

Part Four: Open-Economy Macroeconomics and the International Monetary System

Chapter 16

The Price Adjustment Mechanism with Flexible and Fixed Exchange Rates

"The adoption of flexible exchange rates would have the great advantage of freeing governments to use their instruments of domestic policy for the pursuit of domestic objectives, while, at the same time, removing the pressures to intervene in international trade and payments for balance-of-payments reasons."

Milton Friedman, "The Case for Flexible Exchange Rates" in Essays in Positive Economics. University of Chicago Press, 1953.

I. Chapter Outline

- 16.1 Introduction
- 16.2 Adjustment with Flexible Exchange Rates
 - 16.2a Balance-of-Payments Adjustments with Exchange Rate Changes
 - 16.2b Derivation of the Demand Curve for Foreign Exchange
 - 16.2c Derivation of the Supply Curve for Foreign Exchange
- 16.3 Effect of Exchange Rate Changes on Domestic Prices and the Terms of Trade
- 16.4 Stability of Foreign Exchange Markets
 - 16.4a Stable and Unstable Foreign Exchange Markets
 - 16.4b The Marshall-Lerner Condition
- 16.5 Elasticities in the Real World
 - 16.5a Elasticity Estimates
 - 16.5b The J-Curve Effect and Revised Elasticity Estimates
 - 16.5c Currency Pass-Through
- 16.6 Adjustment Under the Gold Standard
 - 16.6a The Gold Standard
 - 16.6b The Price-Specie-Flow Mechanism

II. Chapter Summary and Review

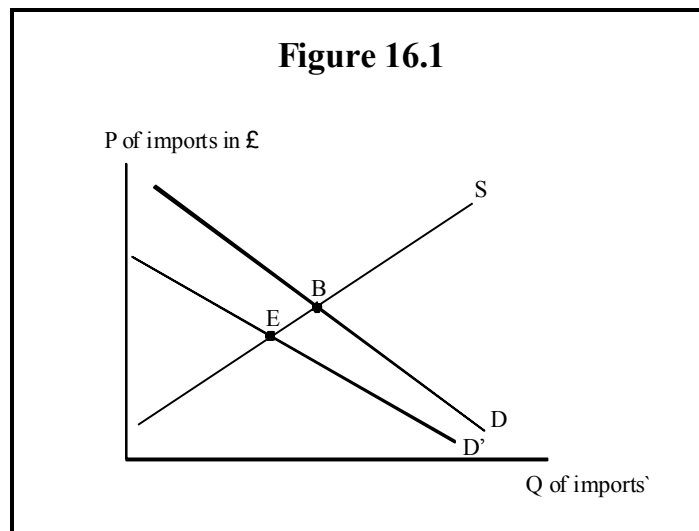
A balance-of-payments surplus or deficit due to autonomous transactions will produce adjustments that tend to correct that surplus or deficit. This adjustment mechanism was considered briefly in Chapter 15 in connection with different approaches to exchange rate determination. The adjustment mechanism works through both changes in prices, including the exchange rate (the price of foreign exchange), and changes in income. This chapter describes the price adjustment mechanism. The price adjustment mechanism works through supply and demand responses in the market for goods and services. Hence, autonomous (privately motivated) financial capital flows are assumed away.

As developed in Chapter 14, the foreign exchange market indicates the state of the balance of payments. If there is a surplus or deficit in the balance of payments due to autonomous transactions, then there is disequilibrium in the foreign exchange market which will result in a change in the exchange rate if exchange rates are free to vary. As the exchange rate changes, the quantity supplied and demanded for foreign exchange will change. The degree to which the exchange rate will change depends upon the size of the quantity supplied and demanded responses for foreign exchange, or the elasticities of the supply and demand for foreign exchange with respect to the exchange rate. In this approach, the primary focus is on how exchange rate changes affect the quantity supplied and demanded of foreign exchange through the effect of exchange rate changes on trade flows. This approach to adjustment is an early approach to balance-of-payments adjustment known as the **trade or elasticity approach**. (More recent approaches to adjustment include effects on income, money holdings, and security holdings, as well as effects of exchange-rate changes on imports and exports.)

In the elasticity approach, the elasticities of the supply and demand for foreign exchange rest on the underlying elasticities in the market for exports and imports. The U.S. demand for foreign exchange, say pounds, depends upon the U.S. demand for imports from Britain. The U.S. market for imports from Britain is shown in Fig. 16.1, where the vertical axis measures the price of imports in pounds.

