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Open Economy II - The Mundell-Fleming Model

Lecture No. & Title: 1(One):

The Mundell - Fleming Model

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The Mundell-Fleming Model

Introduction:

Hello friends, in this session I will discuss about Mundell-Fleming model which has been described as "the dominant policy paradigm" for studying open-economy monetary and fiscal policy.

In 1990, Robert Mundell was awarded the Nobel Prize in Economic Sciences for his work in open-economy macroeconomics, including this model.

The Mundell-Fleming model is closely related to the IS-LM model. Both models include the interaction between the goods markets and the money market. But the difference is that the IS-LM model assumes a closed economy, while Mundell-Fleming model assumes an open economy.

Assumptions:

- The economy being studied is a small open economy with perfect capital mobility.
- The economy's interest rate (r) is determined by the world's interest rate (r*). r=r*

Where r is domestic interest rate and r* is world interest rate.

This model is useful for understanding the problems related to whether a country should adopt fixed or flexible exchange rate. This model also helps in understanding how the economy operates under a fixed exchange rate.

<u>The Goods Market and the IS* Curve:</u>

As said earlier, that Mundell-Fleming model is closely related to IS-LM model and hence the market for goods and services is like IS-LM model but it adds a new term for net exports. The equation representing goods market-

$Y=C(Y-T) +I(r) +G+NX (e)$

This equation represents that Y is the aggregate income which is the sum of consumption (C), investment (I), government expenditure (G) and net exports (NX). Y-T shows the disposable income, r is the interest rate on which investment inversely depends, e is the exchange rate and net exports depend negatively on exchange rate.
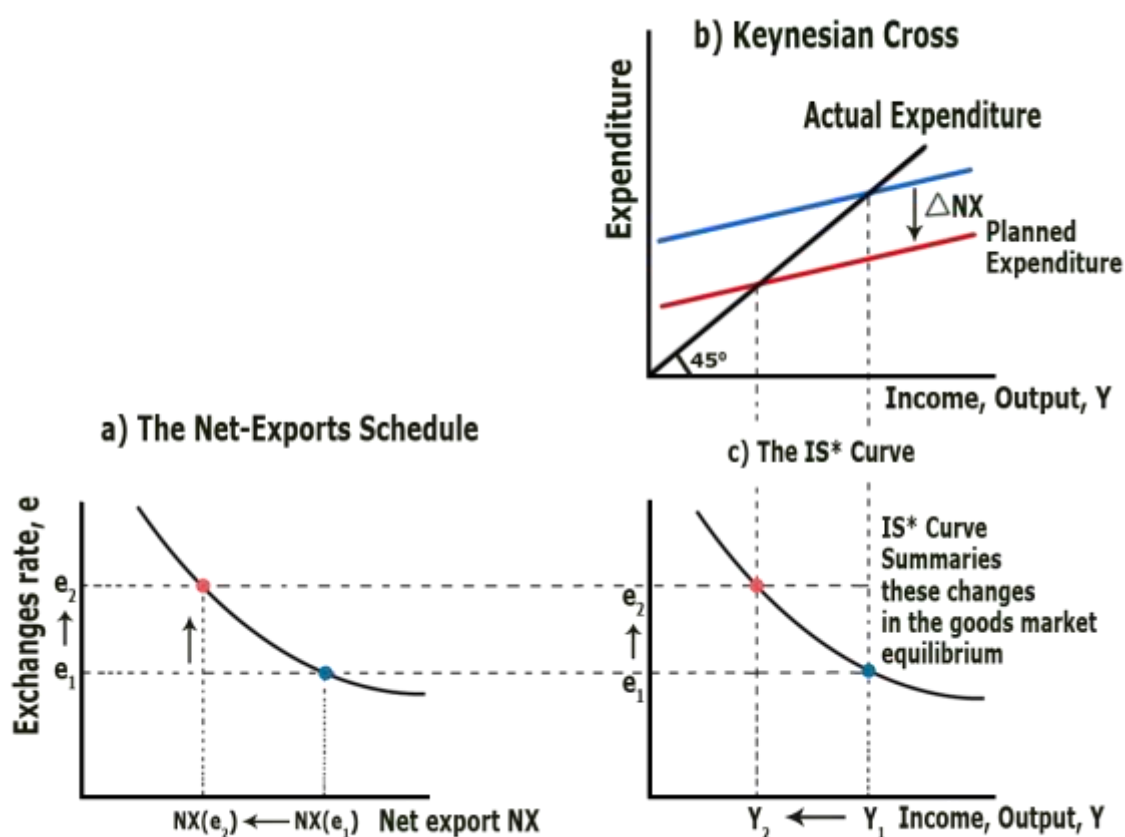
Mundell-Fleming model assumes that the price levels at home and abroad are fixed and hence the real exchange rate is proportional to the nominal exchange rate.

