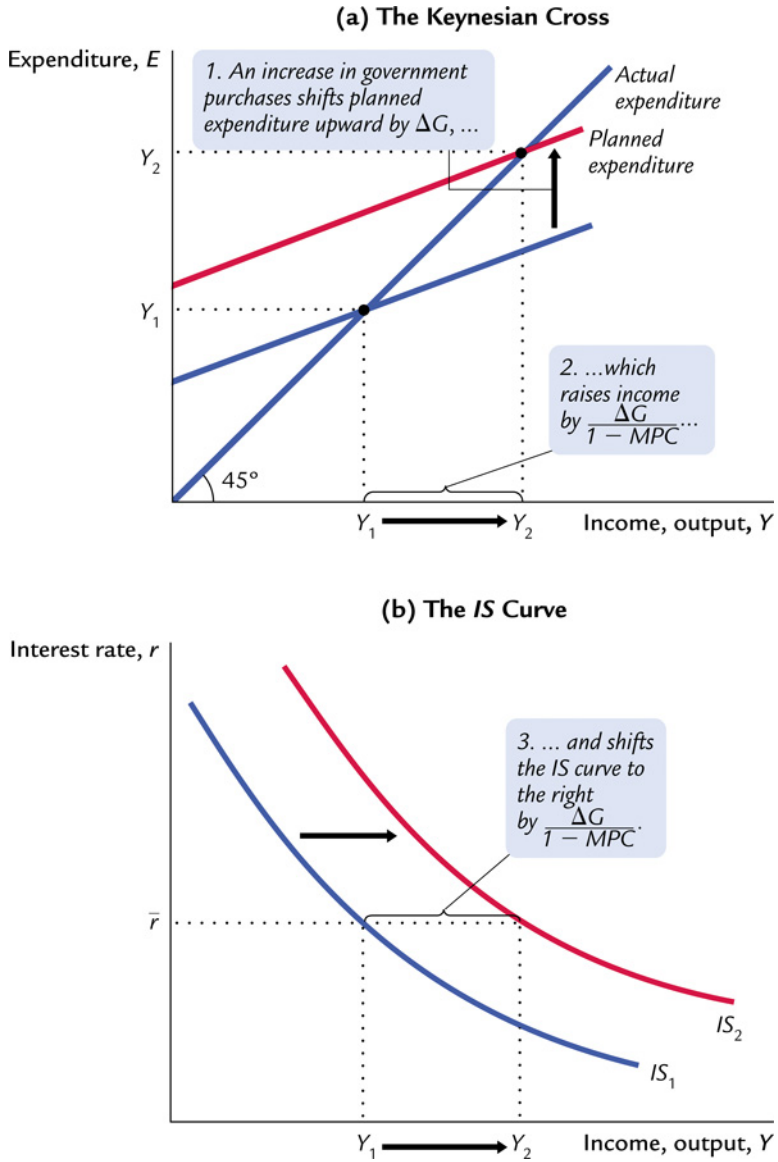
- IS curve shows combinations of Y and r that prevail in the economy, and thus higher r is associated with lower Y.

- IS curve shows, for any given r, the level of Y that brings the goods market into the equilibrium.


(b) The Keynesian Cross
Expenditure, E
3. ...which shifts planned expenditure downward ...
Actual expenditure
Planned expenditure
ΔI
45°
Y2
Y1
Income, output, Y
4. ...and lowers income.
(a) The Investment Function
Interest rate, r
1. An increase in the interest rate ...
r2
r1
2. ... lowers planned investment, ...
ΔI
I(r)
I(r2)
I(r1)
Investment, I
(c) The IS Curve
Interest rate, r
5. The IS curve summarizes these changes in the goods market equilibrium.
IS
Income, output, Y

- IS is drawn for given levels of G, and T. Thus, changes in G or T lead to shifts in the IS curve.

- E.g., for a given interest rate, if G changes by ΔG Y changes by $\frac{1}{1-MPC} \times \Delta G$.

