

CHAPTER 20: OUTPUT, THE INTEREST RATE AND THE EXCHANGE RATE



OUTPUT, THE INTEREST RATE, AND THE EXCHANGE RATE

- The model developed in this chapter is an extension of the open economy *IS-LM* model, known as the Mundell-Fleming model.
- The main questions we try to solve are:
 - What determines the exchange rate?
 - How can policy makers affect exchange rates?

20-1 EQUILIBRIUM IN THE GOODS MARKET

- Equilibrium in the goods market can be described by the following equations:

$$Y = C(Y - T) + I(Y, r) + G - IM(Y, \varepsilon) / \varepsilon + X(Y^*, \varepsilon)$$

$(+)$ $(+,-)$ $(+,+)$ $(+,-)$

$$NX(Y, Y^*, \varepsilon) \equiv X(Y^*, \varepsilon) - IM(Y, \varepsilon) / \varepsilon$$

$$Y = C(Y - T) + I(Y, r) + G + NX(Y, Y^*, \varepsilon)$$

$(+)$ $(+,-)$ $(-+-)$

20-1 EQUILIBRIUM IN THE GOODS MARKET

- Consumption, C , depends positively on disposable income, $Y - T$.
- Investment, I , depends positively on output Y , and negatively on the real interest rate, r .
- Government spending, G , is taken as given.
- The quantity of imports, IM , depends positively on both output, Y , and the real exchange rate ϵ .
- Exports, X , depend positively on foreign output Y^* , and negatively on the real exchange rate ϵ .

20-1 EQUILIBRIUM IN THE GOODS MARKET

$$Y = C(Y - T) + I(Y, r) + G + NX(Y, Y^*, \varepsilon)$$

$(+)$ $(+, -)$ $(- + -)$

● The main implication of this equation is that both the real interest rate and the real exchange rate affect demand and, in turn, equilibrium output:

- An increase in the real interest rate leads to a decrease in investment spending, and to a decrease in the demand for domestic goods.
- An increase in the real exchange rate leads to a shift in demand toward foreign goods, and to a decrease in net exports.

20-1 EQUILIBRIUM IN THE GOODS MARKET

- In this chapter we make two simplifications:
- Both the domestic and the foreign price levels are given; thus, the nominal and the real exchange rate move together:

$$P = P^* = 1, \text{ so } \varepsilon = E$$

- There is no inflation, neither actual nor expected.

$$\pi^e = 0, \text{ so } r = i$$

Then, the equilibrium condition becomes:

$$Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, E)$$

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20-2 EQUILIBRIUM IN FINANCIAL MARKETS

○ Now that we look at a financially open economy, we must also take into account the fact that people have a choice between domestic bonds and foreign bonds.

We wrote the condition that the supply of money be equal to the demand for money as:

$$\frac{M}{P} = YL(i)$$

We can use this equation to think about the determination of the nominal interest rate in an open economy.

Domestic Bonds versus Foreign Bonds

- What combination of domestic and foreign bonds should financial investors choose in order to maximize expected returns?

$$(1 + i_t) = (1 - i_t^*) \pounds \frac{E_t}{E_{t+1}^e} |$$

The left side gives the return, in terms of domestic currency. The right side gives the expected return, also in terms of domestic currency. In equilibrium, the two expected returns must be equal.

Domestic Bonds versus Foreign Bonds

● If the expected future exchange rate is given, then:

$$E_t = \frac{1 + i_t}{1 + i_t^*} E_{t+1}^e$$

The current exchange rate is:

$$E = \frac{1 + i}{1 + i^*} \bar{E}^e$$

Domestic Bonds versus Foreign Bonds

$$E = \frac{1 + i}{1 + i^*} \bar{E}^e$$

This relation tells us that the current exchange rate depends on the domestic interest rate, on the foreign interest rate, and on the expected future exchange rate:

- An increase in the domestic interest rate leads to an increase in the exchange rate.
- An increase in the foreign interest rate leads to a decrease in the exchange rate.
- An increase in the expected future exchange rate leads to an increase in the current exchange rate.