This shows that when the domestic currency appreciates foreign goods become cheaper compared to domestic goods and this causes exports to fall and imports to rise.

The two financial variables which affect expenditure on goods and services in the goods-market equilibrium are the interest rate and the exchange rate. The assumption of perfect capital mobility helps in simplifying the situation, we get-

$Y=C(Y-T) +I(r^*) +G+NX (e)$

This equation can be called as IS* equation. The asterisk reminds us the assumption of constant interest rate at the world interest rate(r^*).

b) Keynesian Cross

Actual Expenditure

$\downarrow\triangle NX$ Planned Expenditure

45°

Income, Output, Y

a) The Net-Exports Schedule

c) The IS* Curve

IS* Curve Summaries these changes in the goods market equilibrium

$NX(e_2)\longleftarrow NX(e_1)$ Net export NX

$Y_2 \longleftarrow Y_1$ Income, Output, Y

The IS curve slopes downward due to higher exchange rate which reduces net exports, which in turn lowers aggregate income.

The Money Market and the LM* Curve:

The money market in Mundell-Fleming model is represented by an equation-

M/P= L (r, Y)

In this equation, the demand for and supply of real money balances are equal. M/P represents the supply of real money balances while L is the demand for real money balances.

The demand for real balances depends on two things that is the rate of interest (r) and income(Y). Rate of interest is negatively related to demand for real balances and income is positively related.

The money supply M is an exogenous variable controlled by the Central Bank, and the price level P is also assumed to be exogenously fixed.

M/P=L(r*, Y)

a) The LM Curve

b) The LM* Curve
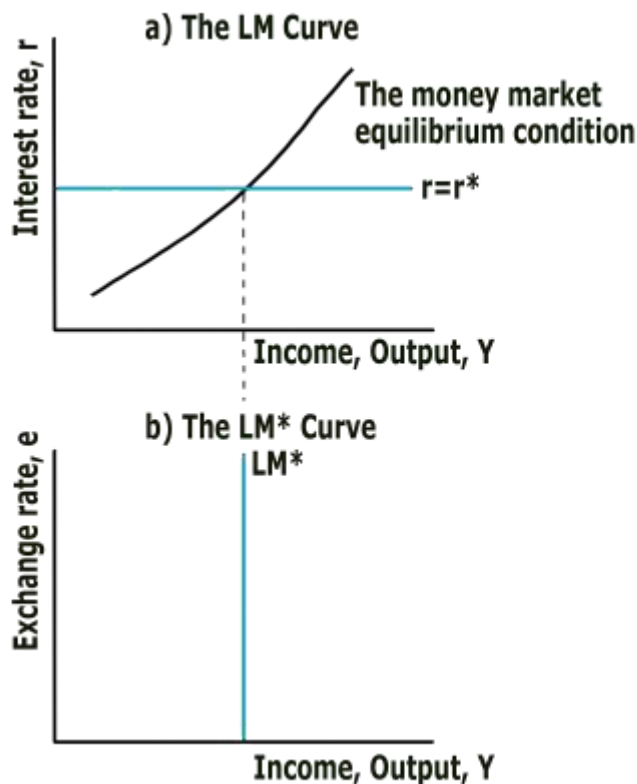
The following diagram has two panels- panel (a) and panel (b). Panel (a) shows the standard LM curve which is derived by the equation $M/P=L(r,Y)$ together with the horizontal line representing the world interest rate r^*. The intersection of these two curves determines the level of income, regardless of the exchange rate and hence, the LM* curve is vertical in panel (b)