Suppose the initial equilibrium in the U.S. import market is indicated by point B. *At point B there is some quantity of imports and some pound price. Multiplying that price times the quantity of imports gives the total value of pounds demanded by U.S. citizens to pay for British imports.* Further, assume that given

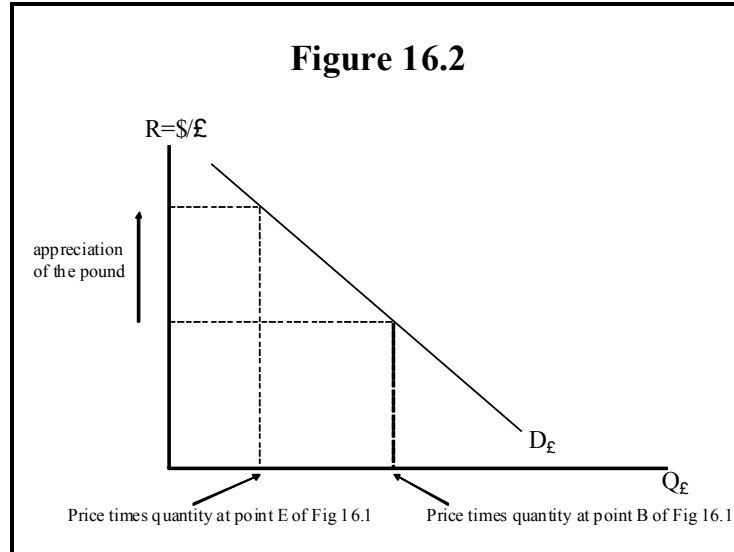
this level of imports, there is a balance-of-payments deficit. (With no autonomous movements of financial capital a deficit means that the value of imports exceeds the value of exports.) The excess demand for foreign currency will cause an appreciation of the pound and a depreciation of the dollar. (The terms "appreciation" and "depreciation" refer to movements of the exchange rate in a floating-rate system, while "revaluation" and "**devaluation**" are terms used to describe changes in the peg of a fixed-rate system.) Because prices are measured in pounds, there will be no *direct* effect of the depreciation on British exporters who denominate in pounds. Thus, the import supply curve in Figure 16.1 does not change.



The demand curve for imports, however, is affected by the depreciation of the dollar. A dollar will yield now fewer pounds on the foreign exchange market. If U.S. importers are to continue to purchase the same quantity of imports, the pound price they are willing to pay will have to fall by the same proportionate amount as the depreciation so the demand curve in Fig. 16.1 will shift down by the same proportion as the depreciation of the dollar. This is shown in Fig. 16.1 by the shift from *D* to *D'*. As a consequence of the shift in the demand curve, the new equilibrium is at point *E* in Fig. 16.1. At point *E*, the pound price is lower than at point *B*, *and* the quantity of imports is lower than at point *B*. Multiplying this new lower price times the new lower quantity gives a lower demand for foreign exchange than at point *B*. Thus, a higher dollar price of the pound produces a lower demand for pounds, as shown in Fig. 16.2.

The horizontal axis in Fig. 16.2 measures the total value of pounds used to buy imports, which is the price of imports times the quantity of imports from Fig. 16.1. It is of some importance to note that the shape of the downward-

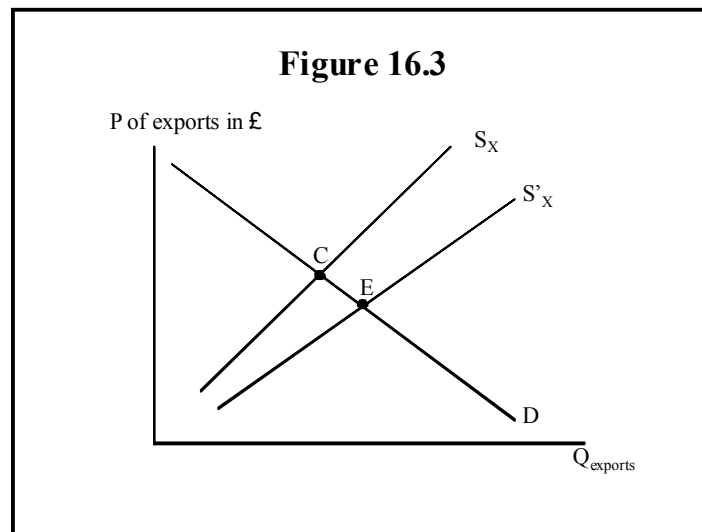
sloping demand curve for foreign exchange may change as the shape of the demand curve for imports changes. In the extreme case of a vertical demand curve for imports, depreciation will not affect the demand curve. (Shifting a vertical demand curve down leaves it unchanged.) In this extreme case, the demand for foreign exchange is unchanged. Apart from this extreme case, currency depreciation will always cause the demand for foreign exchange to fall, so the demand curve for foreign exchange will generally be downward sloping.