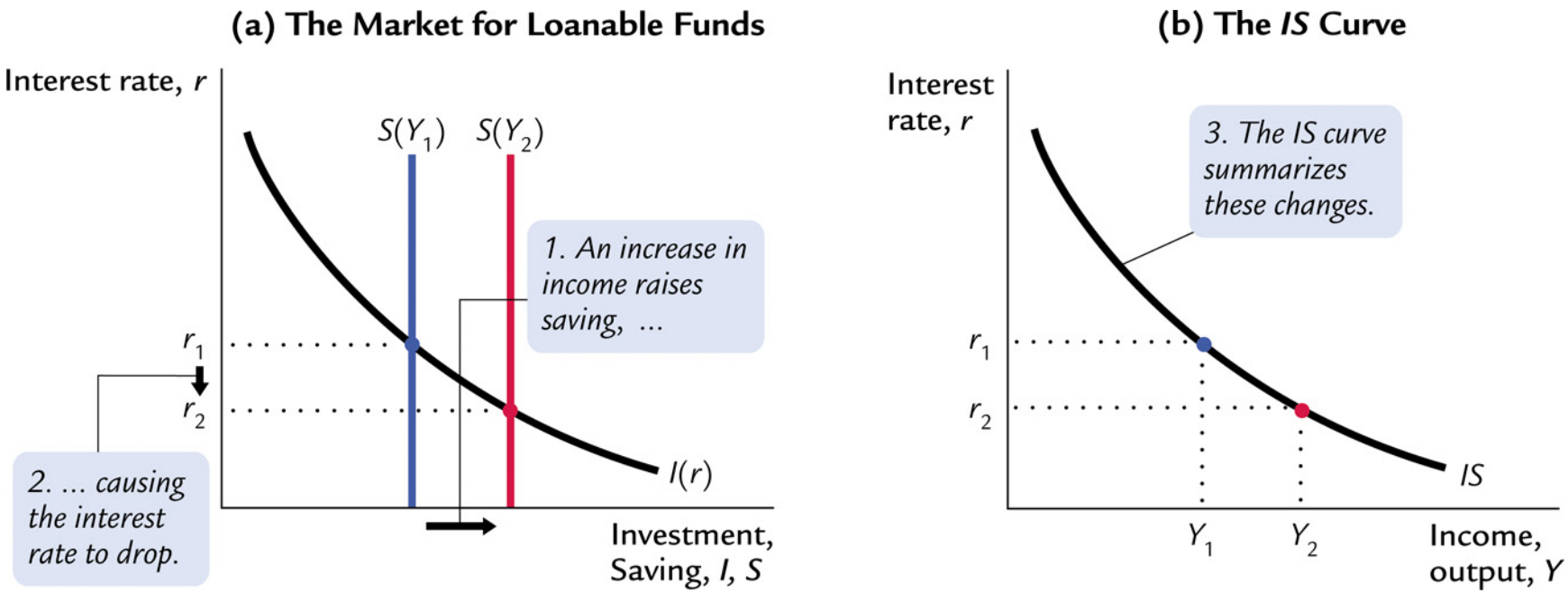

(a) The Keynesian Cross
Expenditure, E
1. An increase in government purchases shifts planned expenditure upward by ΔG, ...
Actual expenditure
Planned expenditure
Y2
Y1
2. ...which raises income by ΔG / (1 − MPC)...
45°
Y1
Y2
Income, output, Y
(b) The IS Curve
Interest rate, r
3. ... and shifts the IS curve to the right by ΔG / (1 − MPC).
r̄
IS2
IS1
Y1
Y2
Income, output, Y

IS Curve: Perspective from the Market for Loanable Funds

$$Y - C(Y - T) - G = I(r)$$
$$S(Y, T, G) = I(r).$$

- National savings curve is drawn for a given level of Y, G, and T. Thus, it shifts whenever Y, G, or T change.

- A higher level of Y shifts S curve to the right, and leads to a lower r. This will be reflected in a downward sloping IS curve.