Deriving the Model:
According to the Mundell -Fleming model, a small open economy with perfect capital mobility can be described by the two equations-
$Y=C(Y-T) +I(r^*) +G+NX (e)$ ------------------------- IS*
$M/P=L(r^*, Y)$ ---LM*
The IS* equation shows the equilibrium state in goods market while the LM* equation shows the equilibrium in money market.
In these equations, some variables are exogenous variables and some are endogenous like G, M, P and the world interest rate r^* are exogenous variables while variables like Y and e are endogenous variables.

Equilibrium condition in two markets:
The equilibrium for the economy is established when the IS* curve and LM* curve intersect each other.
The intersection shows the exchange rate and the level of income at which the goods market and the money market are in equilibrium.
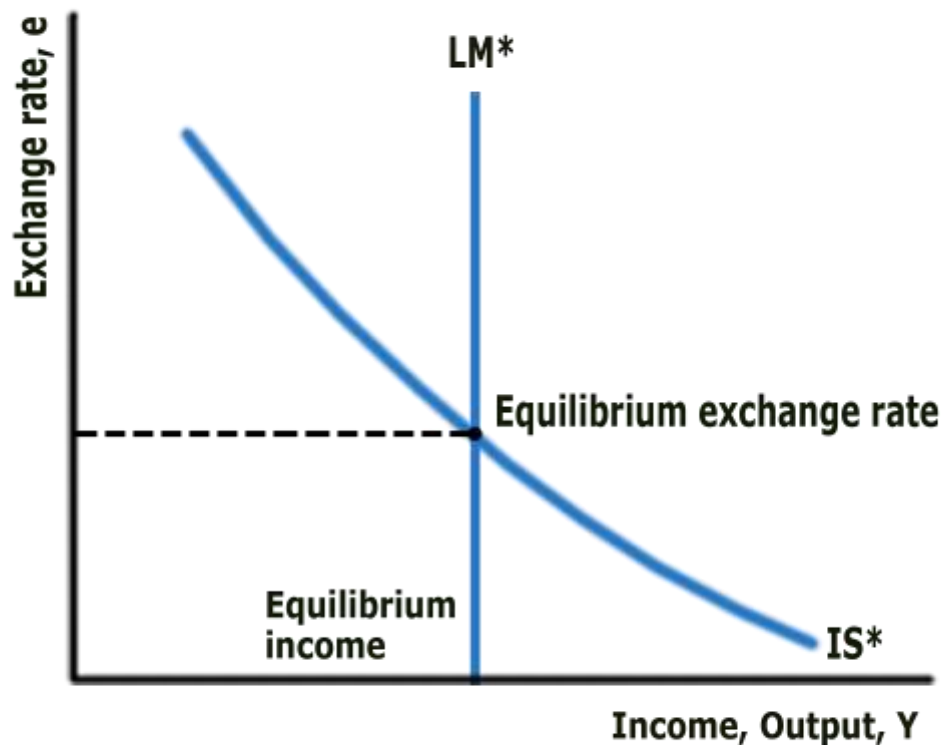
This graph shows the equilibrium condition in goods and money market. Both the curves are drawn with the assumption of interest rate constant at the world constant rate.

The small open economy under floating exchange rate:

In floating exchange rate, exchange rate is determined by the market forces and is allowed to fluctuate in response to changing economic conditions.

Under this system, exchange rate e adjusts to achieve simultaneous equilibrium in goods market and the money market.

There are three types of policies- fiscal policy, monetary policy and trade policy. The goal of the Mundell-Fleming model is to understand the impact of policies on the equilibrium exchange rate. Now I will discuss one by one the impact of all these policies on exchange rate and interest rate.