The market for U.S. exports to Britain generates the supply curve of pounds in the foreign exchange market. The procedure is similar to that for generating the demand for pounds, but is different enough to warrant its own discussion. The market for U.S. exports where the price is measured in pounds is shown in Fig. 16.3. Given a price in pounds, depreciation of the dollar will not affect the British demand for U.S. exports, so the demand curve for U.S. exports is unchanged. U.S. exporters, however, will be willing to export more for a given pound price because a depreciation of the dollar will make the pound worth more dollars. For a given level of exports, U.S. exporters will be willing to accept a lower pound price by the same proportionate amount as the depreciation. Thus, the supply of exports shifts vertically down by the same proportionate amount as the depreciation. In Fig. 16.3, a depreciation of the dollar causes equilibrium to move from point C to point E.

Notice that depreciation has an ambiguous effect on the value of exports US exports to Britain. The price in pounds of exports has fallen, but the quantity has increased. If the demand curve is relatively flat —highly elastic— then the export price decrease will be small and the export quantity increase will be large.

In this case, more total pounds will be supplied and depreciation will produce an increased quantity supplied of pounds. The supply curve of foreign exchange will be upward sloping. If, however, the demand curve is vertical (highly inelastic), then the price of exports will fall considerably with little change in quantity. The price multiplied by quantity will actually be lower and depreciation will cause fewer pounds to be supplied. In this case, the supply curve for foreign exchange is downward sloping! In general, the greater the elasticity of demand for exports, the more likely is the supply curve to be upward sloping. (Review this point again until it is clear.)

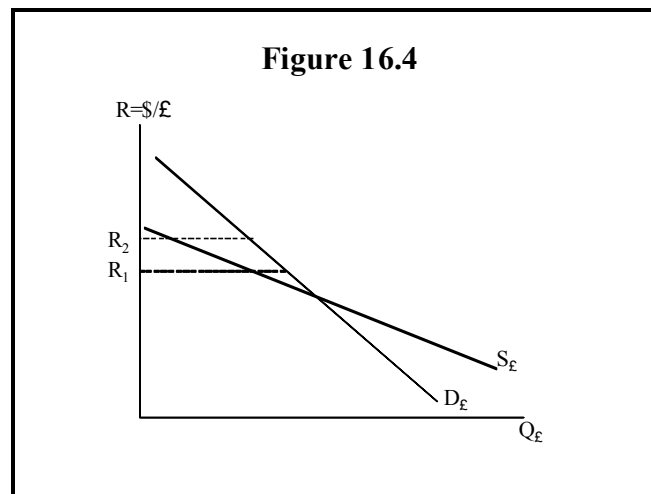


The above analysis of depreciation was conducted in pound prices in order to determine the effect of dollar depreciation on the quantity supplied and quantity demanded of pounds in the foreign exchange market. The analysis could also be conducted in terms of dollar prices. The results of that analysis would show that the dollar prices of U.S. imports and exports increase. Intuitively, a depreciation of the dollar will increase the demand for U.S. exports, causing the price of export goods to increase, while the supply of imports would appear to decrease, causing the price of imports to increase. A higher price for imports would cause a substitution into import-competing goods, causing a general rise in prices in the U.S. economy. A depreciation of the dollar will be inflationary.

Because depreciation increases the price of exports and imports, depreciation may also affect the terms of trade (the price of exports relative to the price of imports) if, as is likely, the price of exports increases by a different amount than the price of imports.

