

KRUGMAN ♦ OBSTFELD

INTERNATIONAL

Theory & Policy

ECONOMICS

8

Chapter 16

Output and the Exchange Rate in the Short Run

Preview

- Determinants of aggregate demand in the short run
- A short run model of output markets
- A short run model of asset markets
- A short run model for both output markets and asset markets
- Effects of temporary and permanent changes in monetary and fiscal policies
- Adjustment of the current account over time
- *IS-LM* model

Introduction

- Long run models are useful when all prices of inputs and outputs have time to adjust.
- In the short run, some prices of inputs and outputs may not have time to adjust, due to labor contracts, costs of adjustment, or imperfect information about willingness of customers to pay at different prices.
- This chapter builds on the short run and long models of exchange rates to explain how output is related to exchange rates in the short run.
 - ◆ It shows how macroeconomic policies can affect production, employment, and the current account.

Determinants of Aggregate Demand

- Aggregate demand is the aggregate amount of goods and services that individuals and institutions are willing to buy:
 1. consumption expenditure
 2. investment expenditure
 3. government purchases
 4. net expenditure by foreigners: the current account

Determinants of Aggregate Demand

- Determinants of consumption expenditure include:
 - ◆ **Disposable income:** income from production (Y) minus taxes (T).
 - ◆ More disposable income means more consumption expenditure, but consumption typically increases less than the amount that disposable income increases.
 - ◆ Real interest rates may influence the amount of saving and spending on consumption goods, but we assume that they are relatively unimportant here.
 - ◆ Wealth may also influence consumption expenditure, but we assume that it is relatively unimportant here.

Determinants of Aggregate Demand (cont.)

- Determinants of the current account include:
 - ◆ **Real exchange rate:** prices of foreign products relative to the prices of domestic products, both measured in domestic currency: EP^*/P
 - As the prices of foreign products rise relative to those of domestic products, expenditure on domestic products rises, and expenditure on foreign products falls.
 - ◆ **Disposable income:** more disposable income means more expenditure on foreign products (imports)

How Real Exchange Rate Changes Affect the Current Account

- The current account measures the value of exports relative to the value of imports: $CA \approx EX - IM$.
 - ◆ When the real exchange rate EP^*/P rises, the prices of foreign products rise relative to the prices of domestic products.
 1. The **volume** of exports that are bought by foreigners rises.
 2. The **volume** of imports that are bought by domestic residents falls.
 3. The **value** of imports in terms of domestic products rises: the value/price of imports rises, since foreign products are more valuable/expensive.

How Real Exchange Rate Changes Affect the Current Account (cont.)

- If the volumes of imports and exports do not change much, the *value effect* may dominate the *volume effect* when the real exchange rate changes.
 - ◆ For example, contract obligations to buy fixed amounts of products may cause the volume effect to be small.
- However, evidence indicates that for most countries the volume effect dominates the value effect after one year or less.
- Let's assume for now that a real depreciation leads to an increase in the current account: the volume effect dominates the value effect.

Determinants of Aggregate Demand

- Determinants of the current account include:
 - ◆ **Real exchange rate:** an increase in the real exchange rate increases the current account.
 - ◆ **Disposable income:** an increase in the disposable income decreases the current account.

Determinants of Aggregate Demand (cont.)

- For simplicity, we assume that exogenous political factors determine government purchases G and the level of taxes T .
- For simplicity, we currently assume that investment expenditure I is determined by exogenous business decisions.
 - ◆ A more complicated model shows that investment depends on the cost of spending or borrowing to finance investment: the interest rate.

Determinants of Aggregate Demand (cont.)

- Aggregate demand is therefore expressed as:

$$D = C(Y - T) + I + G + CA(EP^*/P, Y - T)$$

Consumption expenditure as a function of disposable income

Investment expenditure and government purchases, both exogenous

Current account as a function of the real exchange rate and disposable income.

- Or more simply:

$$D = D(EP^*/P, Y - T, I, G) \quad (16-1)$$

Determinants of Aggregate Demand (cont.)

- Determinants of aggregate demand include:
 - ◆ **Real exchange rate:** an increase in the real exchange rate increases the current account, and therefore increases aggregate demand of domestic products.
 - ◆ **Disposable income:** an increase in the disposable income increases consumption expenditure, but decreases the current account.
 - Since consumption expenditure is usually greater than expenditure on foreign products, the first effect dominates the second effect.
 - As income increases for a given level of taxes, aggregate consumption expenditure and aggregate demand increase by less than income.

Short Run Equilibrium for Aggregate Demand and Output

- Equilibrium is achieved when the value of income from production (output) Y equals the value of aggregate demand D .

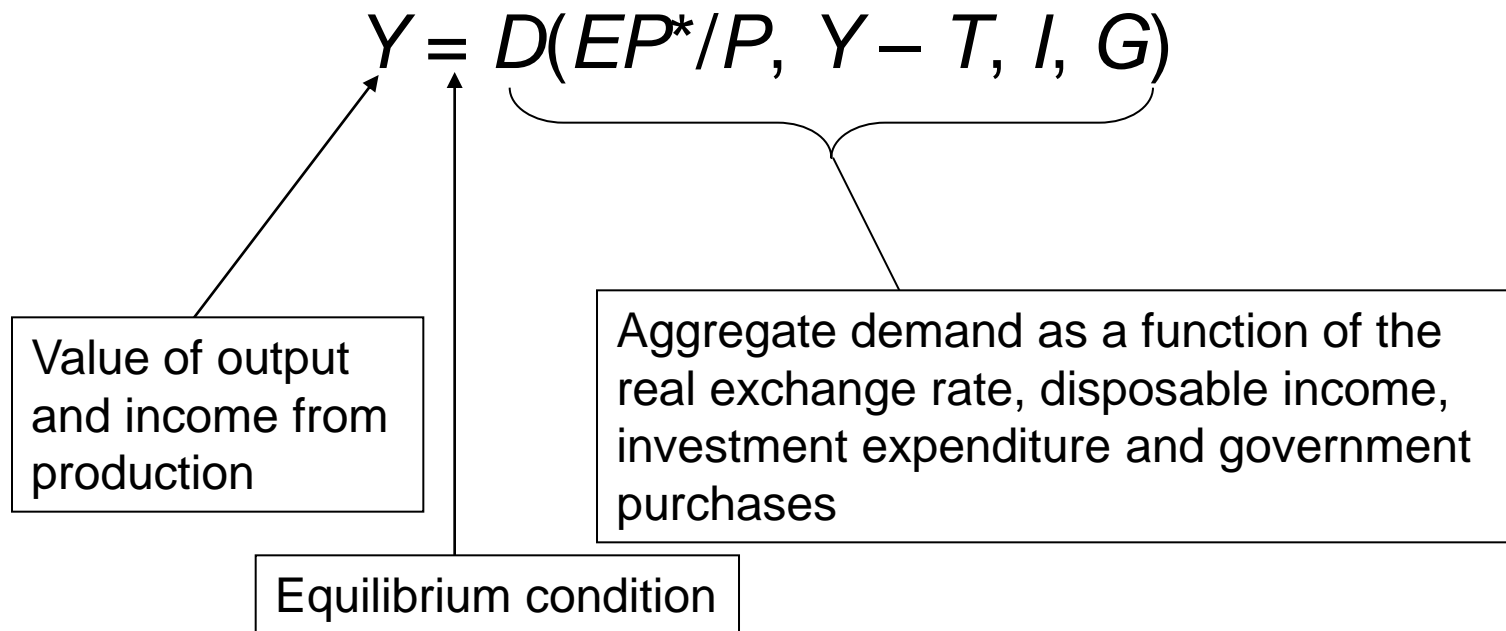
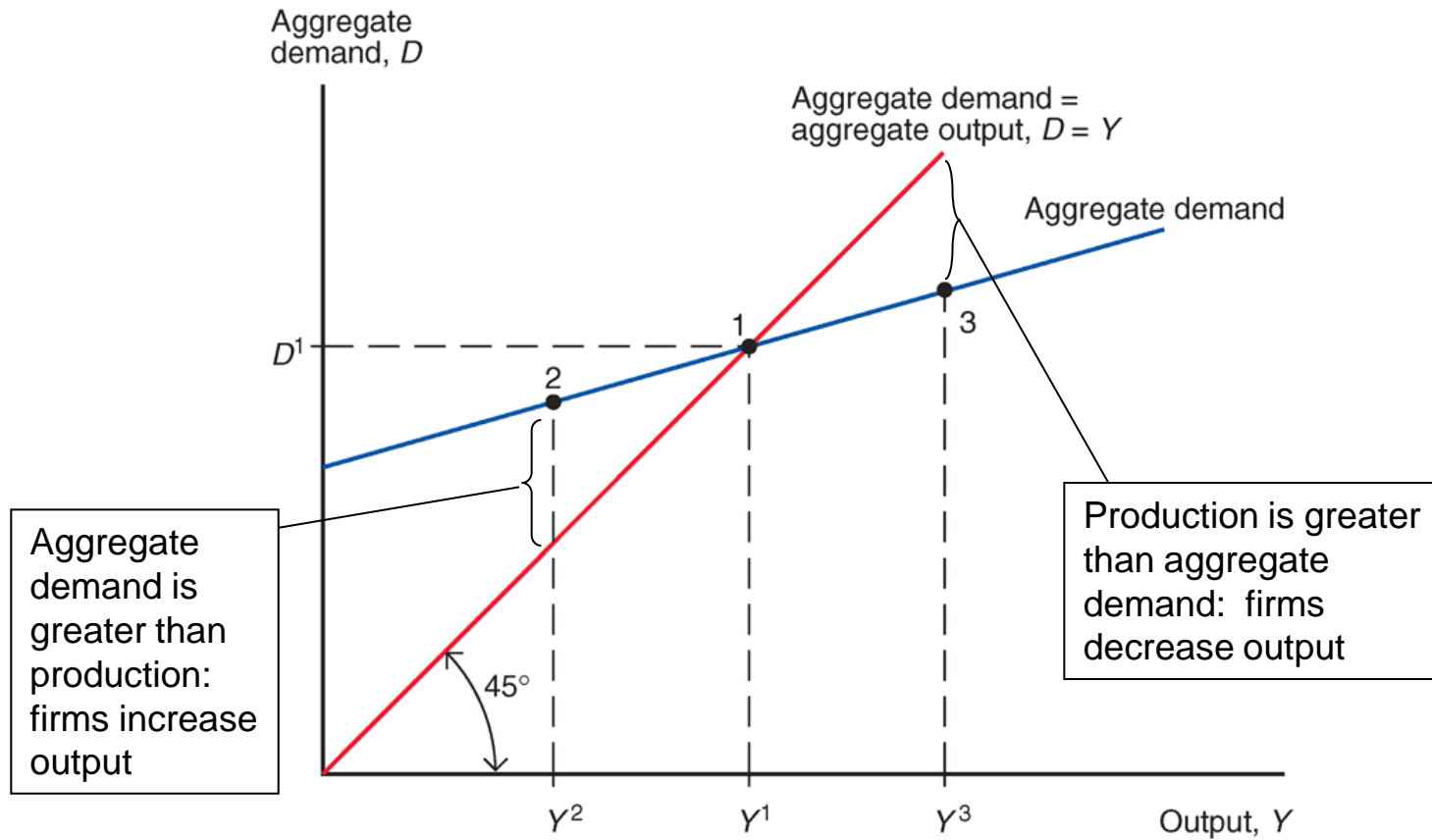


Fig. 16-2: The Determination of Output in the Short Run



Short Run Equilibrium and the Exchange Rate: *DD* Schedule

- How does the exchange rate affect the short run equilibrium of aggregate demand and output?
- With fixed domestic and foreign levels of average prices, a rise in the nominal exchange rate makes foreign goods and services more expensive relative to domestic goods and services.
- A rise in the nominal exchange rate (a domestic currency depreciation) increases aggregate demand of domestic products.
- In equilibrium, production will increase to match the higher aggregate demand.

Fig. 16-3: Output Effect of a Currency Depreciation with Fixed Output Prices

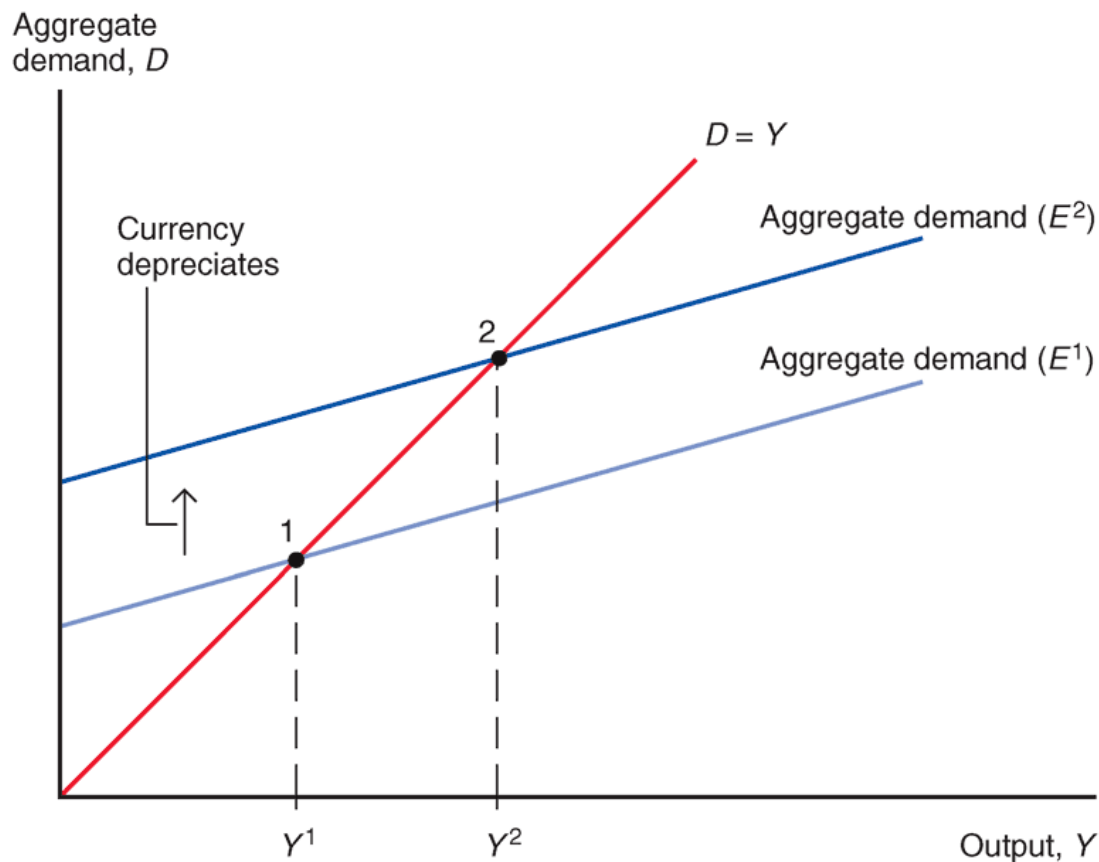
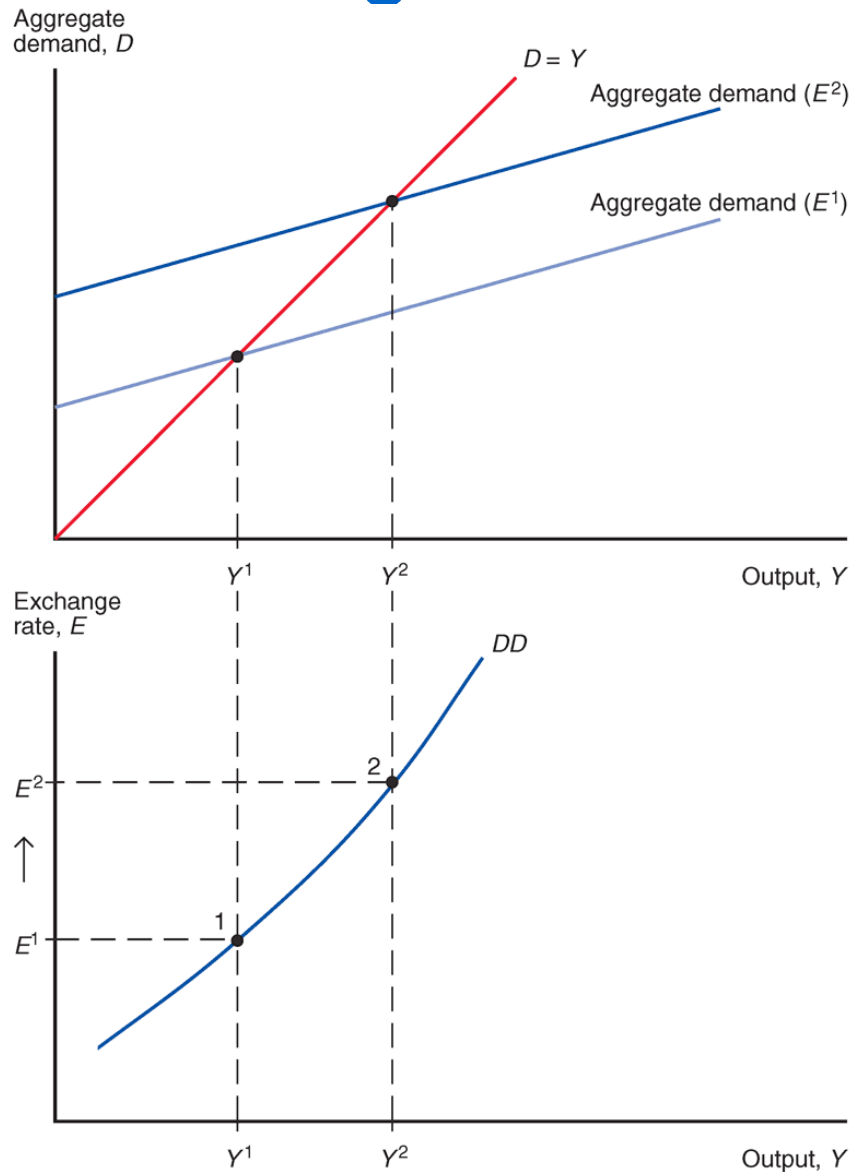