(a) The Market for Loanable Funds
Interest rate, r
S(Y1)
S(Y2)
1. An increase in income raises saving, ...
r1
r2
2. ... causing the interest rate to drop.
I(r)
Investment, Saving, I, S
(b) The IS Curve
Interest rate, r
3. The IS curve summarizes these changes.
r1
r2
IS
Y1
Y2
Income, output, Y

IS Curve: Summary

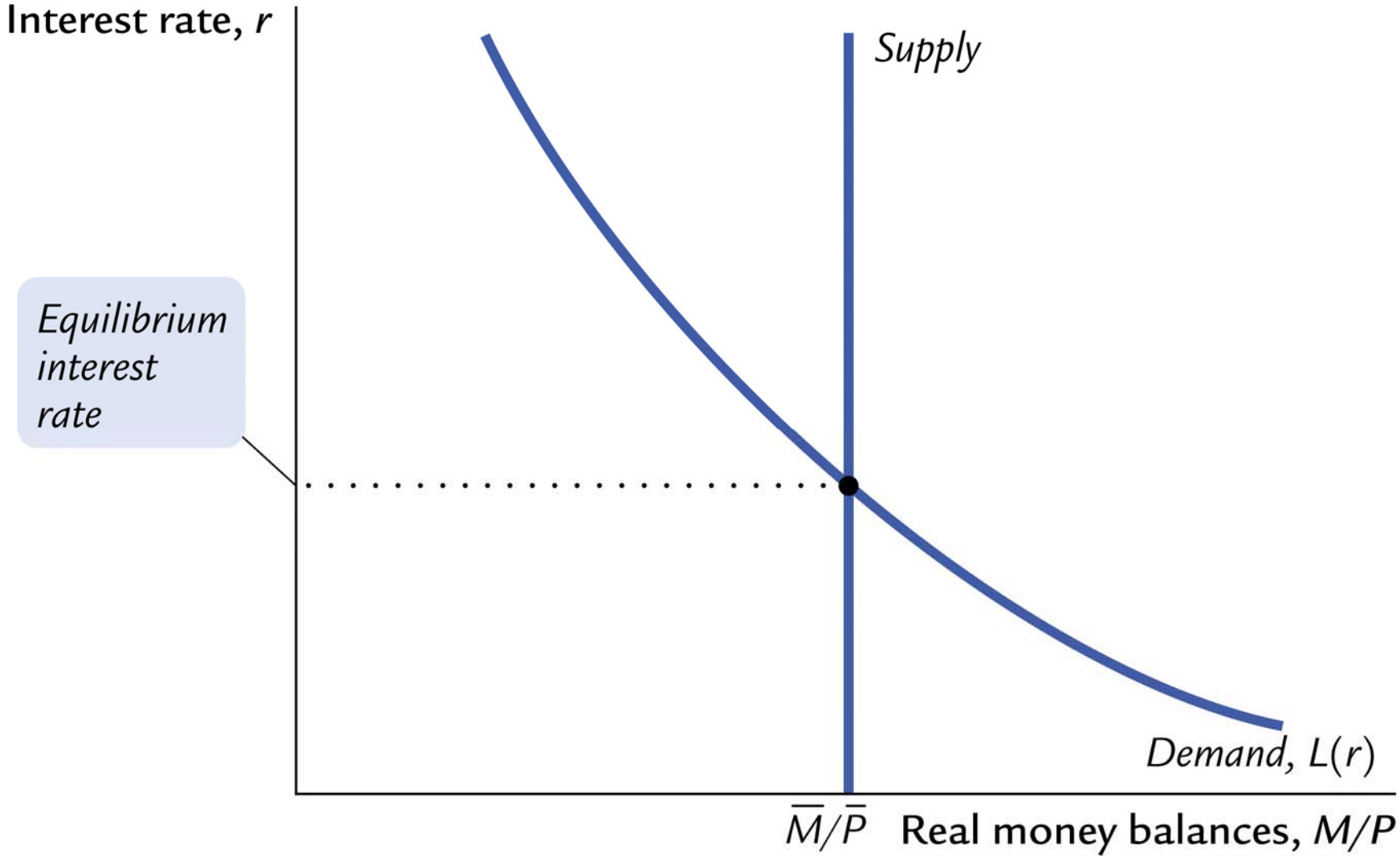
- *IS* curve shows combinations of r and Y, consistent with equilibrium in the goods market.
- *IS* curve is drawn for a given level of G and T.
- Changes in G or T that increase the demand for goods and services shift the *IS* curve to the right.
- Changes in G or T that reduce the demand for goods and services shift the *IS* curve to the left.