It was concluded above that the demand curve for foreign exchange will tend to be downward sloping, but the supply curve may be upward sloping or downward sloping. This leads to the possibility of a very interesting and problematic situation. Suppose in Fig. 16.3 that the demand curve for exports is very steep. Depreciation will shift down the supply curve of exports, as shown in Fig. 16.3, but with a very steep demand curve for exports, the price will fall and the quantity will not change much. Britain will need *less* total pounds to buy U.S. exports. This, as discussed, will produce a downward-sloping curve. Suppose it looks like that shown in Fig. 16.4. Now suppose the current exchange rate is R_1 , at which there is a U.S. balance-of-payments deficit, because the quantity demand of foreign exchange exceeds the quantity supplied. The excess demand for foreign exchange will cause R to increase, say to R_2 (a depreciation of the dollar), which will cause an even *larger* excess demand for pounds. In this case, depreciation does not work to narrow a balance-of-payments deficit; it *widens the balance-of-payments deficit* (creates an even larger excess demand for pounds). This is an **unstable foreign exchange market**, in that a change in the exchange rate does not produce a movement towards equilibrium, but a movement away from it.

Verify that, if the demand is downward sloping and the supply curve is upward sloping, a disequilibrium foreign exchange rate, like R_1 in Fig. 16.4, will cause the exchange rate to move towards equilibrium. This is a **stable foreign exchange market**.

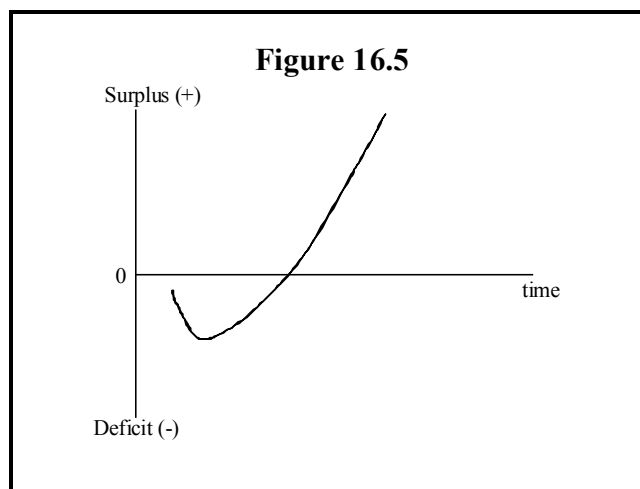


As explained above, the slope of the supply curve (upward versus downward, as well as how steep) depends upon the price elasticity of demand for exports, and the steepness of the downward-sloping demand curve depends upon the price elasticity of the demand for imports. Without proof (see Appendix

A16.2. in *International Economics* for the derivation), the foreign exchange market will be stable if the sum of the price elasticities of demand for U.S. exports and imports exceed 1.0. This is known as the **Marshall-Lerner Condition**.

Some early (1940s) estimates of elasticities suggested that the sum of the price elasticities of demand were less than or close to 1.0. Such **elasticity pessimism** casts doubt on the ability of a floating exchange-rate system to remedy balance of payments disequilibria. Subsequent research, however, verifies that the Marshall-Lerner condition is indeed met. Movements of the exchange rate do serve to eliminate balance of payments disequilibria.

Part of the source of elasticity pessimism resulted from looking at time periods too short to capture the full effect of exchange rate changes. In the short run, price elasticities are very small because producers and consumers adjust their plans somewhat slowly to price changes. This produces, in the very short run, an unstable foreign exchange market. A country whose currency depreciates in response to a balance-of-payments deficit will find itself with a larger deficit and further depreciation, until consumers and producers respond. Only in time will the deficit improve in response to the depreciation. The time path of the deficit will appear as in Figure 16.5. This phenomenon is known as the **J-curve effect**, named after the shape of the time path that the deficit produces after the depreciation.



In addition to the low price elasticities of demand in the short run, the effect of depreciation can be reduced by a less than 100% currency **pass through**. If the U.S. dollar depreciates 5%, then the price of imported goods measured in U.S. dollars increases by 5% if imported goods prices expressed in

foreign currency are not changed. Foreign exporters, however, may be reluctant to allow the depreciation to increase the dollar prices charged to U.S. buyers for fear of losing hard-earned market share. If foreign exporters do not allow the prices of its exports expressed in dollars to increase by 5%, then they are effectively reducing the prices of exports expressed in foreign currency units. If depreciation does not change prices, then the quantity of imports will not change prices. If pass through is not 100%, then foreign exporters are absorbing some of the depreciation by settling for lower profits. This analysis assumes that markets are not perfectly competitive. If markets are perfectly competitive for which economic profits must be zero in the long run, then the long run will see a complete pass through as firms will be forced to exit the industry, leading to higher prices.