20.2 EQUILIBRIUM IN FINANCIAL MARKETS

Domestic Bonds versus Foreign Bonds

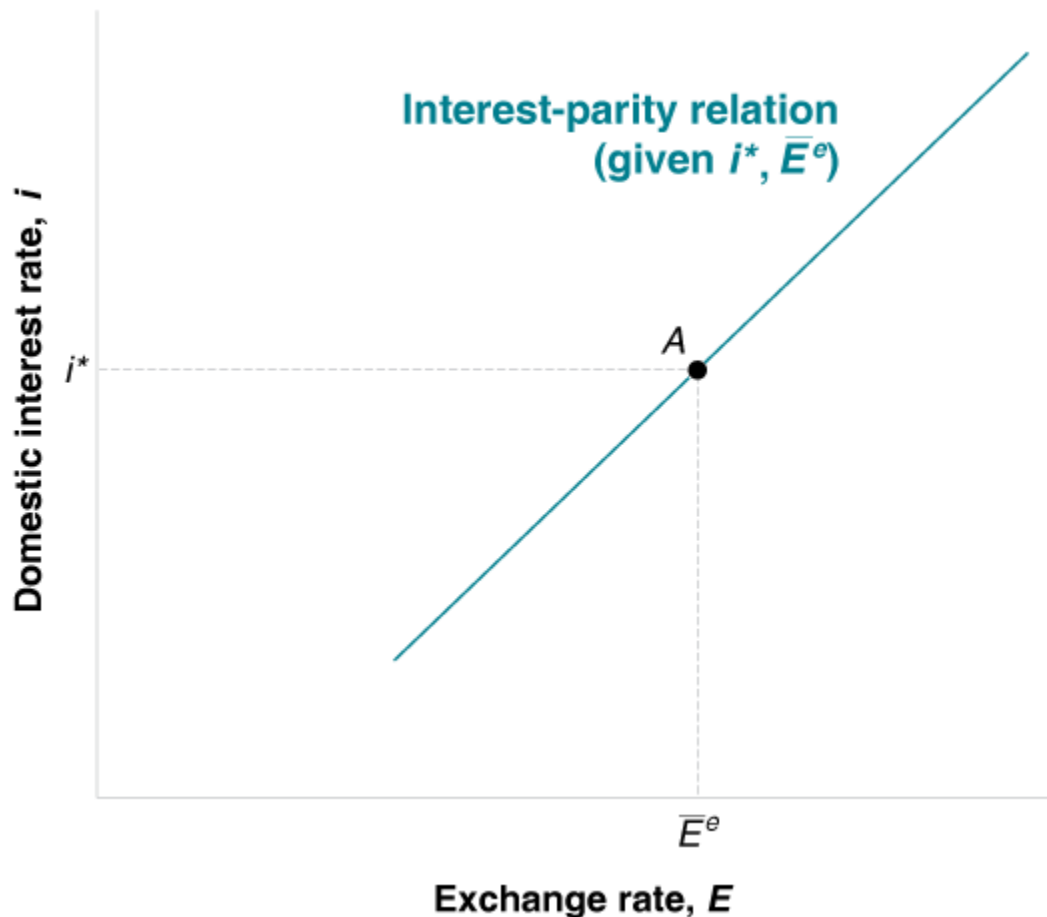
- An increase in the U.S. interest rate, say, after a monetary contraction, will cause the U.S. interest rate to increase, and the demand for U.S. bonds to rise. As investors switch from foreign currency to dollars, the dollar appreciates.
- The more the dollar appreciates, the more investors expect it to depreciate in the future.
- The initial dollar appreciation must be such that the expected future depreciation compensates for the increase in the U.S. interest rate. When this is the case, investors are again indifferent and equilibrium prevails.

Domestic Bonds versus Foreign Bonds

■ Figure 20 – 1

The Relation between the Interest Rate and the Exchange Rate Implied by Interest Parity

A higher domestic interest rate leads to a higher exchange rate—an appreciation.