The Money Market and the *LM* Curve

Keynes' theory of liquidity preference: interest rate adjusts to balance the supply and demand for money.

$$(M/P)^d = L(r, Y).$$

When the money market is in equilibrium,
$M/P = (M/P)^d = L(r, Y)$.
Have you noticed any changes in the function for liquidity demand?

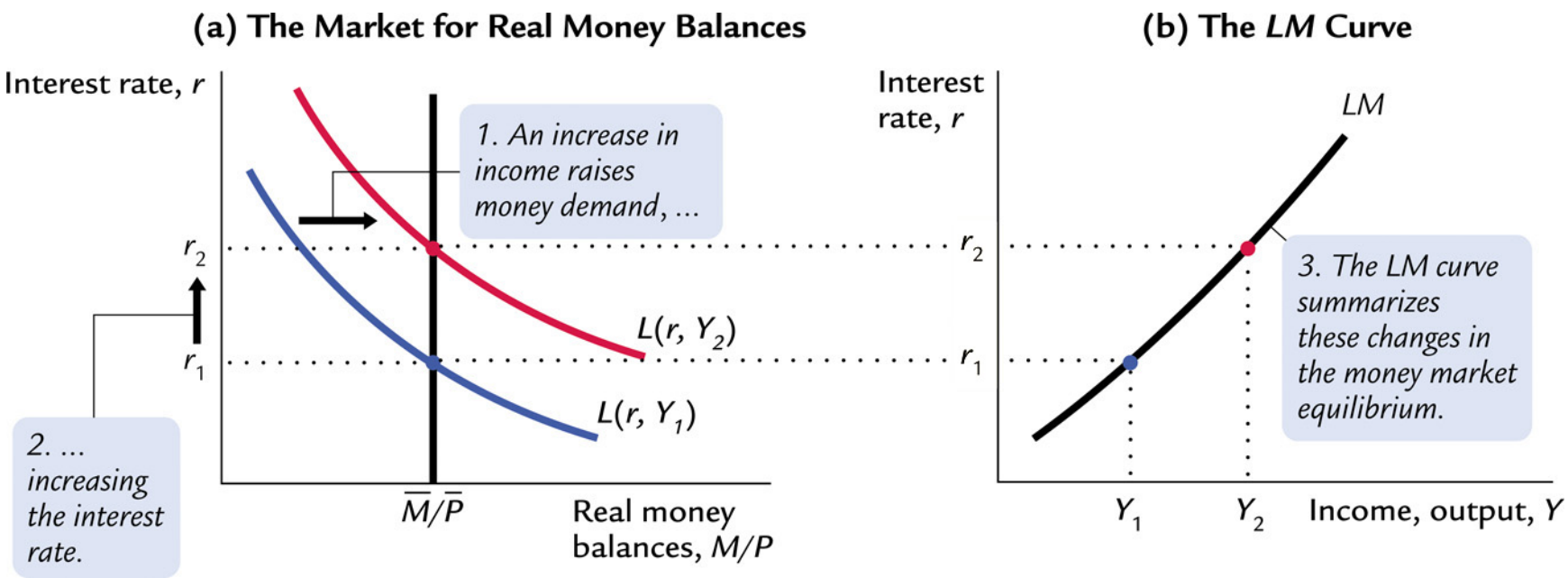

Interest rate, r
Supply
Equilibrium interest rate
Demand, L(r)
$\overline{M}/\overline{P}$
Real money balances, M/P

- The money market is the interaction between the supply of real money balances, M/P, and the demand for real money balances, $(M/P)^d$. Drawn for a given Y, M and P, as a function of r.

- When M is fixed by the central bank, shifts in L curve will lead to changes in r.

- When $Y\uparrow$, the L curve shifts to the right, and $r\uparrow$.