The preceding discussion in this chapter focuses on the adjustment to a balance-of-payments deficit in a floating exchange-rate system. In a fixed exchange-rate system, like the **gold standard**, adjustment occurs through changes in the domestic economy. This chapter reviews the effect of a deficit on domestic prices (income adjustments are analyzed in Chapter 17). In a fixed exchange rate system, the **rules of the game** are to support the value of your currency, either with respect to other currencies, or in the gold standard, relative to gold. If a nation experiences a balance-of-payments deficit (in autonomous transactions), then there will be downward pressure on its exchange rate. In order to comply with the rules of the game, the central bank is obligated to support its currency by buying it with foreign currency reserves. When a central bank buys its own currency, it is taking domestic money out of circulation. This reduction in the money supply will cause domestic prices to fall, which will stimulate exports and discourage now relatively higher priced imports, thus correcting the balance-of-payments deficit.

With a gold standard, countries agree to maintain the price of their currency relative to gold. These gold prices imply an exchange rate between currencies. If in the United States the price of an ounce of gold is maintained by agreement at \$5 and in Britain at £1, then the implied cost of the pound is \$5/£1. If, on the foreign exchange market, the dollar threatens to change due to a US balance-of-payments disequilibrium, then gold would be shipped between countries. For example, if on the foreign exchange market the value of the pound crept to \$5.10, then no one would buy pounds directly with dollars. Gold could be purchased in the United States for \$5 and shipped to Britain where it would yield £1. Gold shipments do have transaction costs, so gold would be shipped only if the foreign exchange price differed from the gold prices by an amount greater

than the transaction costs. The foreign exchange prices at which gold would be shipped are called the **gold points (gold export point and gold import point)**. A deficit country would experience an outflow of gold. With gold as the money supply, or gold-backed paper, a reduction in gold means a decrease in the money supply and a reduction in goods prices. With lower goods prices, the deficit would be corrected. This movement of gold and prices is called the **price-species-flow mechanism** and was stated by Hume in the eighteenth century to point out the mercantilist folly of attempting to produce continual external surpluses. In a fixed exchange-rate system, as long as central banks agree to maintain the exchange rate, or equivalently the domestic price of gold, deficits and surpluses are eliminated automatically.

It's important to reiterate a point made in the previous chapters. In a fixed exchange rate system, a country relinquishes control of its money supply in order to maintain a fixed exchange rate. If countries find it necessary to control the money supply for domestic purposes, they will be reluctant to adopt a fixed exchange rate.

III. Questions

1. Explain why depreciation will tend to be more effective in correcting a balance of payments deficit in a very small open economy than in a very large relatively closed economy. (An open economy is one in which exports and imports account for a large proportion of domestic GDP, while a closed economy has few exports and imports relative to GDP.) *(Quick review of principles of microeconomics: One determinant of the price elasticity of demand is the budgetary importance of a good. If, for example, coffee prices increase by 20%, consumers may respond little in terms of coffee consumption. However, if auto prices increase by 20%, consumers may respond by buying significantly fewer new autos. Coffee tends to be a small part of the budget relative to the cost of a new automobile.)*

2. Why is an economy in which inflation is a significant problem less likely to use depreciation alone as a way of eliminating a balance-of-payments deficit?

3. a) What causes gold to move between countries in a gold standard, in which each country agrees to maintain the domestic price of gold?

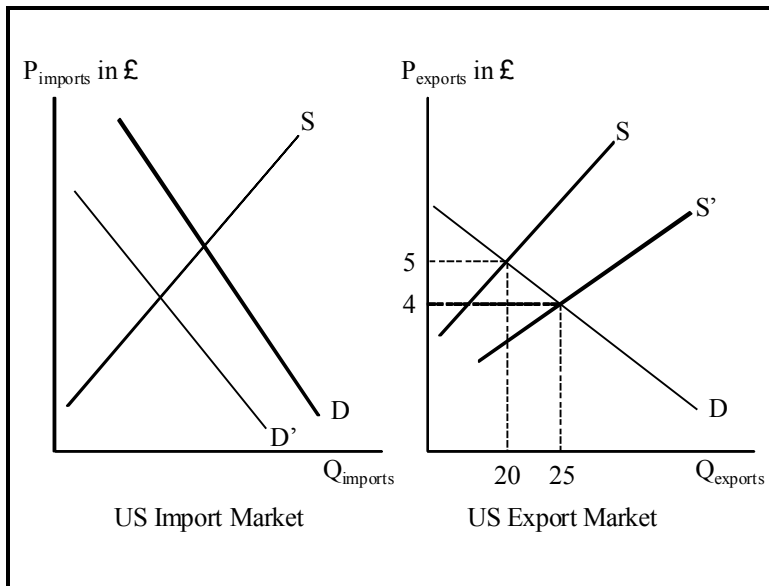
b) How do economies adjust to balance-of-payments disequilibria in a gold