Fig. 16-4: Deriving the *DD* Schedule



Short Run Equilibrium and the Exchange Rate: *DD* Schedule (cont.)

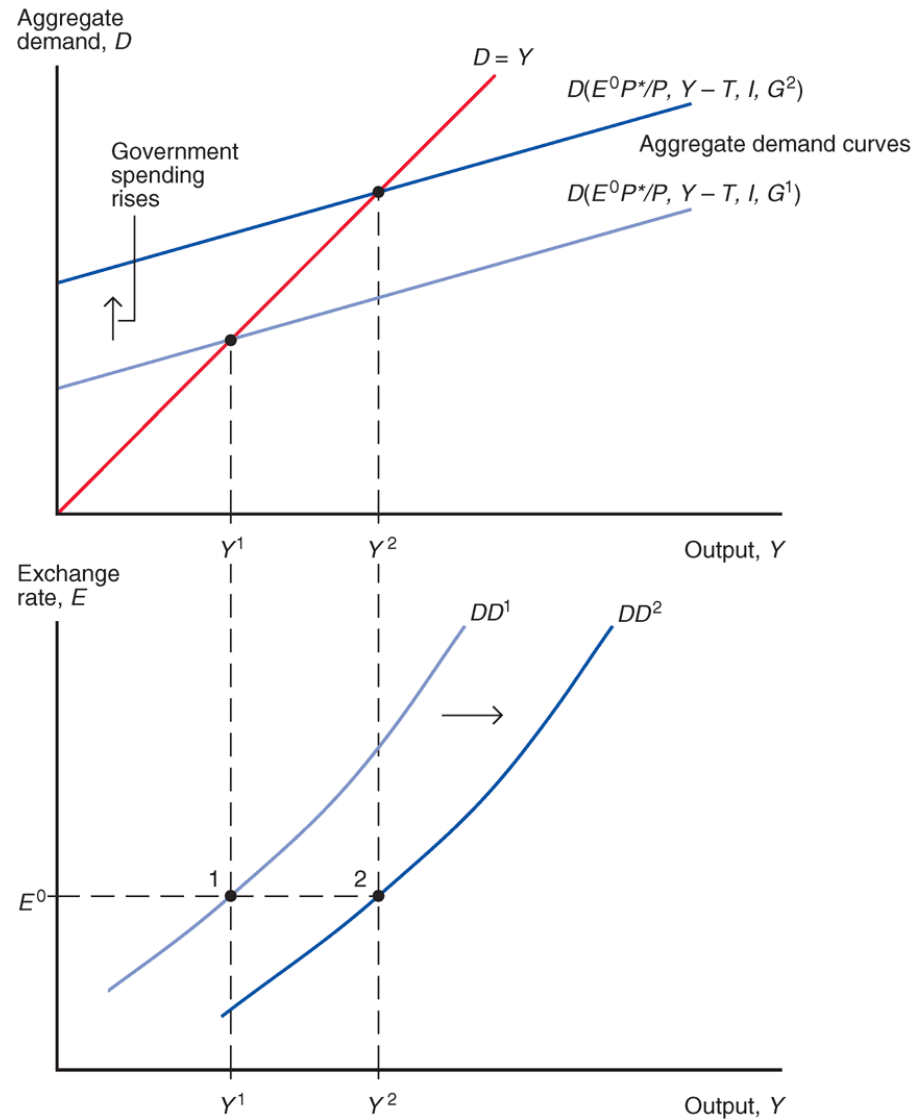
DD schedule

- shows combinations of output and the exchange rate at which the output market is in short run equilibrium (such that aggregate demand = aggregate output).
- slopes upward because a rise in the exchange rate causes aggregate demand and aggregate output to rise.

Shifting the *DD* Curve

- Changes in the exchange rate cause movements along a *DD* curve. Other changes cause it to shift:
 1. **Changes in *G***: more government purchases cause higher aggregate demand and output in equilibrium. Output increases for every exchange rate: the *DD* curve shifts right.

Fig. 16-5: Government Demand and the Position of the *DD* Schedule



Shifting the *DD* Curve (cont.)

- 2. Changes in T :** lower taxes generally increase consumption expenditure, increasing aggregate demand and output in equilibrium for every exchange rate: the *DD* curve shifts right.
- 3. Changes in I :** higher investment expenditure is represented by shifting the *DD* curve right.
- 4. Changes in P relative to P^* :** lower domestic prices relative to foreign prices are represented by shifting the *DD* curve right.

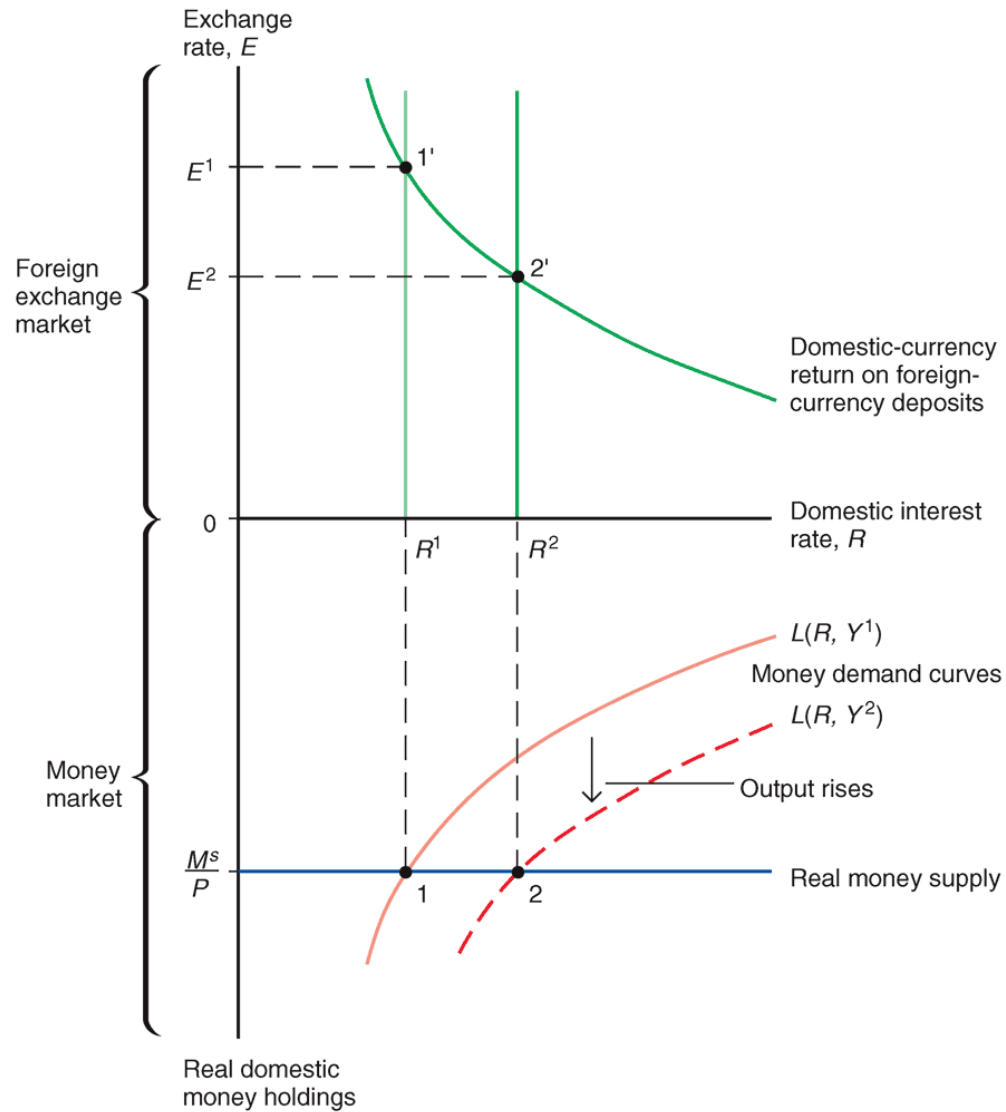
Shifting the *DD* Curve (cont.)

- 5. Changes in *C*:** willingness to consume more and save less is represented by shifting the *DD* curve right.
- 6. Changes in demand of domestic goods relative to foreign goods:** willingness to consume more domestic goods relative to foreign goods is represented by shifting the *DD* curve right.

Short Run Equilibrium in Asset Markets

- We consider two sets of asset markets:
 1. Foreign exchange markets
 - ◆ interest parity represents equilibrium:
$$R = R^* + (E^e - E)/E$$
 2. Money market
 - ◆ Equilibrium occurs when the quantity of real monetary assets supplied matches the quantity of real monetary assets demanded: $M^s/P = L(R, Y)$
 - ◆ A rise in income from production causes the demand of real monetary assets to increase.

Fig. 16-6: Output and the Exchange Rate in Asset Market Equilibrium



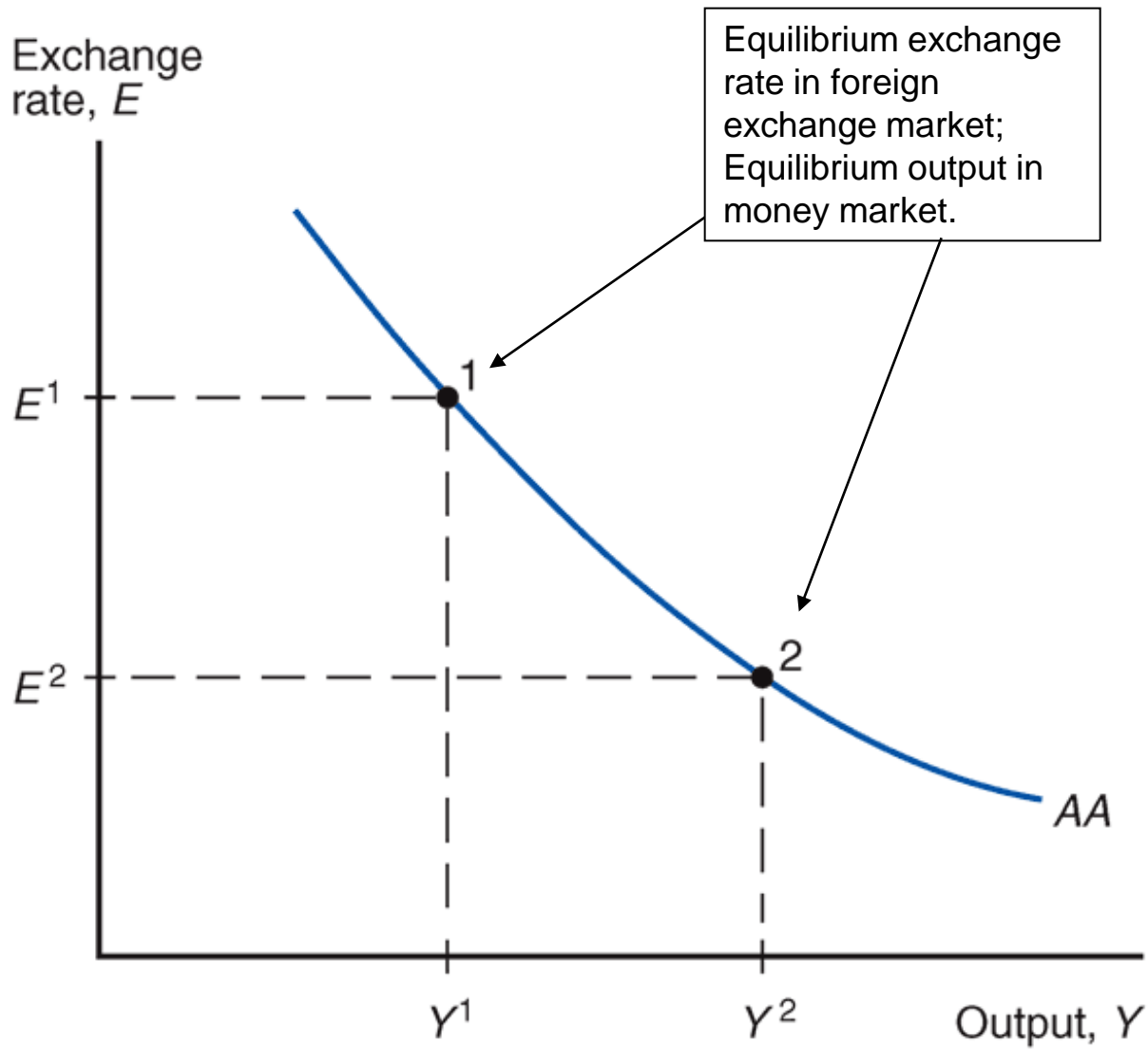
Short Run Equilibrium in Asset Markets (cont.)

- When income and production increase,
 - ◆ demand of real monetary assets increases,
 - ◆ leading to an increase in domestic interest rates,
 - ◆ leading to an appreciation of the domestic currency.
- Recall that an appreciation of the domestic currency is represented by a fall in E .
- When income and production decrease, the domestic currency depreciates and E rises.

Short Run Equilibrium in Asset Markets: AA Curve

- The inverse relationship between output and exchange rates needed to keep the foreign exchange markets and the money market in equilibrium is summarized as the *AA* curve.