- Goods-market equilibrium implies that output depends, among other factors, on the interest rate and the exchange rate.

$$Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, E)$$

The interest rate is determined by the equality of money supply and money demand:

$$\frac{M}{P} = YL(i)$$

20-3 PUTTING GOODS AND FINANCIAL MARKETS TOGETHER

The interest-parity condition implies a negative relation between the domestic interest rate and the exchange rate:

$$E = \frac{1 + i}{1 + i^*} \bar{E}^e$$
$$i \uparrow \Rightarrow E \downarrow$$
$$i \downarrow \Rightarrow E \uparrow$$

● The open-economy versions of the *IS* and *LM* relations are:

$$IS : Y = C(Y - T) + I(Y, i) + G + NX \left(Y, Y^*, \frac{1+i}{1+i^*} \bar{E}^e \right)$$

$$LM : \frac{M}{P} = YL(i)$$

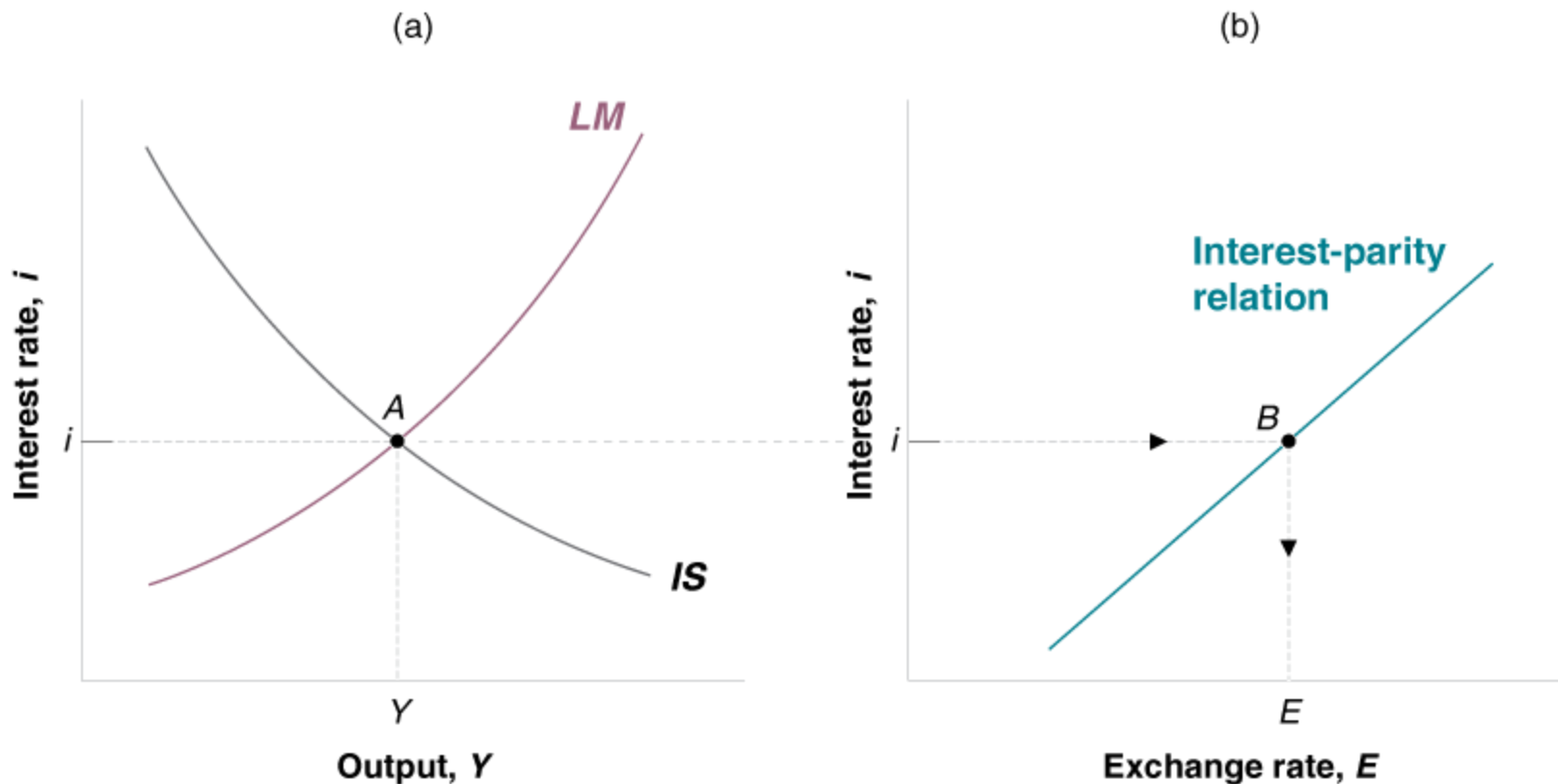
An increase in the interest rate now has two effects:

- The first effect, which was already present in a closed economy, is the direct effect on investment.
- The second effect, which is present only in the open economy, is the effect through the exchange rate.

■ **Figure 20 – 2**

The IS–LM Model in an Open Economy

An increase in the interest rate reduces output both directly and indirectly (through the exchange rate): The *IS* curve is downward sloping. Given the real money stock, an increase in output increases the interest rate: The *LM* curve is upward sloping.



Sudden Stops, the Strong Dollar, and the Limits to the Interest Parity Condition



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The interest parity condition assumes that financial investors care only about expected returns. As we discussed in Chapter 18, investors care not only about returns but also about risk and about liquidity.

Sometimes the perception that risk has increased leads investors to want to sell all the assets they have in that country, no matter what the interest rate. These episodes, which have affected many Latin American and Asian emerging economies, are known as **sudden stops**.

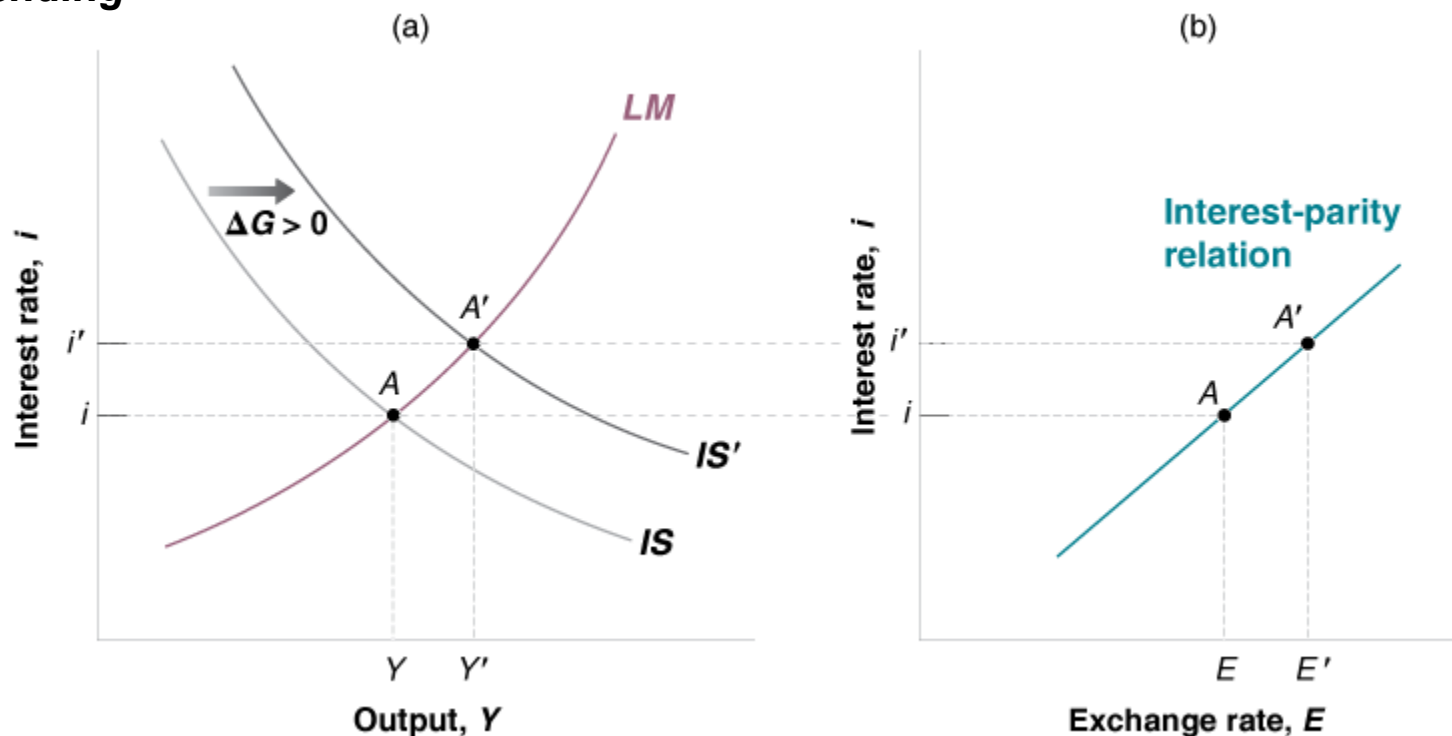
20-4 THE EFFECTS OF POLICY IN AN OPEN ECONOMY