Fiscal Policy:
Let us suppose that government increases expenditure by increasing government purchases or by cutting taxes. When government adopts such expansionary fiscal policy, it increases expenditure that will shift the IS* curve to right.
The effect of fiscal policy is different on small open economy and on closed economy.
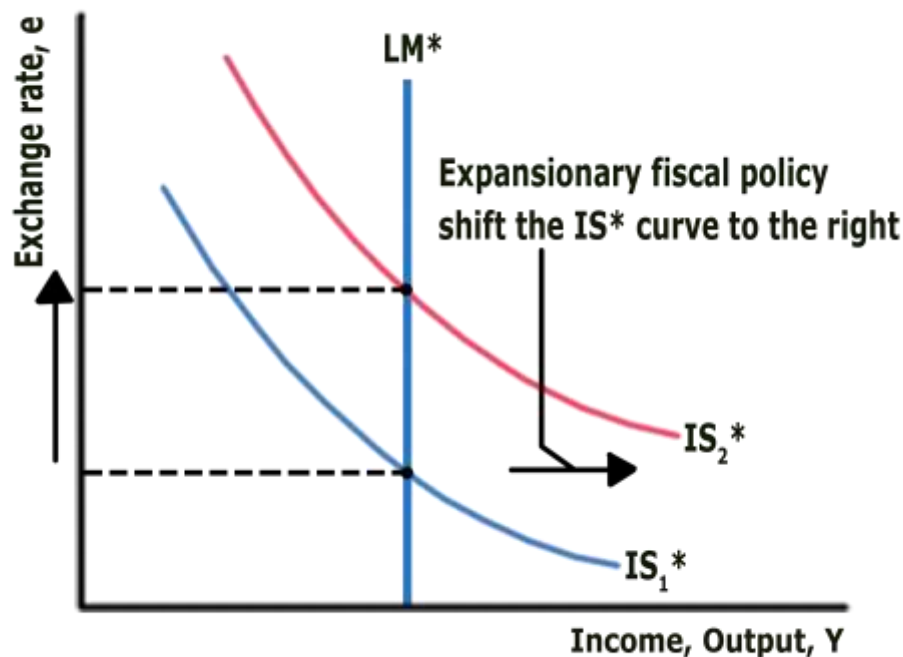
The graph shows that increase in government purchases or a decrease in taxes shifts the IS* to right. This will raise the exchange rate but has no effect on income.
In a closed economy, the expansionary fiscal policy raises income while in a small open economy having floating exchange rate, expansionary fiscal policy will have no effect on income. The interest rate and the exchange rates are the reason behind this. In a closed economy, when there is increase in income, the interest rate rises, because higher income increases the demand for money.

But the case changes in small open economy because when the interest rate starts rising above the world interest rate r*, capital quickly flows in from the abroad to earn higher returns and this inflow of capital will again restore the world interest rate r*. This will appreciate the domestic currency which makes domestic goods expensive relative to foreign goods resulting in reducing net exports.

The fall in net exports is so great that it renders fiscal policy powerless to influence income. This case can be described by the money market equation:

$M/P=L(r,Y)$

In a small economy, r is determined at world interest rate r* and hence there is only one level of income to maintain, and this level of income does not change with change in fiscal policy. Thus, when the government increases spending or cuts taxes, the appreciation of the currency and the fall in net exports must be large enough to offset fully the expansionary effect of the policy on income.