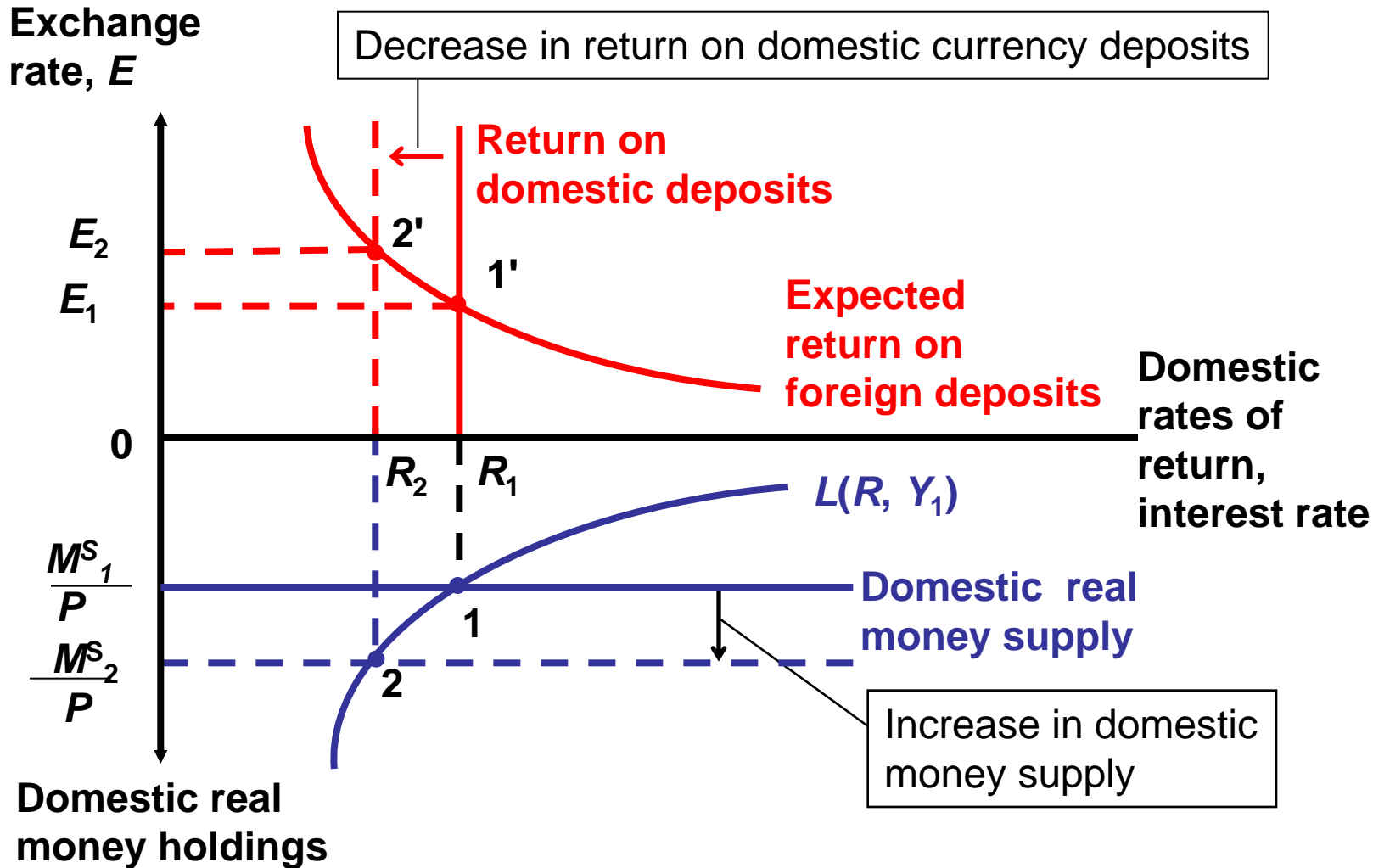
Fig. 16-7: The AA Schedule



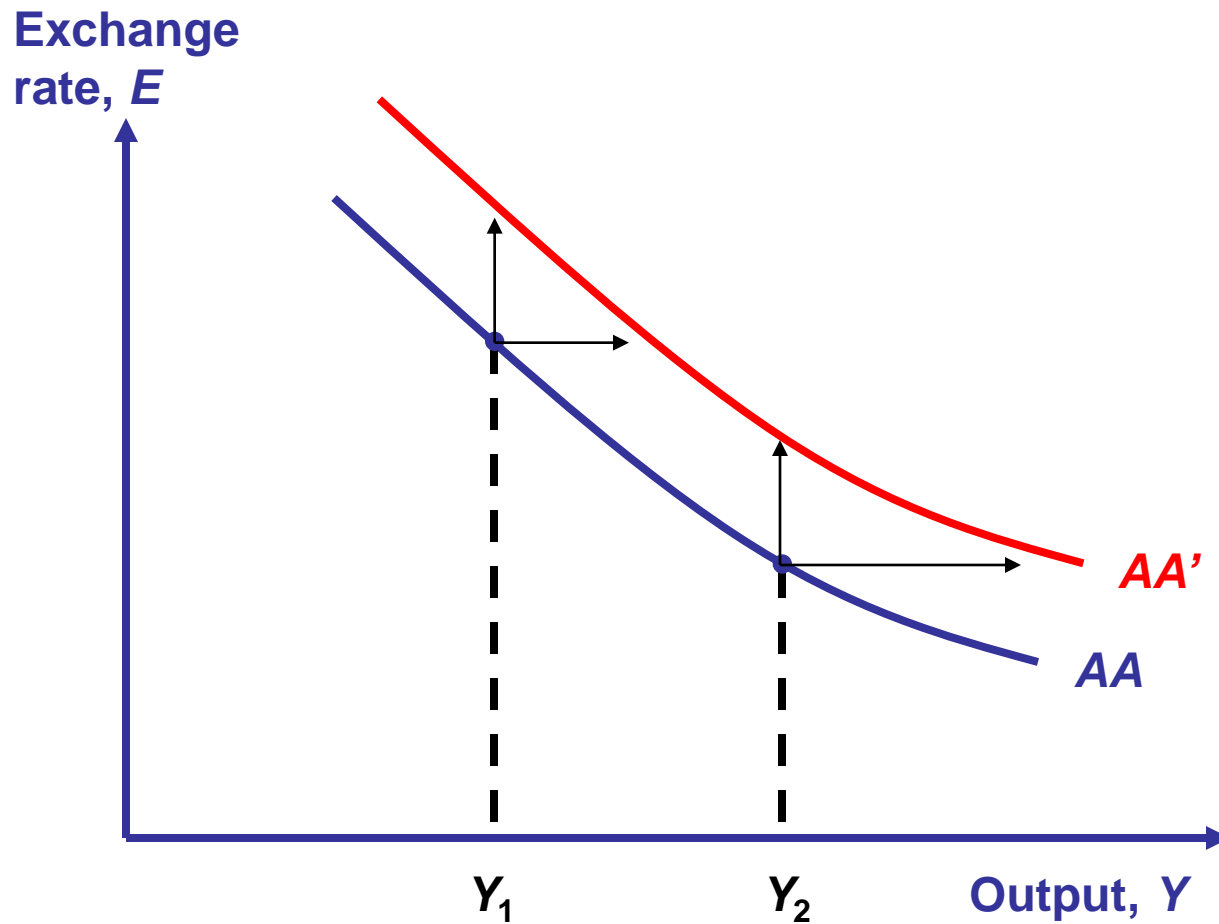
Shifting the AA Curve

- 1. Changes in M^s :** an increase in the money supply reduces interest rates in the short run, causing the domestic currency to depreciate (a rise in E) for every Y : the AA curve shifts up (right).

Shifting the AA Curve



Shifting the AA Curve (cont.)



Shifting the AA Curve (cont.)

- 2. Changes in P :** An increase in the level of average domestic prices decreases the supply of real monetary assets, increasing interest rates, causing the domestic currency to appreciate (a fall in E): the AA curve shifts down (left).
- 3. Changes in the demand of real monetary assets:** if domestic residents are willing to hold a lower amount of real money assets and more non-monetary assets, interest rates on non-monetary assets would fall, leading to a depreciation of the domestic currency (a rise in E): the AA curve shifts up (right).

Shifting the AA Curve (cont.)

- 4. Changes in R^* :** An increase in the foreign interest rates makes foreign currency deposits more attractive, leading to a depreciation of the domestic currency (a rise in E): the AA curve shifts up (right).
- 5. Changes in E^e :** if market participants expect the domestic currency to depreciate in the future, foreign currency deposits become more attractive, causing the domestic currency to depreciate (a rise in E): the AA curve shifts up (right).

Putting the Pieces Together: the *DD* and *AA* Curves

- A short run equilibrium means a *nominal exchange rate* and level of *output* such that:
 1. equilibrium in the output markets holds: aggregate demand equals aggregate output.
 2. equilibrium in the foreign exchange markets holds: interest parity holds.
 3. equilibrium in the money market holds: the quantity of real monetary assets supplied equals the quantity of real monetary assets demanded.

Putting the Pieces Together: the *DD* and *AA* Curves (cont.)

- A short run equilibrium occurs at the intersection of the *DD* and *AA* curves
 - ◆ output markets are in equilibrium on the *DD* curve
 - ◆ asset markets are in equilibrium on the *AA* curve

Fig. 16-8: Short-Run Equilibrium: The Intersection of DD and AA

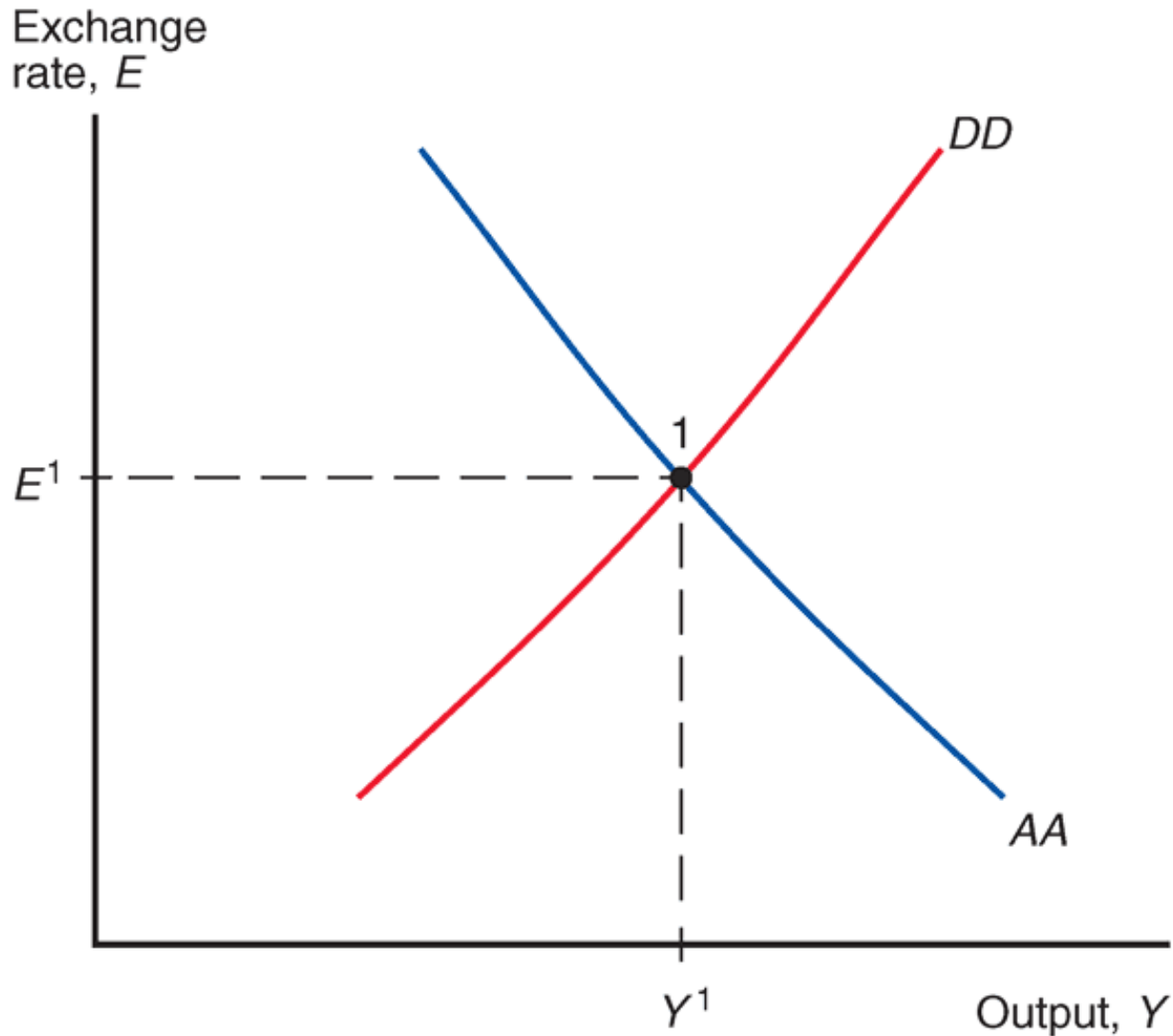
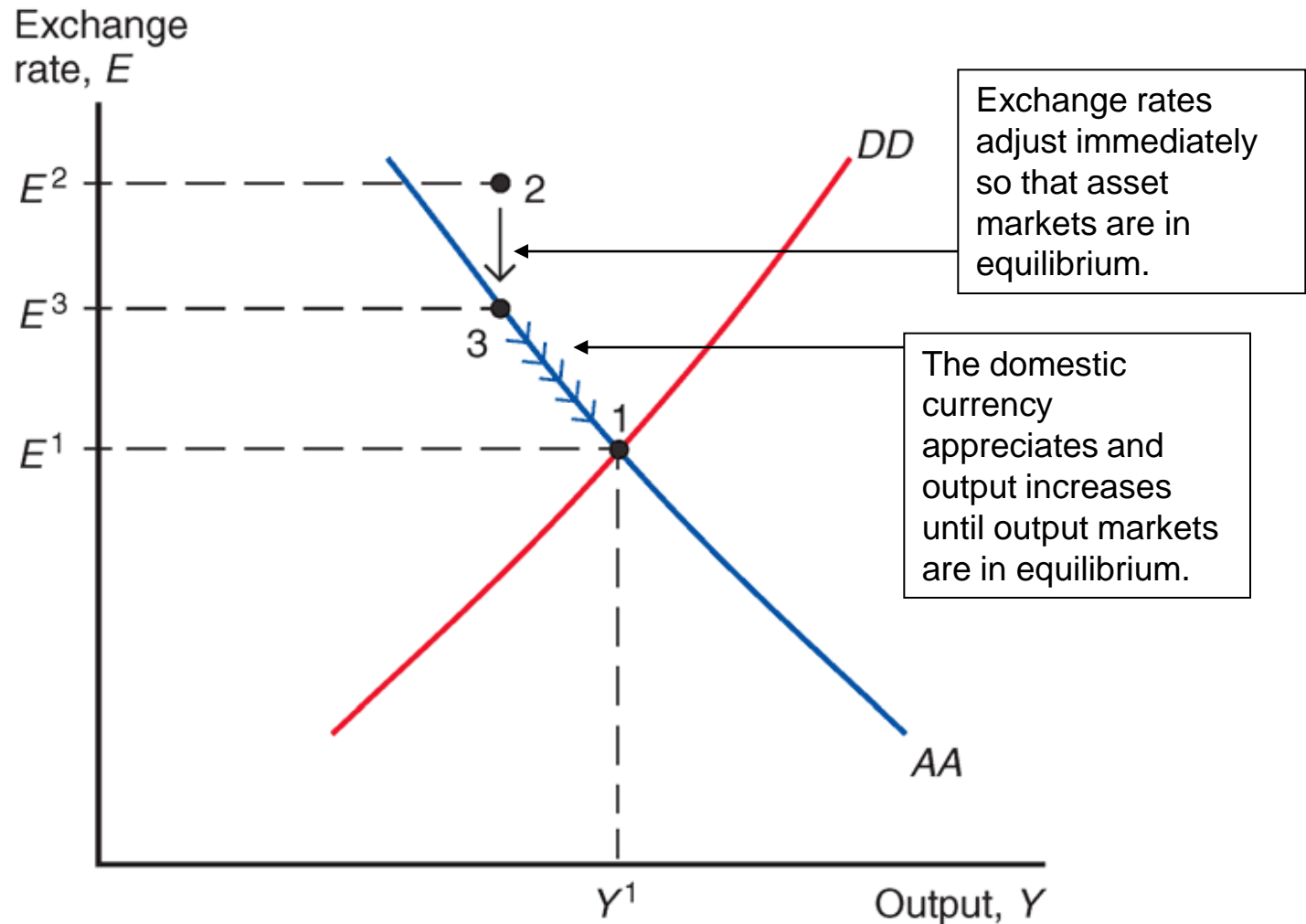