The Effects of Fiscal Policy in an Open Economy

Figure 20-3

The Effects of an Increase in Government Spending

An increase in government spending leads to an increase in output, an increase in the interest rate, and an appreciation.



The increase in government spending shifts the IS curve to the right. It shifts neither the LM curve nor the interest-parity curve.

The Effects of Fiscal Policy in an Open Economy

○ Can we tell what happens to the various components of demand for money when the government increases spending:

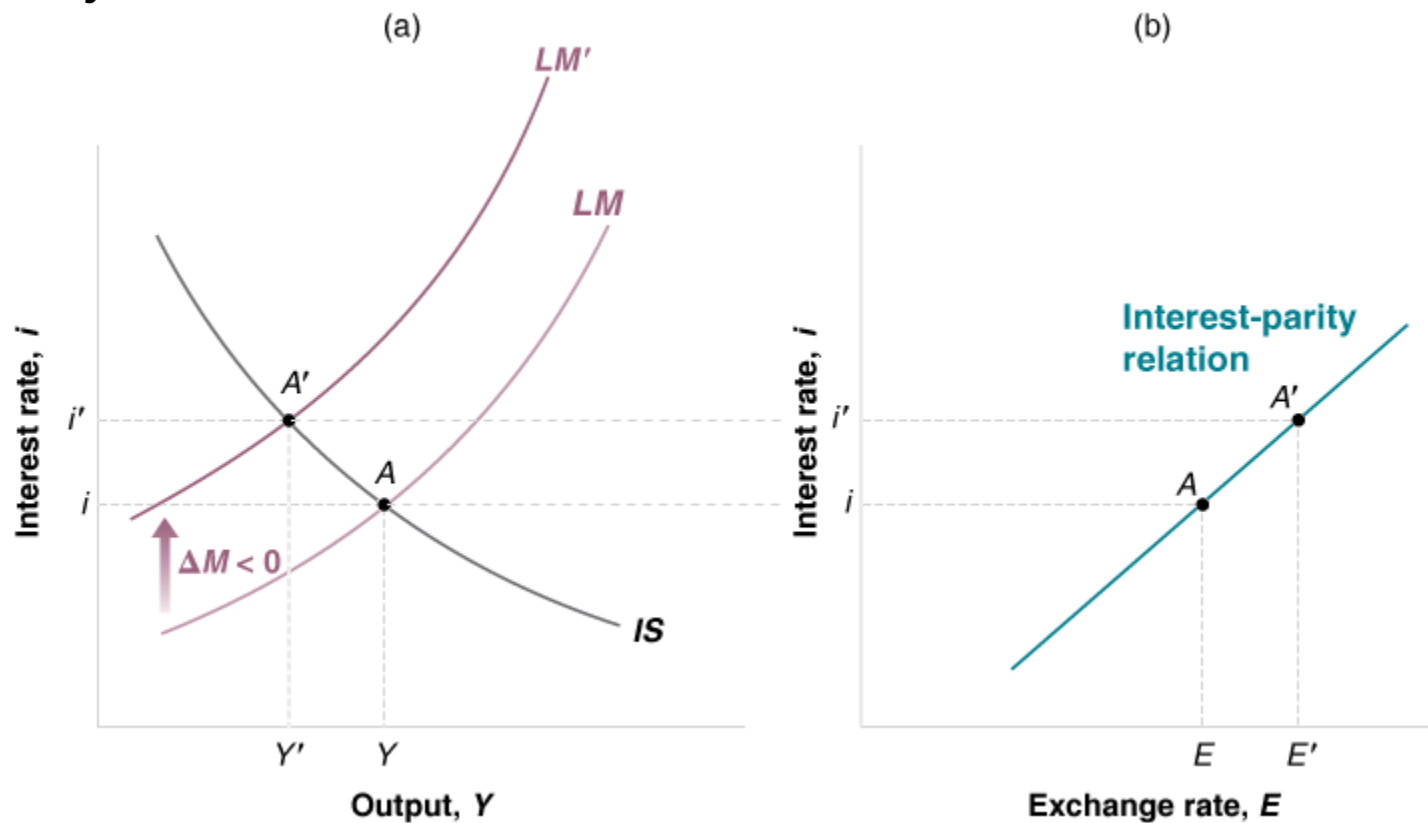
- Consumption and government spending both go up.
- The effect of government spending on investment was ambiguous in the closed economy, it remains ambiguous in the open economy.
- Both the increase in output and the appreciation combine to decrease net exports.