Monetary policy:

Now let us assume that central bank increases the money supply. And it is already assumed that price level is fixed and hence when there is increase in money supply it will lead to increase in real money balances and that is LM* will shift to right, when money supply increases, it will raise income and lowers exchange rate.
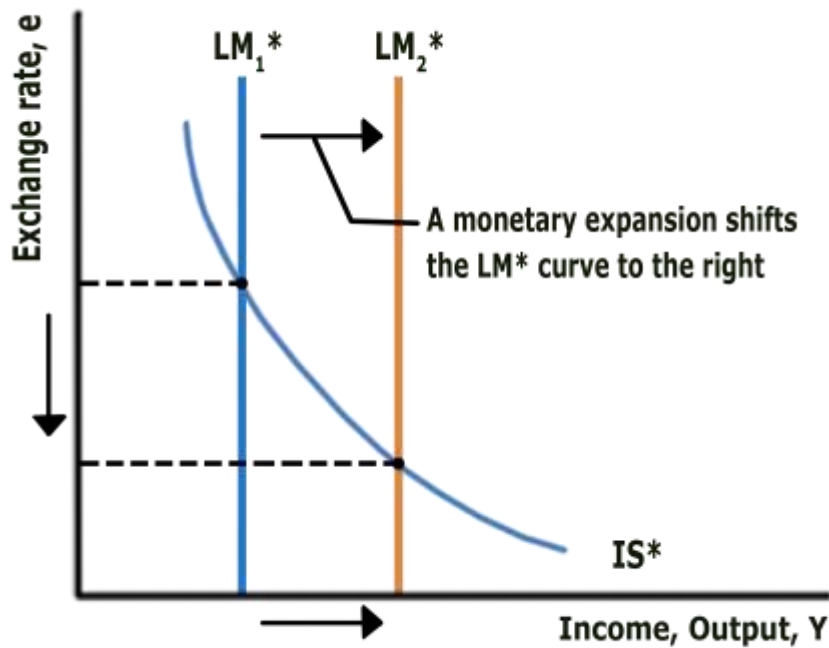
An increase in the money supply shifts the LM* curve to the right, lowering the exchange rate and raising income.

In a small open economy, the monetary policy influences income in different manner as it does in close economy because in small open economy the interest rate is determined by the world interest rate.
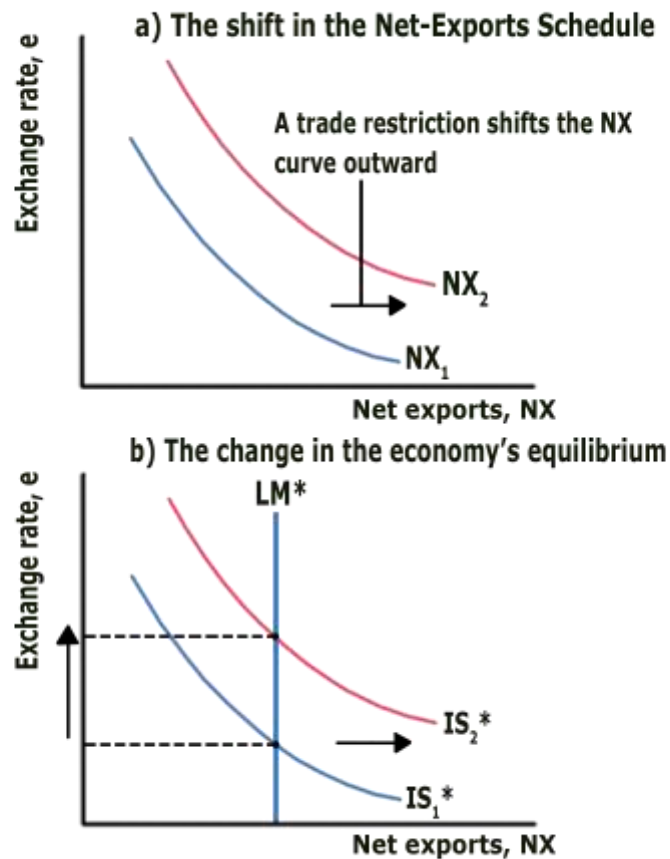
The increase in the money supply will put downward pressure on domestic interest rate. Capital flows out of the economy because investor wants higher return. This outflow of capital will not allow the domestic interest rate from falling down below the world interest rate r*. The capital outflow will increase the supply of domestic currency in the market for foreign currency exchange which will cause domestic currency to depreciate in value. This will make domestic goods cheaper relative to foreign goods which will increase the net exports and hence total income.