standard?

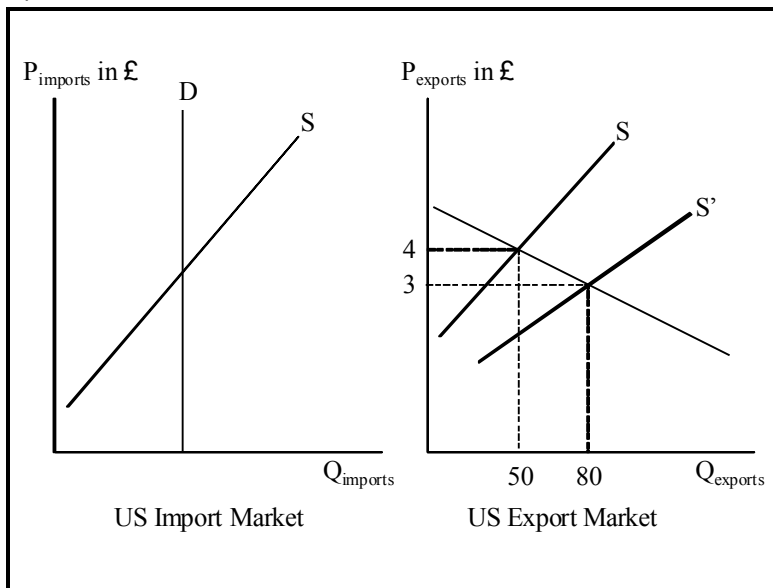
c) What is the major benefit and the major cost of a gold standard (fixed exchange rate system)? (See the quote introducing this chapter.)

4. Each of the graphs below shows the effect of a depreciation of the dollar relative to the pound. In each case, draw the accompanying supply and demand curves for foreign exchange, and determine whether the foreign exchange market is stable or unstable.

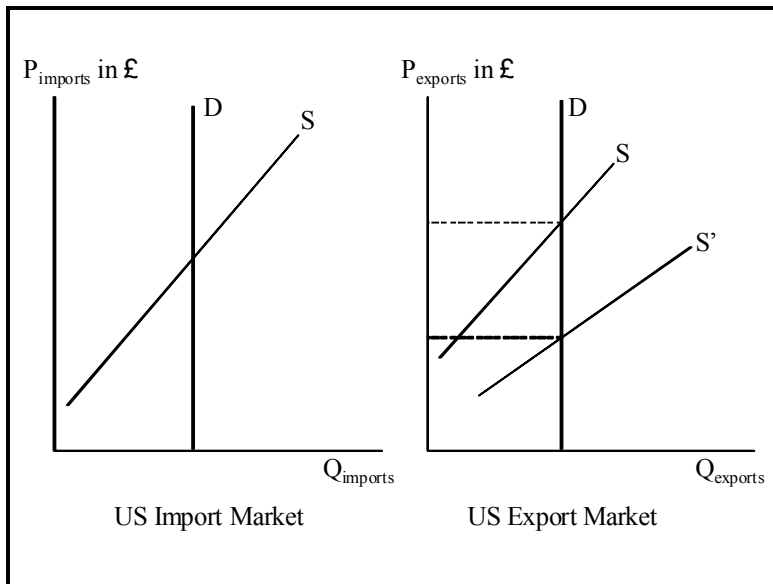
a)



b)



c)



5. Of the three cases in Question 4, which case best explains the early part of the J-curve phenomenon, in which depreciation actually causes a deterioration of the balance of payments? Explain.

6. Suppose there is no currency pass through. What effect will a depreciation of the dollar have on a U.S. balance-of-payments deficit?