Fig. 16-9: How the Economy Reaches Its Short-Run Equilibrium



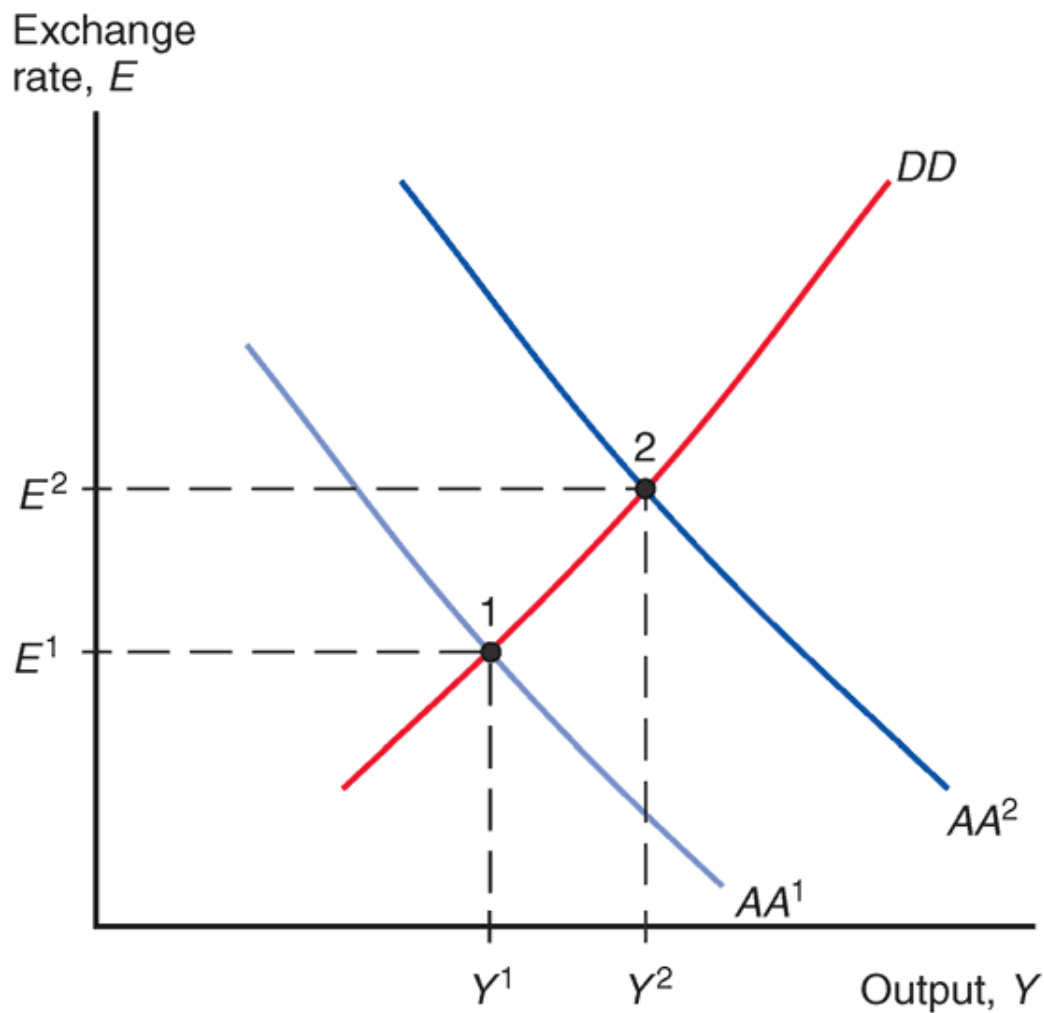
Temporary Changes in Monetary and Fiscal Policy

- **Monetary policy:** policy in which the central bank influences the supply of monetary assets.
 - ◆ Monetary policy is assumed to affect asset markets first.
- **Fiscal policy:** policy in which governments (fiscal authorities) influence the amount of government purchases and taxes.
 - ◆ Fiscal policy is assumed to affect aggregate demand and output first.
- Temporary policy changes are expected to be reversed in the near future and thus do not affect expectations about exchange rates in the long run.

Temporary Changes in Monetary Policy

- An increase in the quantity of monetary assets supplied lowers interest rates in the short run, causing the domestic currency to depreciate (a rise in E).
 - ◆ The AA shifts up (right).
 - ◆ Domestic products relative to foreign products are cheaper so that aggregate demand and output increase until a new short run equilibrium is achieved.

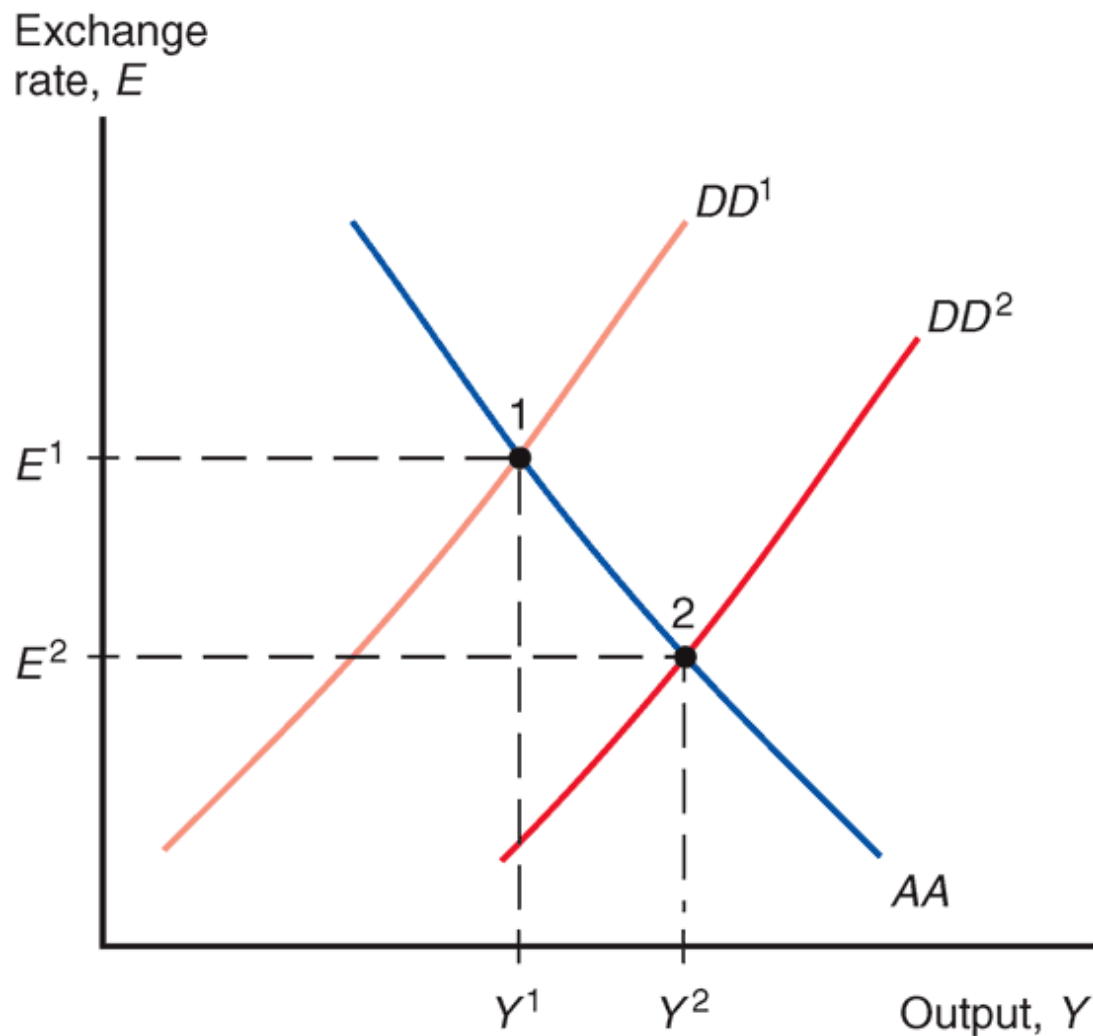
Fig. 16-10: Effects of a Temporary Increase in the Money Supply



Temporary Changes in Fiscal Policy

- An increase in government purchases or a decrease in taxes increases aggregate demand and output in the short run.
 - ◆ The DD curve shifts right.
 - ◆ Higher output increases demand of real monetary assets,
 - ◆ thereby increasing interest rates,
 - ◆ causing the domestic currency to appreciate (a fall in E).

Fig. 16-11: Effects of a Temporary Fiscal Expansion



Policies to Maintain Full Employment

- Resources used in the production process can either be over-employed or underemployed.
- When resources are used effectively and sustainably, economists say that production is at its potential or natural level.
 - ◆ When resources are not used effectively, resources are underemployed: high unemployment, few hours worked, idle equipment, lower than normal production of goods and services.
 - ◆ When resources are not used sustainably, labor is over-employed: low unemployment, many overtime hours, over-utilized equipment, higher than normal production of goods and services.

Fig. 16-12: Maintaining Full Employment After a Temporary Fall in World Demand for Domestic Products

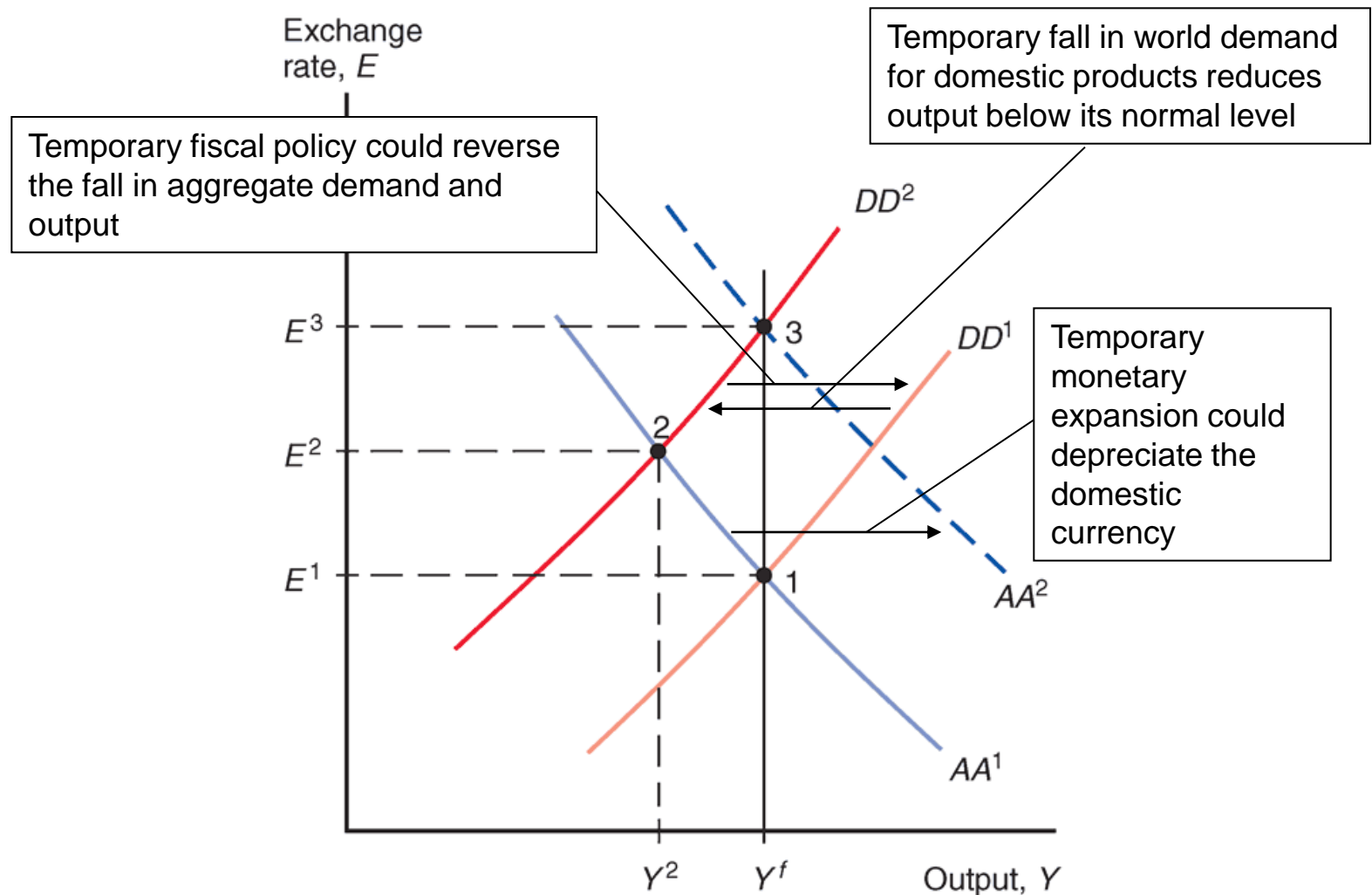
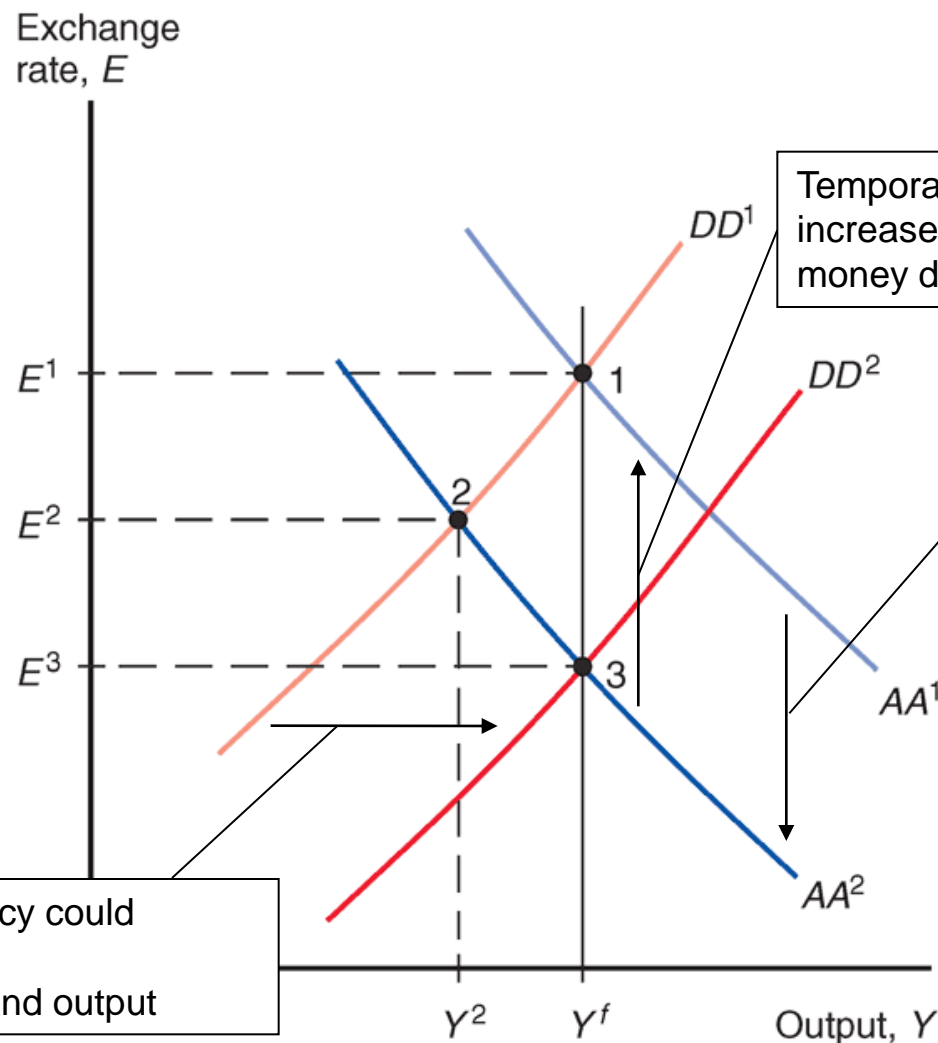


Fig. 16-13: Policies to Maintain Full Employment After a Money Demand Increase



Temporary monetary policy could increase money supply to match money demand

Increase in money demand raises interest rates and appreciates the domestic currency

Temporary fiscal policy could increase aggregate demand and output

Policies to Maintain Full Employment (cont.)