The Effects of Monetary Policy in an Open Economy

■ Figure 20 – 4

The Effects of a Monetary Contraction

A monetary contraction leads to a decrease in output, an increase in the interest rate, and an appreciation.



A monetary contraction shifts the LM curve up. It shifts neither the IS curve nor the interest-parity curve.

20-5 FIXED EXCHANGE RATES

- Central banks act under implicit and explicit exchange-rate targets and use monetary policy to achieve those targets.

Pegs, Crawling Pegs, Bands, the EMS, and the Euro

Some countries operate under *fixed exchange rates*. These countries maintain a fixed exchange rate in terms of some foreign currency. Some **peg** their currency to the dollar.

Some countries operate under a **crawling peg**. These countries typically have inflation rates that exceed the U.S. inflation rate.

Pegs, Crawling Pegs, Bands, the EMS, and the Euro

- Some countries maintain their bilateral exchange rates within some bands. The most prominent example is the European Monetary System (EMS).
- Under the EMS rules, member countries agreed to maintain their exchange rate vis-à-vis the other currencies in the system within narrow limits or bands around a central parity.
- Some countries moved further, agreeing to adopt a common currency, the euro, in effect, adopting a “fixed exchange rate.”

Pegging the Exchange Rate and Monetary Control

- The interest parity condition is:

$$(1 + i_t) = (1 + i_t^*) \frac{E_t}{E_{t+1}^e}$$

Pegging the exchange rate turns the interest parity relation into:

$$(1 + i_t) = (1 + i_t^*) \Rightarrow i_t = i_t^*$$

In words: *Under a fixed exchange rate and perfect capital mobility, the domestic interest rate must be equal to the foreign interest rate.*

Pegging the Exchange Rate and Monetary Control

Increases in the domestic demand for money must be matched by increases in the supply of money in order to maintain the interest rate constant, so that the following condition holds:

$$\frac{M}{P} = YL(i^*)$$

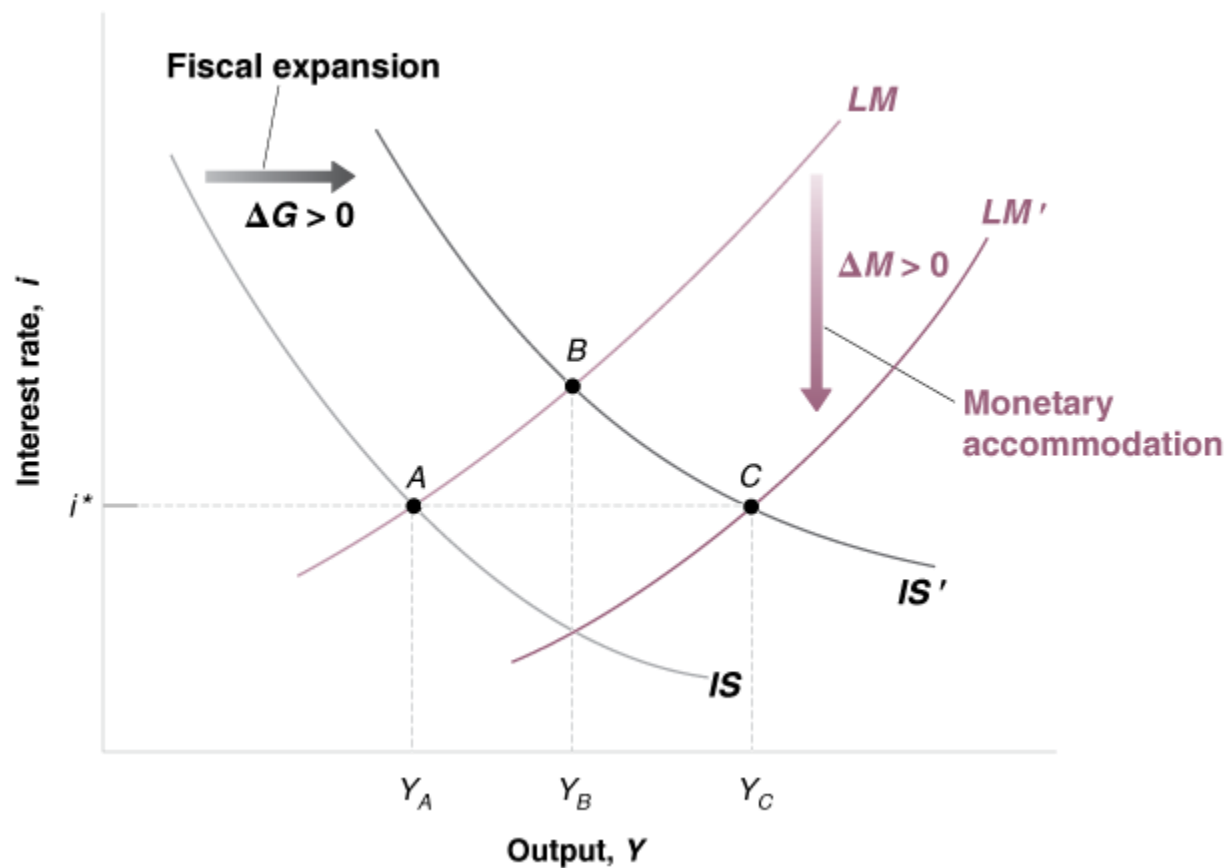
Let's summarize: *Under fixed exchange rates, the central bank gives up monetary policy as a policy instrument.*

Fiscal Policy under Fixed Exchange Rates

■ Figure 20 – 5

The Effects of a Fiscal Expansion under Fixed Exchange Rates

Under flexible exchange rates, a fiscal expansion increases output from Y_A to Y_B . Under fixed exchange rates, output increases from Y_A to Y_C .



The central bank must accommodate the resulting increase in the demand for money.

Fiscal Policy under Fixed Exchange Rates

- There are a number of reasons why countries choosing to fix its interest rate appears to be a bad idea:
 - By fixing the exchange rate, a country gives up a powerful tool for correcting trade imbalances or changing the level of economic activity.
 - By committing to a particular exchange rate, a country also gives up control of its interest rate, and they must match movements in the foreign interest rate risking unwanted effects on its own activity.
 - Although the country retains control of fiscal policy, one policy instrument is not enough. A country that wants to decrease its budget deficit cannot, under fixed exchange rates, use monetary policy to offset the contractionary effect of its fiscal policy on output.
- <https://www.thebalance.com/fixed-exchange-rate-definition-pros-cons-examples-3306257>