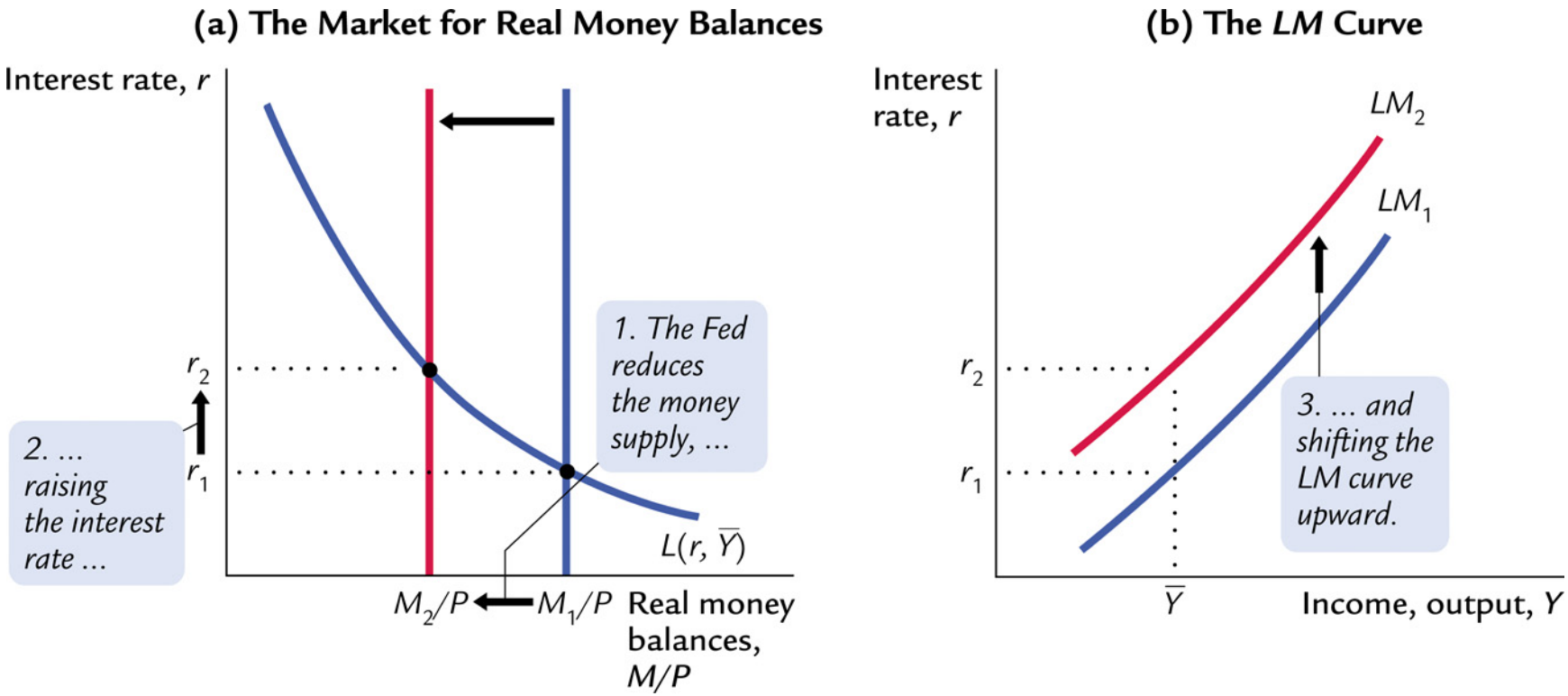
- Thus, a higher level of income is associated with a higher level of real interest rate—the LM curve.


(a) The Market for Real Money Balances
Interest rate, r
1. An increase in income raises money demand, ...
r_2
r_1
$L(r, Y_2)$
$L(r, Y_1)$
2. ... increasing the interest rate.
$\overline{M}/\overline{P}$
Real money balances, M/P
(b) The LM Curve
Interest rate, r
LM
r_2
r_1
3. The LM curve summarizes these changes in the money market equilibrium.
Y_1
Y_2
Income, output, Y

Monetary Policy and the LM Curve

- For a fixed output, a reduction in M by the central bank lead to the fall in the supply of real money balances, M/P, and an increase in the r.

- Thus, for any fixed level of Y, the real interest rate r is higher, and LM curve shifts to the left.