Hence, in a small economy, monetary policy influences income and exchange rate but there is no effect on interest rate.

Trade policy:

Now let us suppose that the government decreases the demand for imported goods by imposing import quotas and tariffs.

Now we will study about the impact of trade policy on aggregate income and the exchange rate and how does the economy reach its new equilibrium.

a) The shift in the Net-Exports Schedule

A trade restriction shifts the NX curve outward

NX_2

NX_1

Net exports, NX

b) The change in the economy's equilibrium

LM*

IS_2^*

IS_1^*

Net exports, NX

Exchange rate, e

The graph shows a tariff or an import quota shifts the net exports schedule in panel (a) to the right and hence in panel (b) the IS* curve shift to right raising the exchange rate and leaving income unchanged.

The small open economy under fixed exchange rate:
## Introduction:

Now we will discuss about the second type of exchange rate that is fixed exchange rate.

Under this exchange rate, the central bank announces a value for the exchange rate and is ready to buy and sell the domestic currency to keep the exchange rate at its announced level.

This was the case for most of the world's major economies in 1950s and 1960s, under the Bretton woods system. Now we will analyse the impact of economic policies on an economy with a fixed exchange rate.

The goal of keeping the fixed exchange rate is to keep the exchange rate at predetermined level. And this is done by buying or selling the foreign currency at fixed exchange rate.

(a) The Equilibrium Exchange Rate is Greater Than the Fixed Exchange Rate
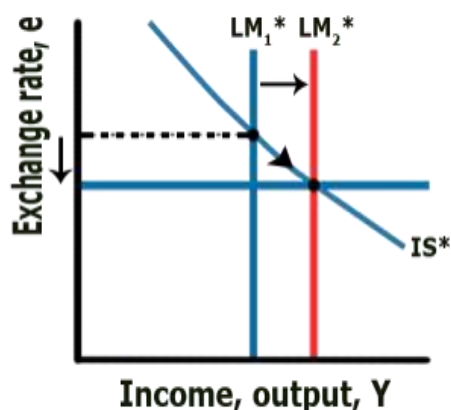
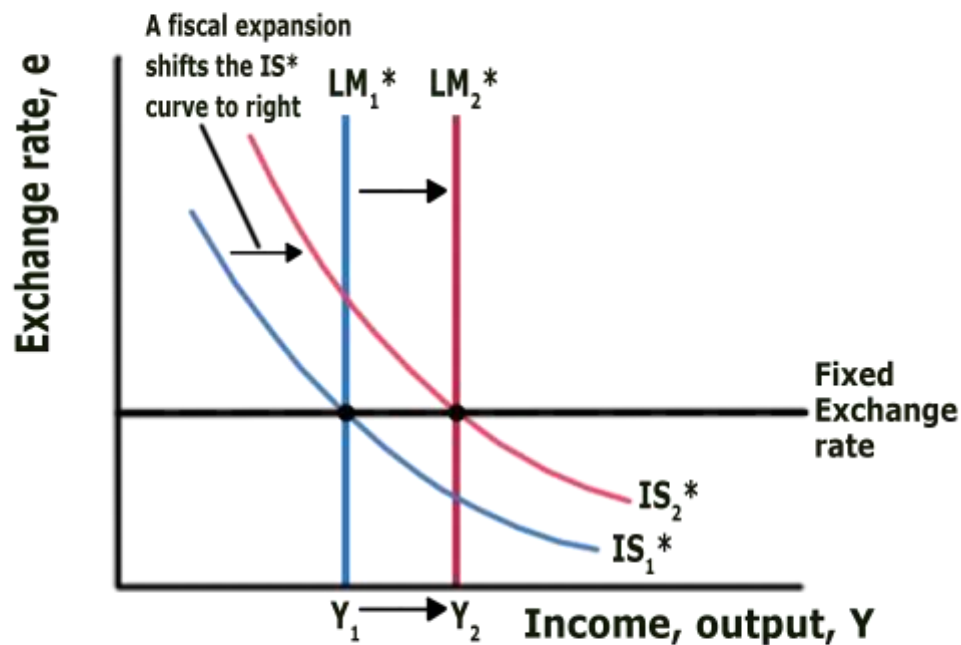**(b) The Equilibrium Exchange Rate is Less Than the Fixed Exchange Rate**
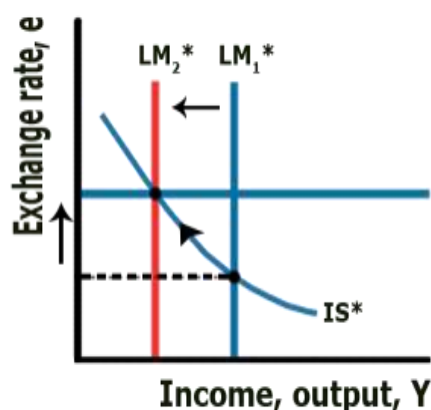
In the graph, panel (a), the equilibrium exchange rate initially exceeds the fixed level. Arbitrageurs will buy foreign currency in foreign exchange markets and sell it to the Fed (Central Bank of USA) for profit. This process automatically increases the money supply, shifting the LM* curve to the right and lowering the exchange rate.