- Policies to maintain full employment may seem easy in theory, but are hard in practice.
- 1. We have assumed that prices and expectations do not change, but people may anticipate the effects of policy changes and modify their behavior.
 - ◆ Workers may require higher wages if they expect overtime and easy employment, and producers may raise prices if they expect high wages and strong demand due to monetary and fiscal policies.
 - ◆ Fiscal and monetary policies may therefore create price changes and inflation thereby preventing high output and employment: **inflationary bias**

Policies to Maintain Full Employment (cont.)

2. Economic data are difficult to measure and to understand.
 - ◆ Policy makers can not interpret data about asset markets and aggregate demand with certainty, and sometimes they make mistakes.
3. Changes in policies take time to be implemented and to affect the economy.
 - ◆ Because they are slow, policies may affect the economy after the effects of an economic change have dissipated.
4. Policies are sometimes influenced by political or bureaucratic interests.

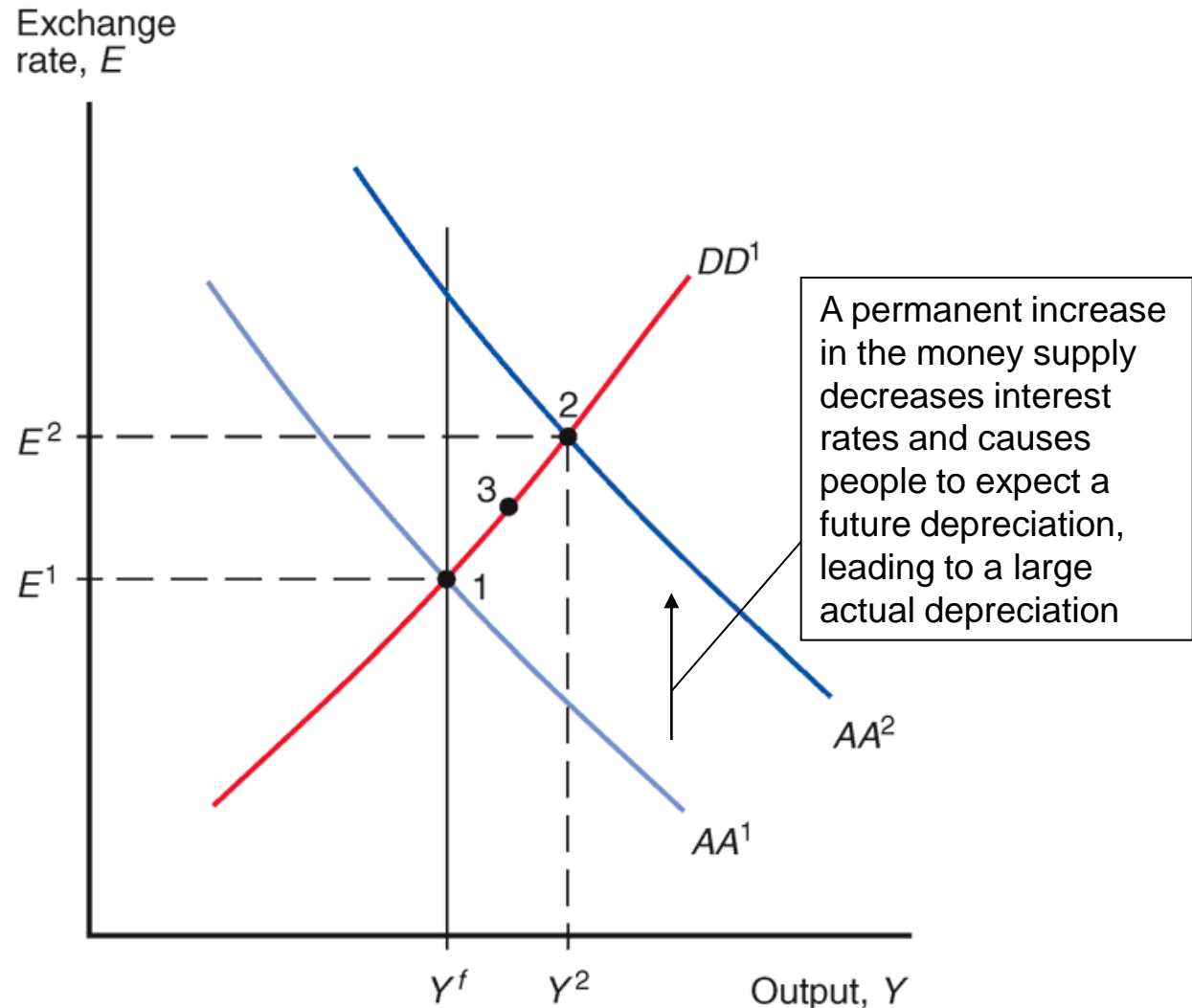
Permanent Changes in Monetary and Fiscal Policy

- “Permanent” policy changes are those that are assumed to modify people’s expectations about exchange rates in the long run.

Permanent Changes in Monetary Policy

- A permanent increase in the quantity of monetary assets supplied
 - ◆ lowers interest rates in the short run and makes people expect future depreciation of the domestic currency, increasing the expected rate of return on foreign currency deposits.
 - ◆ The domestic currency depreciates more than (E rises more than) the case when expectations are constant (Chapter 14 results).
 - ◆ The AA curve shifts up (right) more than the case when expectations are held constant.

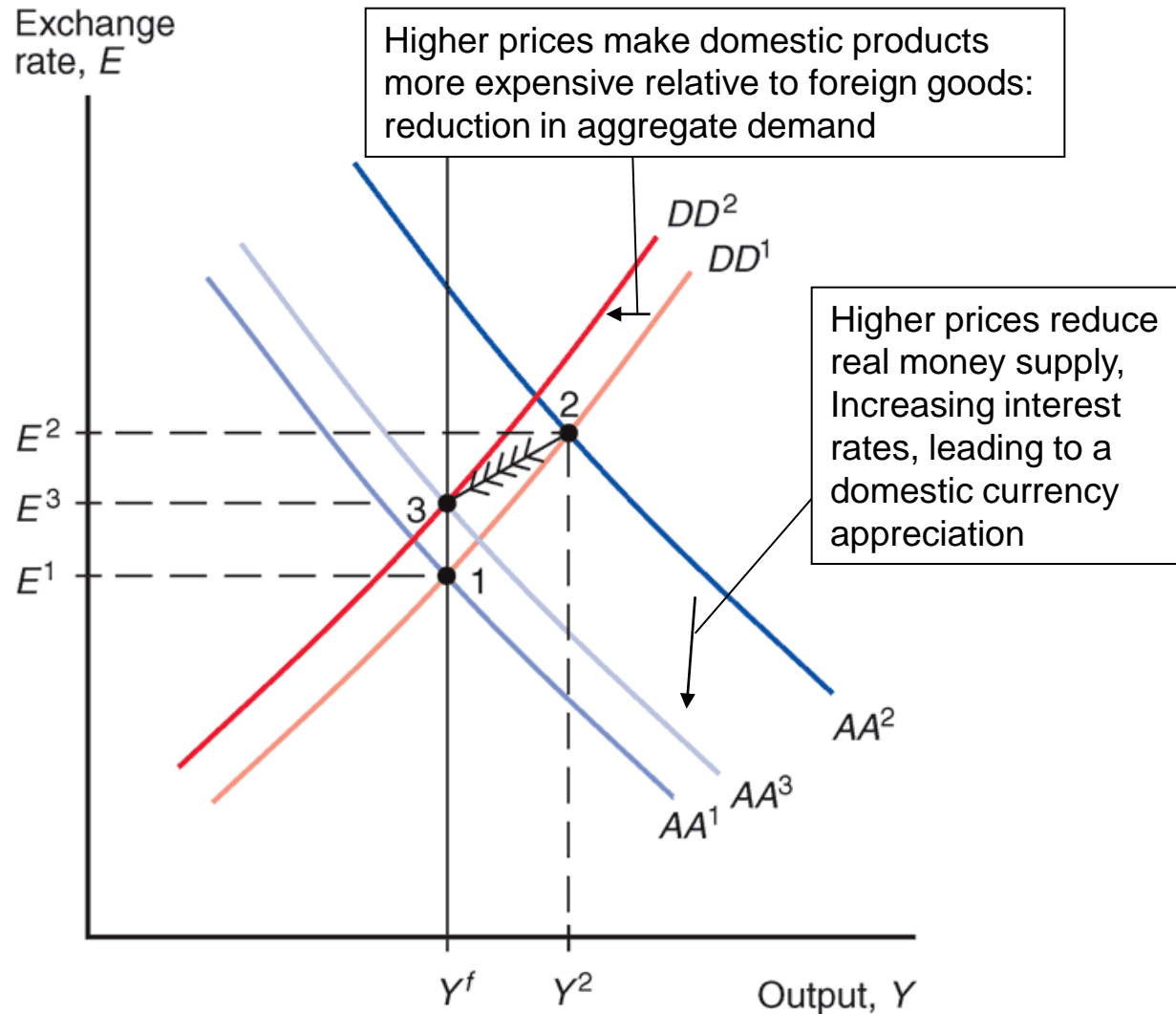
Fig. 16-14: Short-Run Effects of a Permanent Increase in the Money Supply



Effects of Permanent Changes in Monetary Policy in the Long Run

- With employment and hours above their normal levels, there is a tendency for wages to rise over time.
- With strong demand of goods and services and with increasing wages, producers have an incentive to raise prices over time.
- Both higher wages and higher output prices are reflected in a higher level of average prices.
- What are the effects of rising prices?

Fig. 16-15: Long-Run Adjustment to a Permanent Increase in the Money Supply



In the long run, output returns to its normal level, and we also see overshooting: $E_1 < E_3 < E_2$

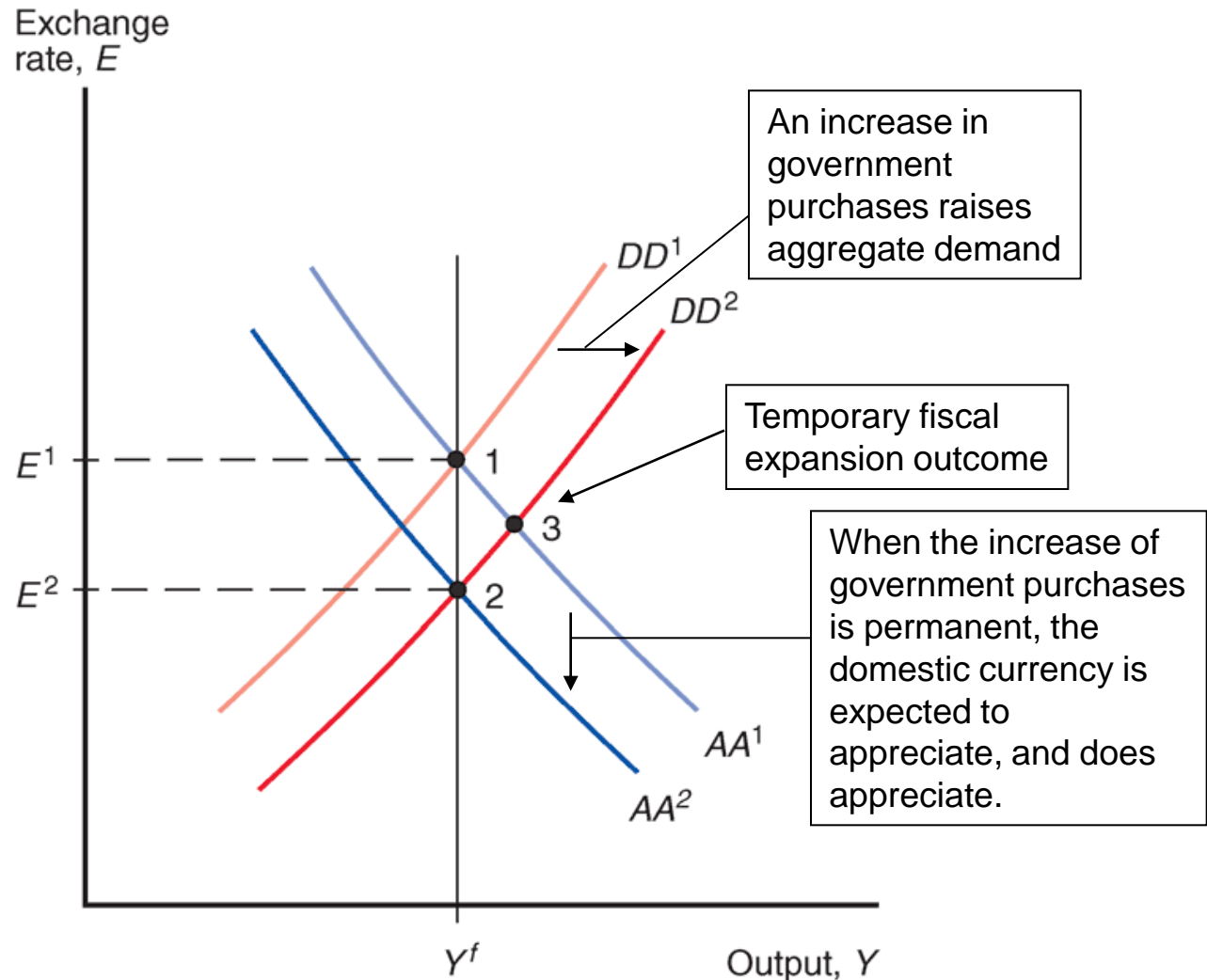
Effects of Permanent Changes in Fiscal Policy

- A permanent increase in government purchases or reduction in taxes
 - ◆ increases aggregate demand
 - ◆ makes people expect the domestic currency to appreciate in the short run due to increased aggregate demand, thereby reducing the expected rate of return on foreign currency deposits and making the domestic currency appreciate.
- The first effect increases aggregate demand of domestic products, the second effect decreases aggregate demand of domestic products (by making them more expensive).

Effects of Permanent Changes in Fiscal Policy (cont.)