(a) The Market for Real Money Balances
Interest rate, r
r2
r1
2. ... raising the interest rate ...
1. The Fed reduces the money supply, ...
L(r, Ȳ)
M2/P
M1/P
Real money balances, M/P
(b) The LM Curve
Interest rate, r
LM2
LM1
r2
r1
3. ... and shifting the LM curve upward.
Ȳ
Income, output, Y

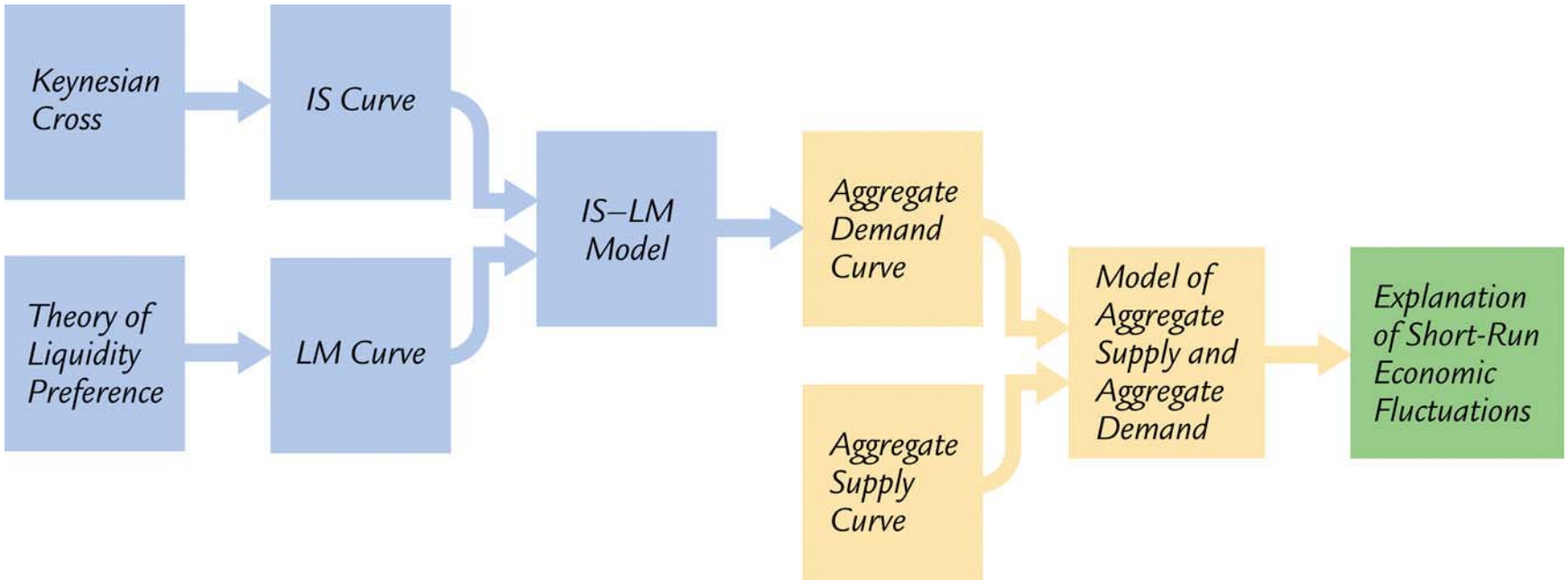
LM Curve: Summary

- Skip pp. 295–296.
- The *LM* curve shows all combinations of Y and r, consistent with equilibrium in the money market.
- The *LM* curve is drawn for given levels of P, and M.
- Decreases in M lead to leftward shifts in the *LM* curve.
- Increases in M lead to rightward shifts in the *LM* curve.

The Short-Run Equilibrium

For given levels of G, T, M, and P, the equilibrium is defined by the levels of r and Y, where the goods market and the money market are cleared—at the intersection of IS and LM curves.

$$Y = C(Y - T) + G + I(r)$$
$$M/P = L(r, Y)$$


Keynesian Cross
IS Curve
Theory of Liquidity Preference
LM Curve
IS–LM Model
Aggregate Demand Curve
Aggregate Supply Curve
Model of Aggregate Supply and Aggregate Demand
Explanation of Short-Run Economic Fluctuations