In panel (b), the equilibrium exchange rate is initially below the fixed level. Arbitrageurs will buy dollars in foreign exchange markets and use them to buy foreign currency from the Fed. This process automatically reduces the money supply, shifting the LM* curve to the left and raising the exchange rate.

Fiscal policy under fixed exchange rate:

Now we will discuss about the effect of fiscal policy on small open economy with a fixed exchange rate.

Let us suppose that the government stimulates domestic spending by increasing government purchases or by cutting taxes. And consequently policy will shift the IS* curve to the right putting upward pressure on the market exchange rate.

A fiscal expansion shifts the IS* curve to right

LM$_1$*   LM$_2$*

Exchange rate, e

Fixed Exchange rate

IS$_2$*

IS$_1$*

Y$_1$ →Y$_2$ Income, output, Y

The graph shows that due to fiscal expansion, there is shift in the IS* curve to the right. To maintain the fixed exchange rate, the Fed must increase the money supply, thereby shifting the LM* curve to the right. Thus, in contrast to the case of floating exchange rates, under fixed exchange rates a fiscal expansion raises income.

Monetary policy:
Suppose that a central bank under fixed exchange rate tries to increase the money supply by buying bonds from the public.
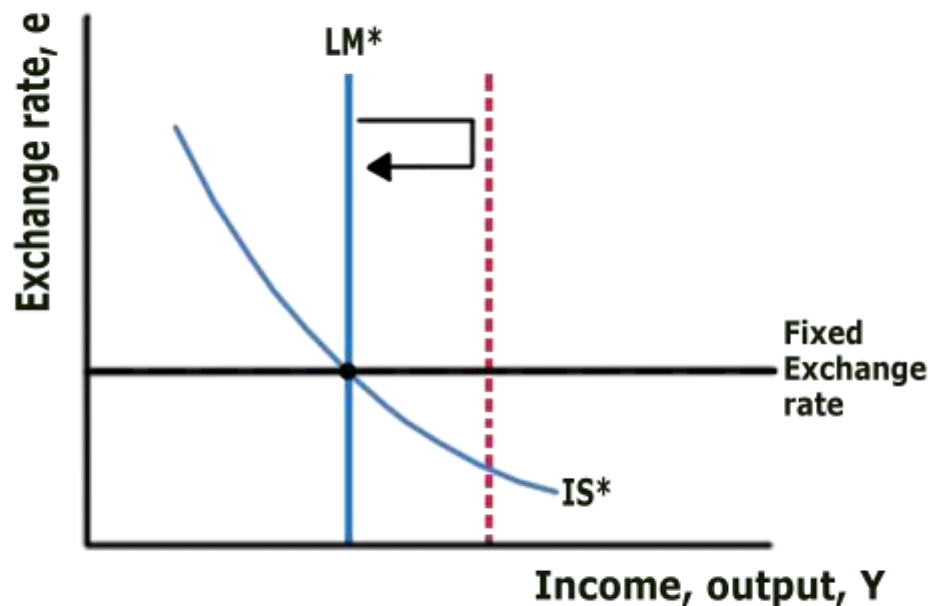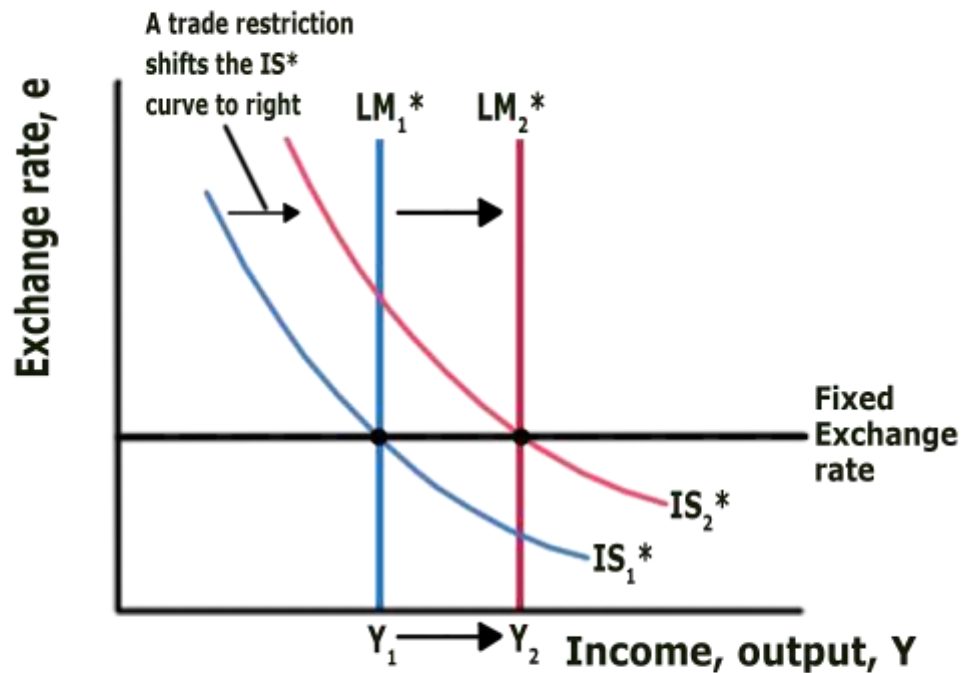

The monetary policy will shift the LM*curve to the right, lowering the exchange rate.

Example: if the Fed tries to increase the money supply, it can do by buying bonds from the public. It will put downward pressure on the exchange rate. To maintain the fixed exchange rate, the money supply and the LM* curve must return to their initial positions. Hence, under fixed exchange rates, normal monetary policy is ineffective.

Trade policy:

Now let us suppose that the government reduces imports by imposing an import quota or a tariff. This will shift the net exports to the right and consequently there is shift in IS* curve to right.

A trade restriction shifts the IS* curve to right

LM$_1$*   LM$_2$*

Exchange rate, e

Fixed Exchange rate

IS$_2$*

IS$_1$*

Y$_1$ ⟶ Y$_2$ Income, output, Y

The graph shows that a tariff or an import quota shifts the IS* curve to the right. This induces an increase in the money supply to maintain the fixed exchange rate. Hence aggregate income increases.

<u>Conclusion</u>:

We can summarise the effects of different policies on exchange rate with the help of following table:

Exchange-Rate Regime						
Impact on policy	**Floating**			**Fixed**		
	Y	E	NX	Y	E	NX
Fiscal expansion	0	↑	↓	↑	0	0
Monetary expansion		↓	↑	0	0	0
Import restriction	0	↑	0	↑	0	↑