- If the change in fiscal policy is expected to be permanent, the first and second effects exactly offset each other, so that output remains at its potential or natural (or long run) level.
- We say that an increase in government purchases completely **crowds out** net exports, due to the effect of the appreciated domestic currency.

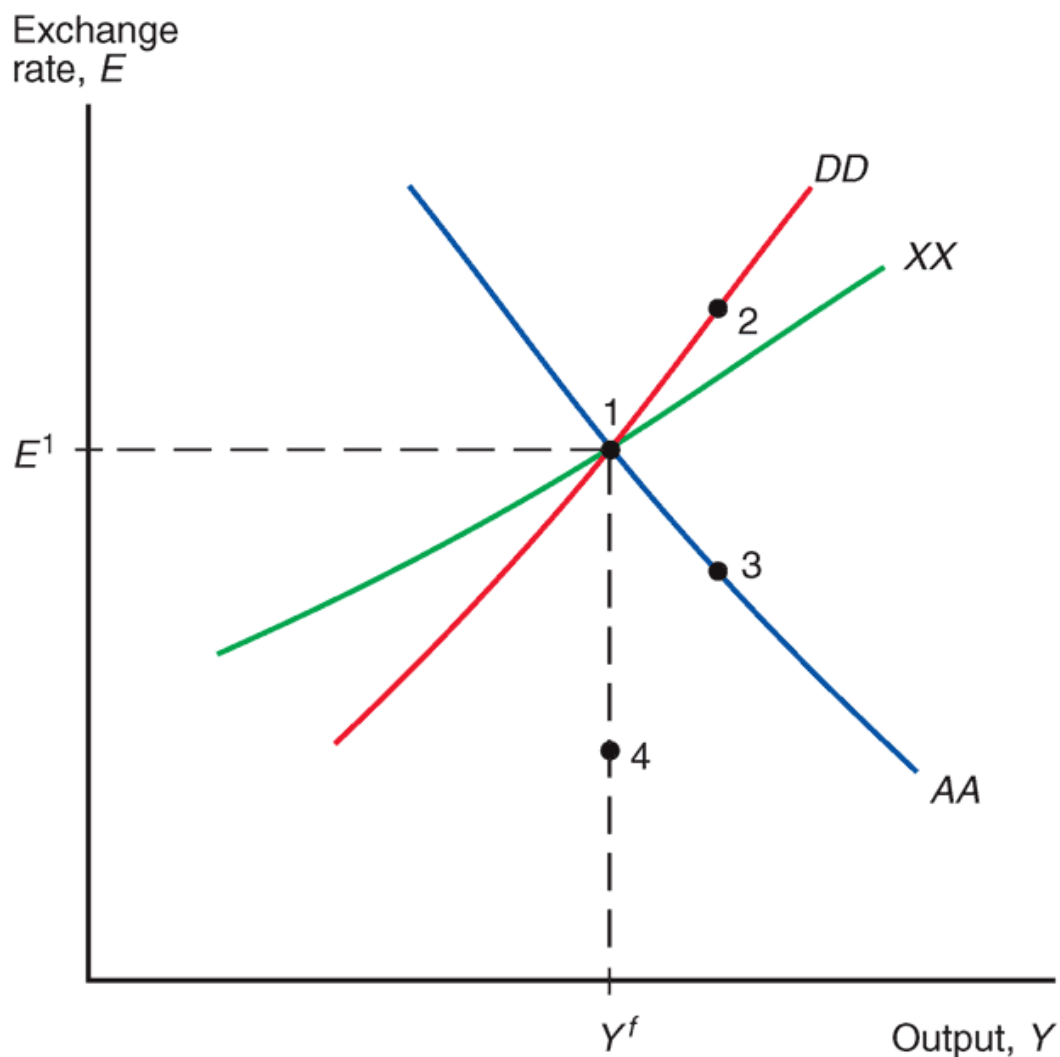
Fig. 16-16: Effects of a Permanent Fiscal Expansion



Macroeconomic Policies and the Current Account

- To determine the effect of monetary and fiscal policies on the current account,
 - ◆ derive the XX curve to represent the combinations of output and exchange rates at which the current account is at its desired level.
- As income from production increases, imports increase and the current account decreases when other factors remain constant.
- To keep the current account at its desired level, the domestic currency must depreciate as income from production increases: the XX curve should slope upward.

Fig. 16-17: How Macroeconomic Policies Affect the Current Account



Macroeconomic Policies and the Current Account (cont.)

- The *XX* curve slopes upward but is flatter than the *DD* curve.
 - ◆ *DD* represents equilibrium values of aggregate demand and domestic output.
 - ◆ As domestic income and production increase, domestic saving increases, which means that aggregate demand (willingness to spend) *by domestic residents* does not rise as rapidly as income and production.

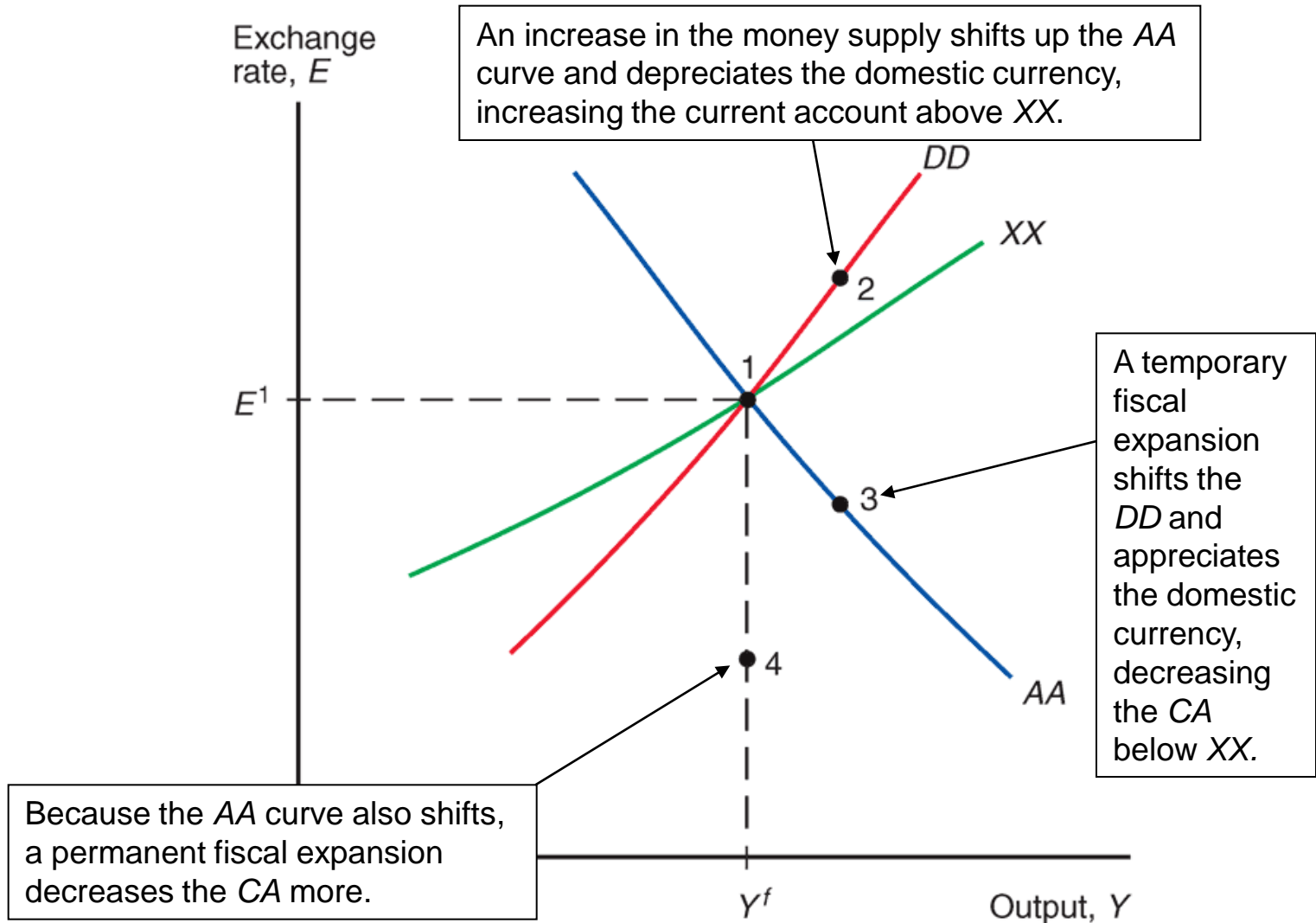
Macroeconomic Policies and the Current Account (cont.)

- ◆ As domestic income and production increase, the domestic currency must depreciate to entice foreigners to increase their demand of domestic products in order to keep the current account (only one component of aggregate demand) at its desired level—on the *XX* curve.
- ◆ As domestic income and production increase, the domestic currency must depreciate *more rapidly* to entice foreigners to increase their demand of domestic products in order to keep *aggregate* demand (by domestic residents and foreigners) equal to production—on the *DD* curve.

Macroeconomic Policies and the Current Account (cont.)

- Policies affect the current account through their influence on the value of the domestic currency.
 - ◆ An increase in the quantity of monetary assets supplied depreciates the domestic currency and often increases the current account in the short run.
 - ◆ An increase in government purchases or decrease in taxes appreciates the domestic currency and often decreases the current account in the short run.

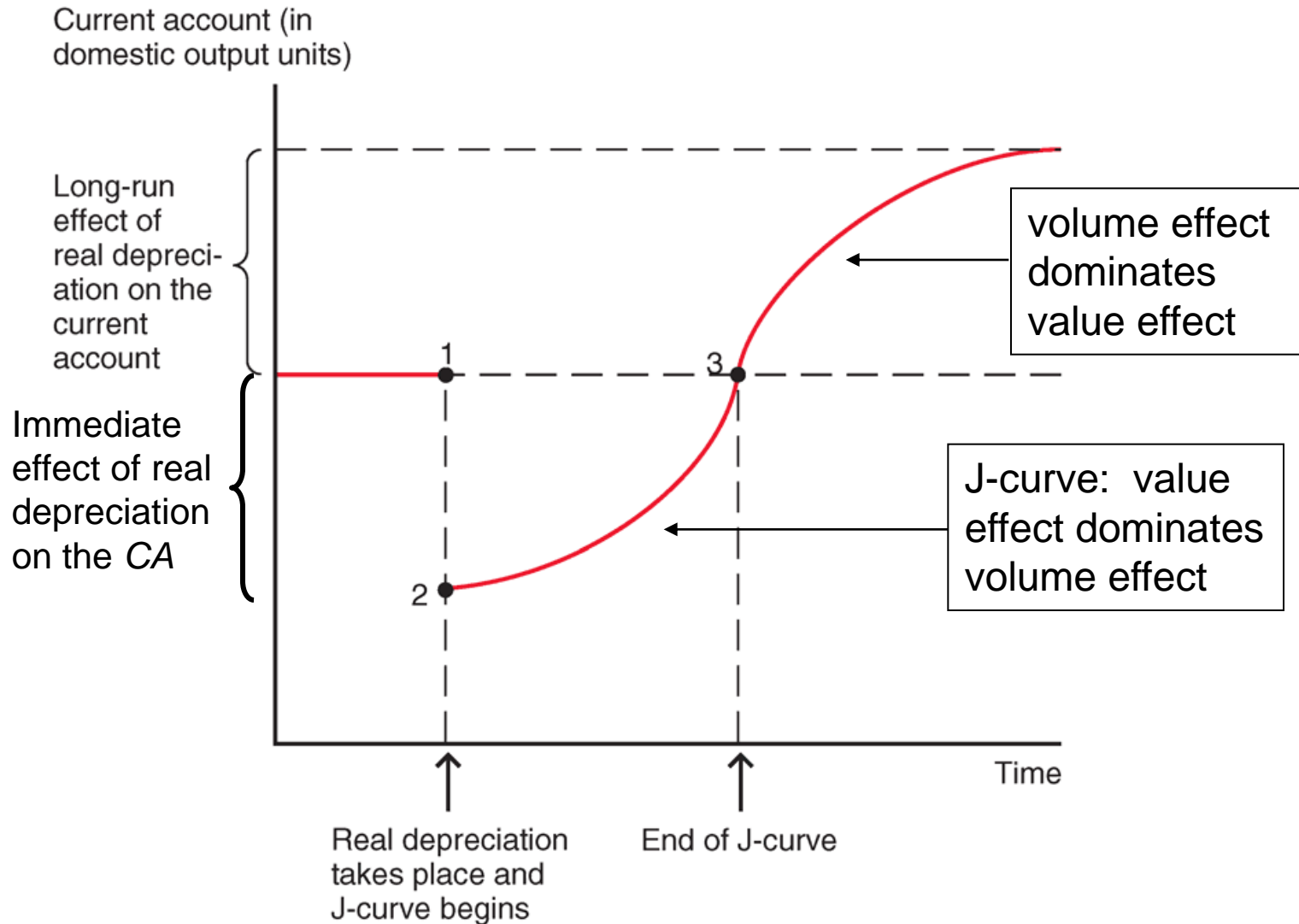
Fig. 16-17: How Macroeconomic Policies Affect the Current Account



Value Effect, Volume Effect and the J-curve

- If the volume of imports and exports is fixed in the short run, a depreciation of the domestic currency
 - ◆ will not affect the volume of imports or exports,
 - ◆ but will increase the value/price of imports in domestic currency and decrease the current account: $CA \approx EX - IM$.
 - ◆ The value of exports in domestic currency does not change.
- The current account could immediately decrease after a currency depreciation, then increase gradually as the volume effect begins to dominate the value effect.

Fig. 16-18: The J-Curve



Value Effect, Volume Effect and the J-curve (cont.)

- **Pass through** from the exchange rate to import prices measures the percentage by which import prices change when the value of the domestic currency changes by 1%.
- In the *DD-AA* model, the pass through rate is 100%: import prices in domestic currency exactly match a depreciation of the domestic currency.
- In reality, pass through may be less than 100% due to price discrimination in different countries.
 - ◆ firms that set prices may decide not to match changes in the exchange rate with changes in prices of foreign products denominated in domestic currency.

Value Effect, Volume Effect and the J-curve (cont.)

- If prices of foreign products in domestic currency do not change much because of a pass through rate less than 100%, then the
 - ◆ value of imports will not rise much after a domestic currency depreciation, and the current account will not fall much, making the J-curve effect smaller.
 - ◆ volume of imports and exports will not adjust much over time since domestic currency prices do not change much.
- Pass through of less than 100% dampens the effect of depreciation or appreciation on the current account.

IS-LM Model

- In the *DD-AA* model, we assumed that investment expenditure is determined by exogenous business decisions.
- In reality, the amount of investment expenditure depends on the interest rate.
 - ◆ Investment projects use saved or borrowed funds, and the relevant interest rate represents the (real) cost of spending or borrowing those funds.
 - ◆ A higher interest rate means less investment expenditure.
- The *IS-LM* model predicts that investment expenditure is inversely related to the relevant interest rate.

IS-LM Model (cont.)

- The *IS-LM* model also allows for consumption expenditure and expenditure on imports to depend on the interest rate.
 - ◆ A higher interest rate makes saving more attractive and consumption expenditure (on domestic and foreign products) less attractive.
 - ◆ However, the effect of the interest rate is much larger on investment expenditure than it is on consumption expenditure and imports.

IS-LM Model (cont.)

- The IS-LM model expresses aggregate demand as:

$$D = C(Y - T, R - \pi^e) + I(R - \pi^e) + G + CA(EP^*/P, Y - T, R - \pi^e)$$

Consumption as a function of disposable income and the real interest rate $R - \pi^e$

Investment as a function of the real interest rate $R - \pi^e$

Government purchases are exogenous

Current account as a function of the real exchange rate, disposable income and the real interest rate $R - \pi^e$

- Or more simply:

$$D = D(EP^*/P, Y - T, R - \pi^e, G)$$

IS-LM Model (cont.)

- Instead of relating exchange rates and output, the *IS-LM* relates interest rates and output.
- In equilibrium, aggregate output = aggregate demand
 - ◆ $Y = D(EP^*/P, Y - T, R - \pi^e, G)$
- In equilibrium, interest parity holds
 - ◆ $R = R^* + (E^e - E)/E$
 - ◆ $E(1 + R) = ER^* + E^e$
 - ◆ $E(1 + R - R^*) = E^e$
 - ◆ $E = E^e / (1 + R - R^*)$

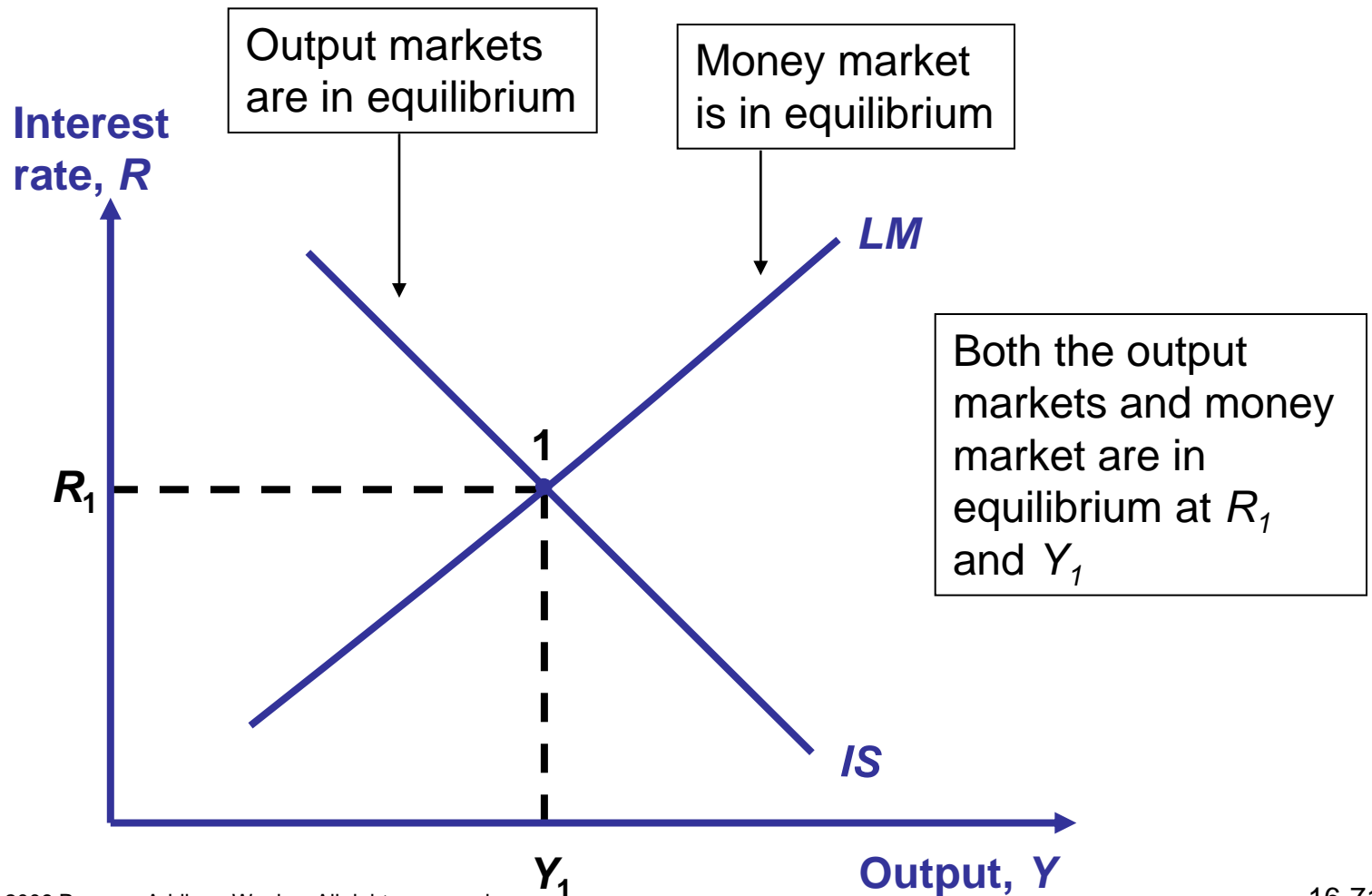
IS-LM Model (cont.)

- $Y = D(E^e P^* / P(1 + R - R^*), Y - T, R - \pi^e, G)$
 - ◆ This equation describes the *IS* curve: combinations of interest rates and output such that aggregate demand equals aggregate output, given values of exogenous variables $E^e, P^*, P, R^*, T, \pi^e$, and G .
 - ◆ Lower interest rates increase investment demand (and consumption and import demand), leading to higher aggregate demand and higher aggregate output in equilibrium.
 - ◆ The *IS* curve slopes down.

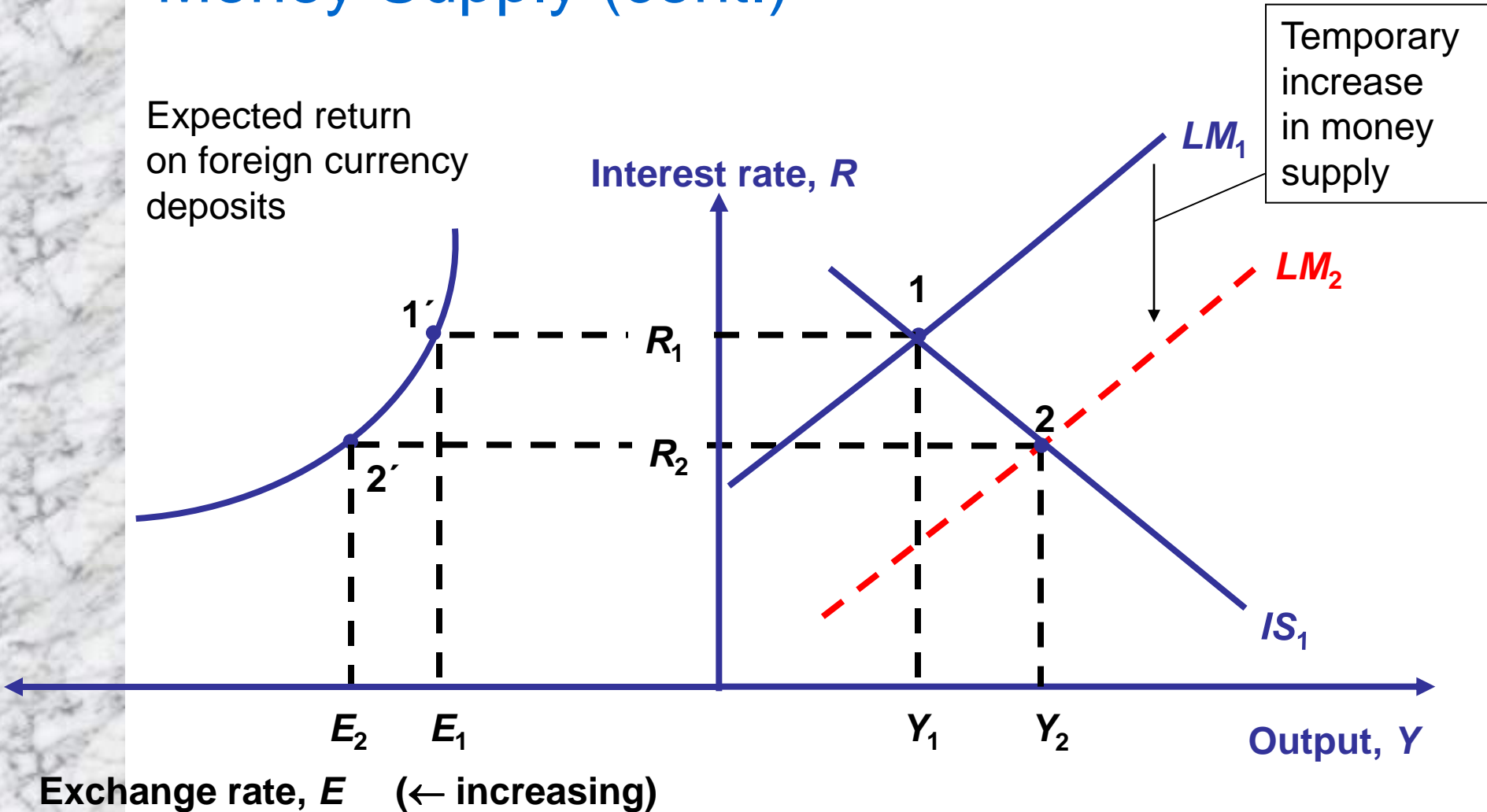
IS-LM Model (cont.)

- In equilibrium, the quantity of real monetary assets supplied matches the quantity of real monetary assets demanded: $M^s/P = L(R, Y)$
 - ◆ This equation describes the *LM* curve: combinations of interest rates and output such that the money market is in equilibrium, given values of exogenous values P and M^s .
 - ◆ Higher income is predicted to cause higher demand of real monetary assets and higher interest rates in the money market.
 - ◆ The *LM* curve slopes up.

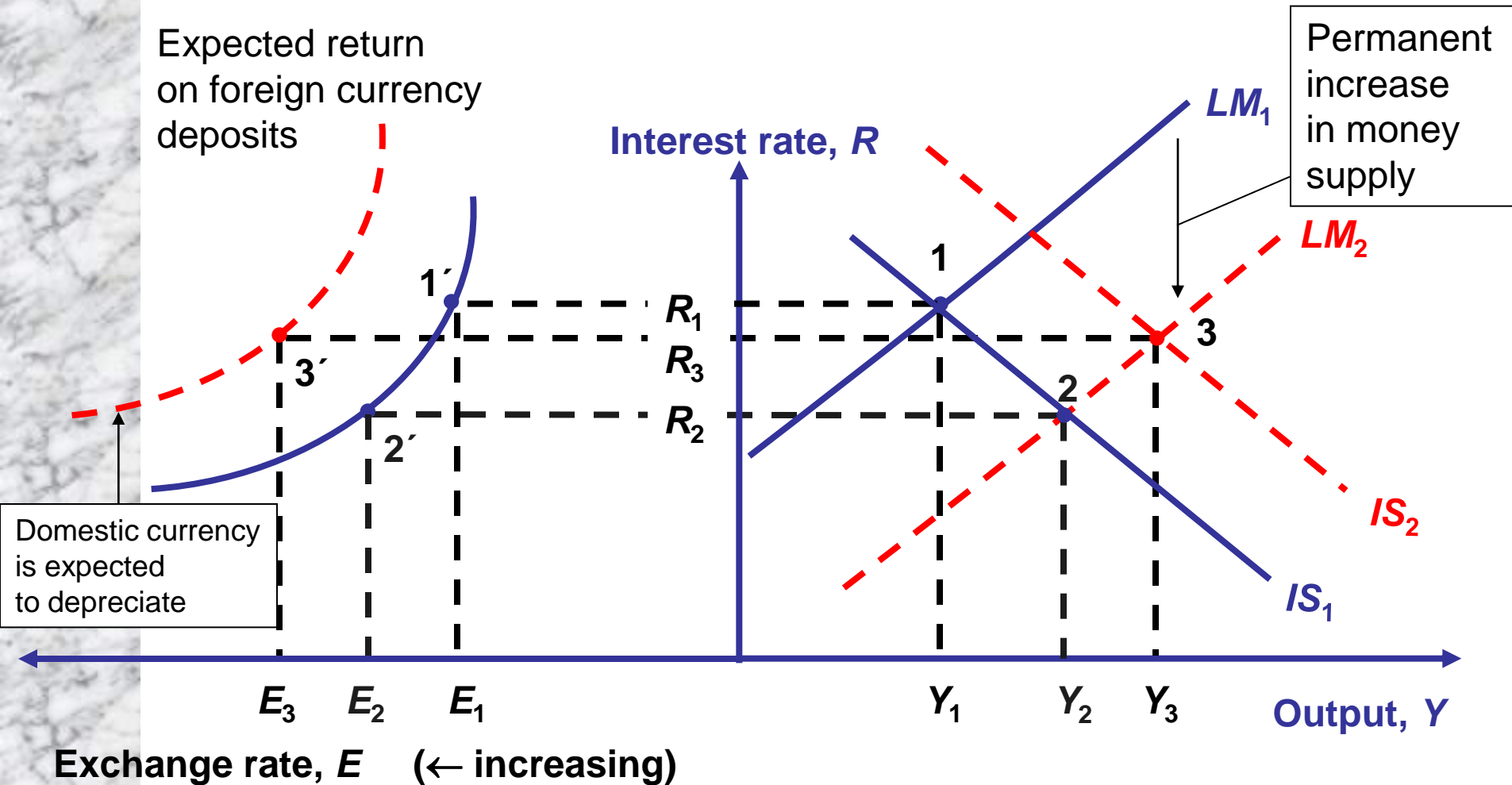
IS-LM Model (cont.)



Effects of Temporary Changes in the Money Supply (cont.)

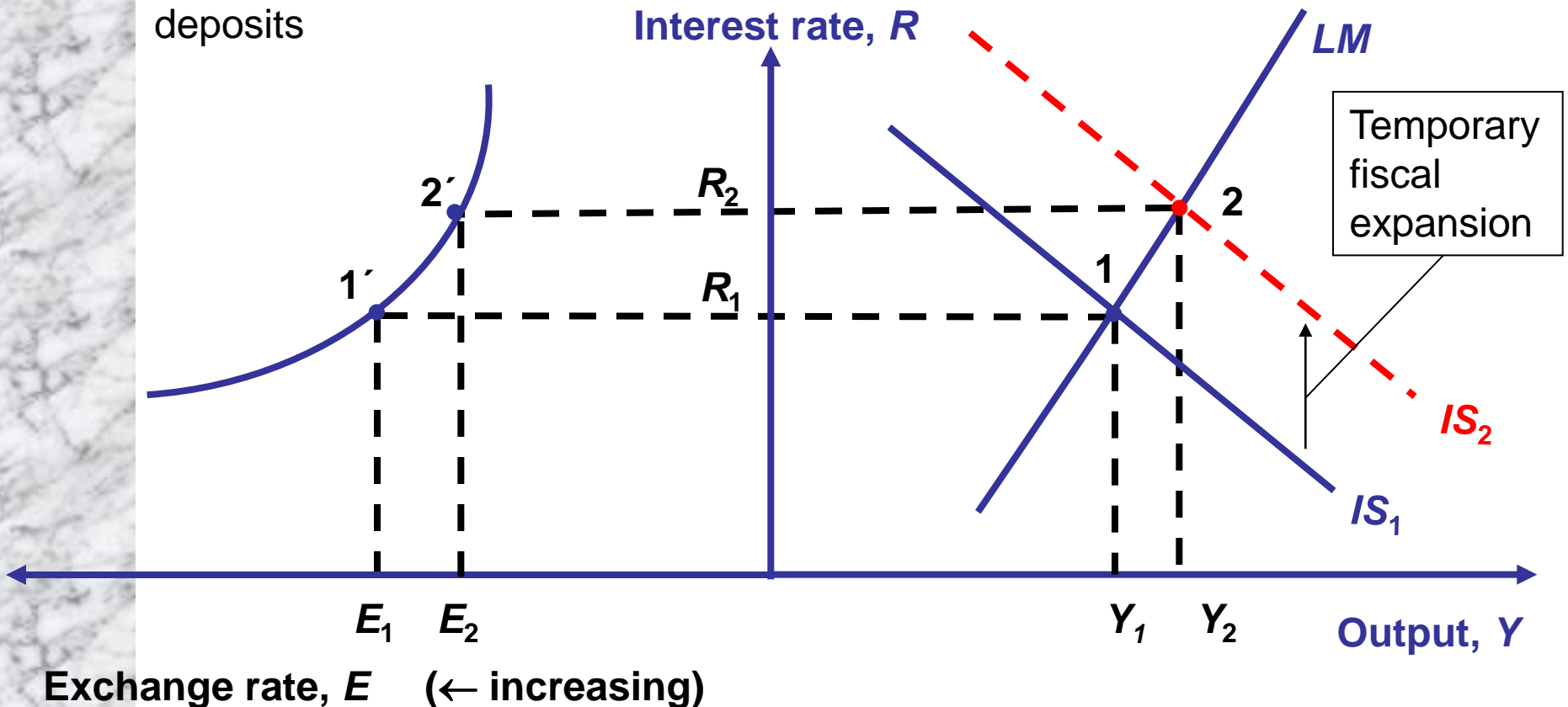


Effects of Permanent Changes in the Money Supply in the Short Run



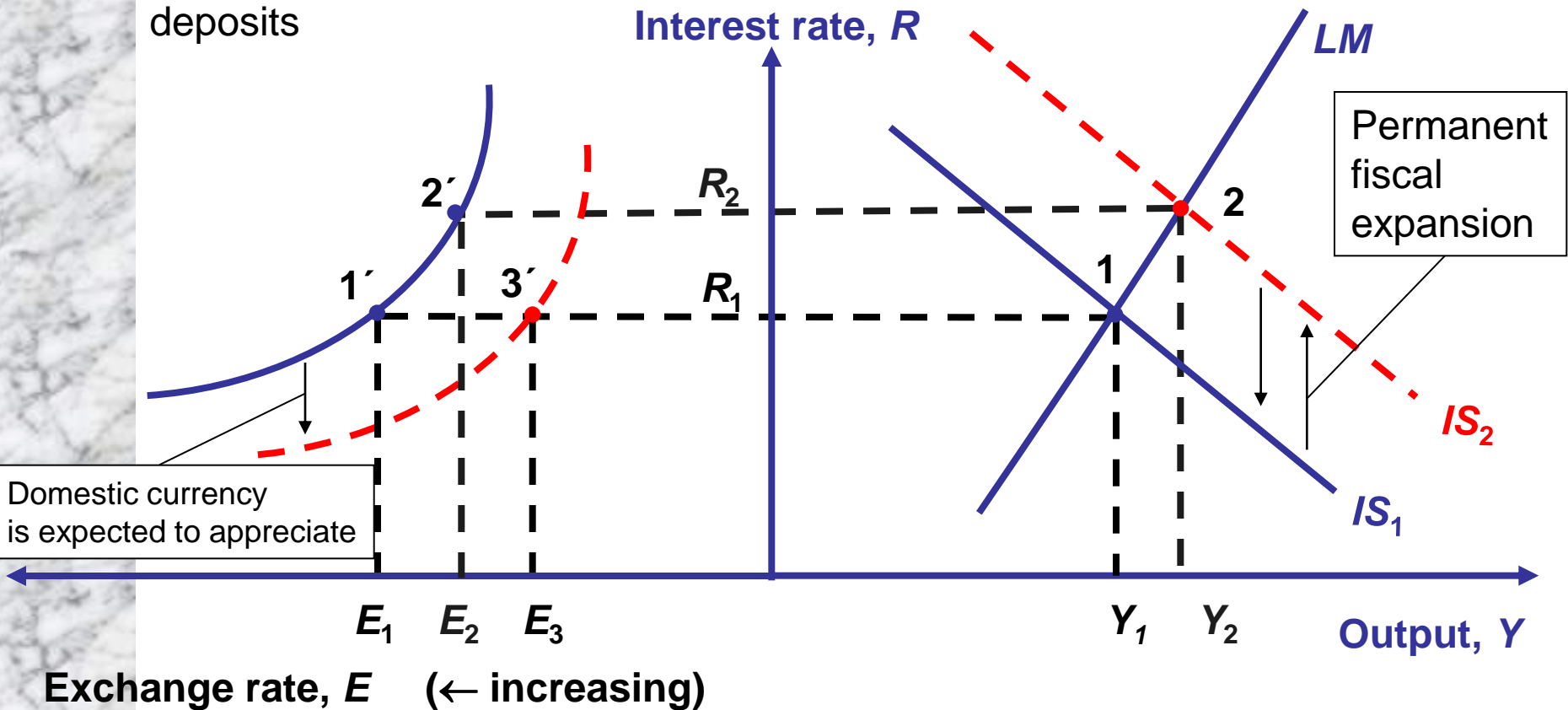
Effects of Temporary Changes in Fiscal Policy

Expected return on foreign currency deposits



Effects of Permanent Changes in Fiscal Policy

Expected return on foreign currency deposits



Summary

1. Aggregate demand is influenced by disposable income and the real exchange rate.
2. The *DD* curve shows combinations of exchange rates and output where aggregate demand = aggregate output.
3. The *AA* curve shows combinations of exchange rates and output where the foreign exchange markets and money market are in equilibrium.

Summary (cont.)

4. In the *DD-AA* model, we assume that a depreciation of the domestic currency leads to an increase in the current account and aggregate demand.
5. But reality is more complicated, and the J-curve shows that the value effect at first dominates the volume effect.

Summary (cont.)

6. A temporary increase in the money supply is predicted to increase output and depreciate the domestic currency.
7. A permanent increase does both to a larger degree in the short run, but in the long run output returns to its normal level.
8. A temporary increase in government purchases is predicted to increase output and appreciate the domestic currency.
9. A permanent increase in government purchases is predicted to completely crowd out net exports, and therefore to have no effect on output.

Summary (cont.)

10. The *IS-LM* model compares interest rates with output.
11. The *IS* curve shows combinations of interest rates and output where aggregate demand = aggregate output.
12. The *LM* curve shows combinations of interest rates and output where the money market is in equilibrium.
13. The *IS-LM* model can be used with the model of the foreign exchange markets to compare output, interest rates and exchange rates.

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Additional Chapter Art

Table 16-1: Factors Determining the Current Account

Change	Effect on current account, <i>CA</i>
Real exchange rate, $EP^*/P \uparrow$	$CA \uparrow$
Real exchange rate, $EP^*/P \downarrow$	$CA \downarrow$
Disposable income, $Y^d \uparrow$	$CA \downarrow$
Disposable income, $Y^d \downarrow$	$CA \uparrow$

Fig. 16-1: Aggregate Demand as a Function of Output

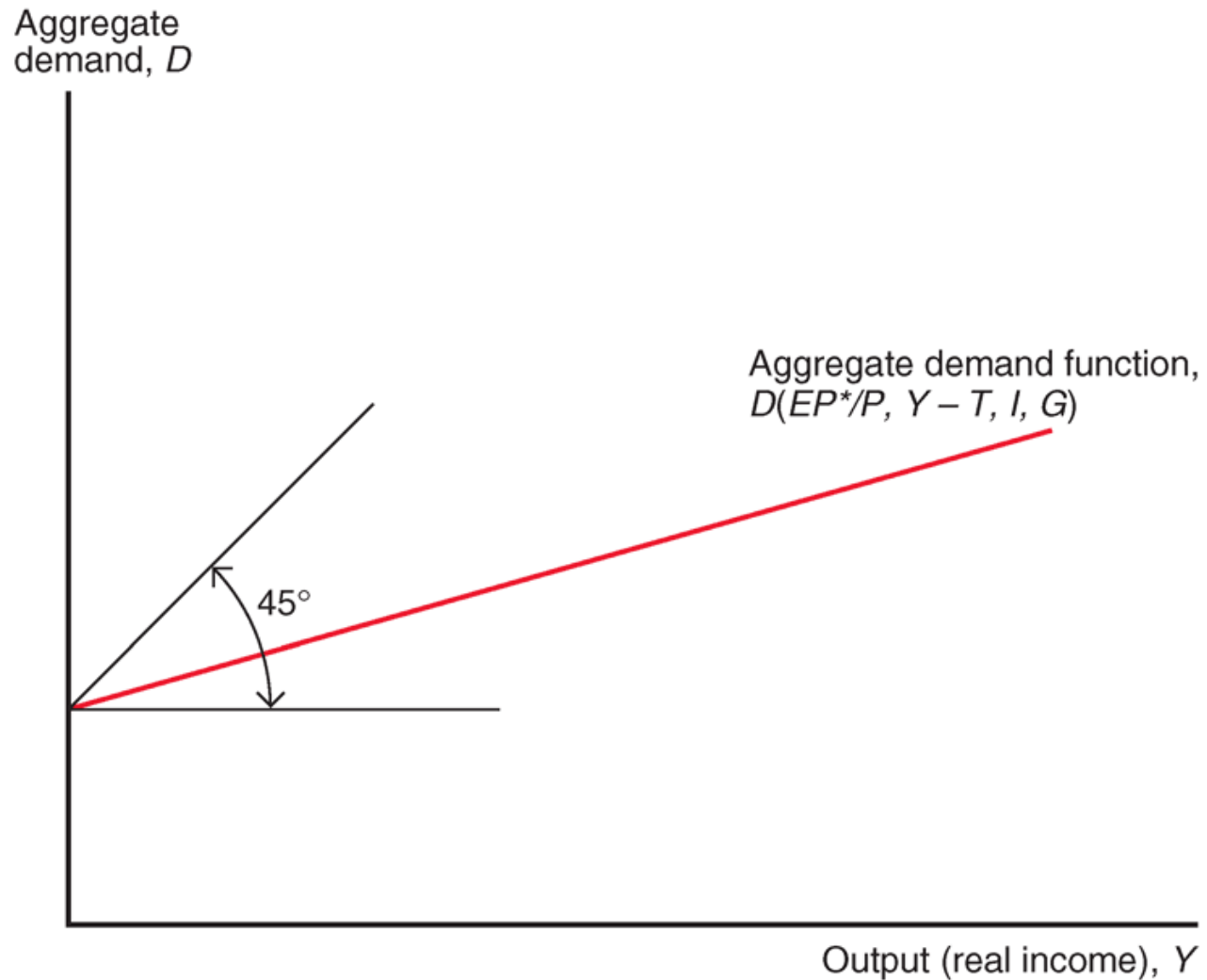


Fig. 16A1-1: Change in Output and Saving

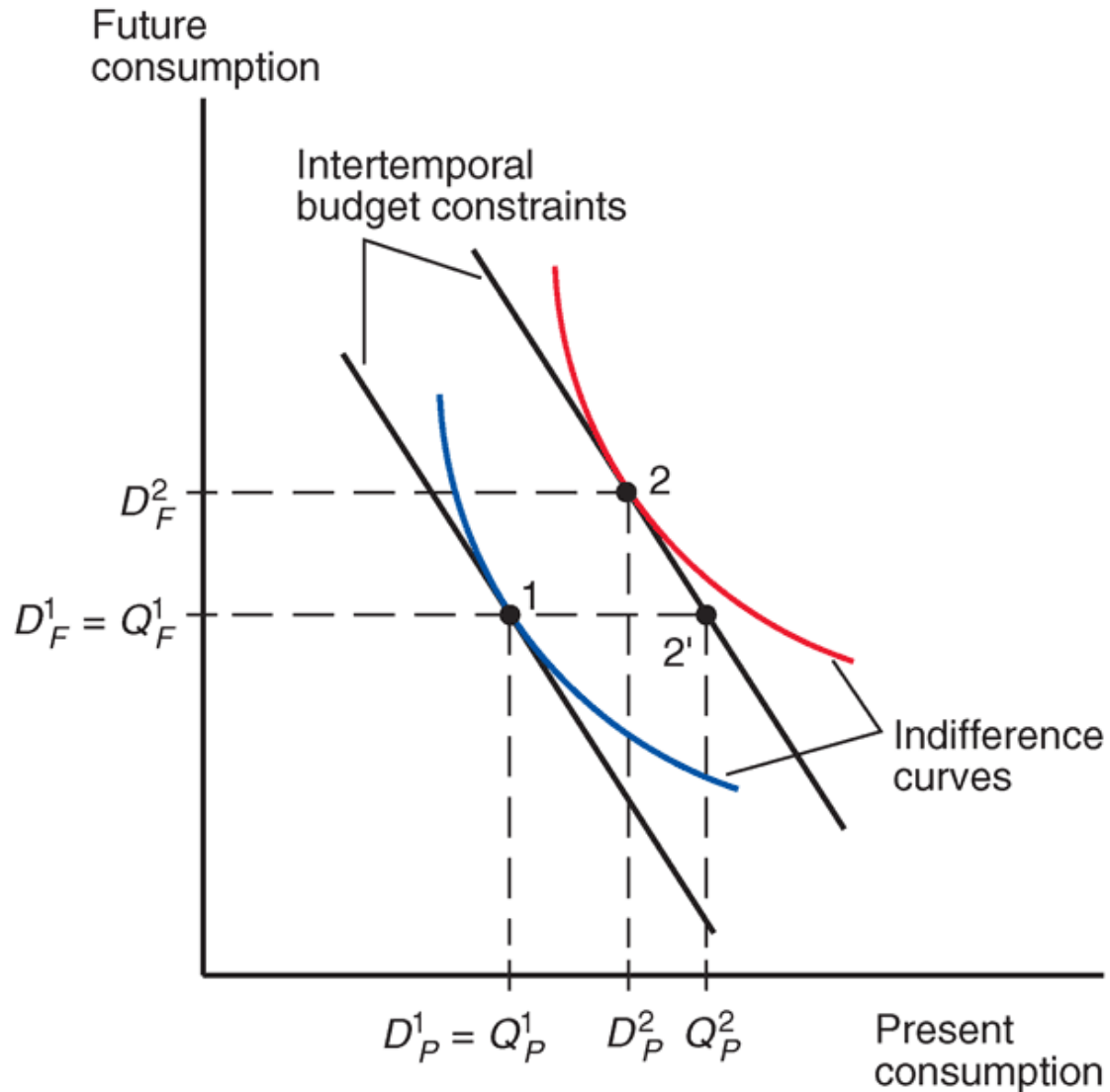


Table 16A2-1: Estimated Price Elasticities for International Trade in Manufactured Goods

Country	η			η^*		
	Impact	Short-run	Long-run	Impact	Short-run	Long-run
Austria	0.39	0.71	1.37	0.03	0.36	0.80
Belgium	0.18	0.59	1.55	—	—	0.70
Britain	—	—	0.31	0.60	0.75	0.75
Canada	0.08	0.40	0.71	0.72	0.72	0.72
Denmark	0.82	1.13	1.13	0.55	0.93	1.14
France	0.20	0.48	1.25	—	0.49	0.60
Germany	—	—	1.41	0.57	0.77	0.77
Italy	—	0.56	0.64	0.94	0.94	0.94
Japan	0.59	1.01	1.61	0.16	0.72	0.97
Netherlands	0.24	0.49	0.89	0.71	1.22	1.22
Norway	0.40	0.74	1.49	—	0.01	0.71
Sweden	0.27	0.73	1.59	—	—	0.94
Switzerland	0.28	0.42	0.73	0.25	0.25	0.25
United States	0.18	0.48	1.67	—	1.06	1.06

Source: Estimates are taken from Jacques R. Artus and Malcolm D. Knight, *Issues in the Assessment of the Exchange Rates of Industrial Countries*. Occasional Paper 29. Washington, D.C.: International Monetary Fund, July 1984, table 4. Unavailable estimates are indicated by dashes.