1. The following three equations describe the Mundell–Fleming model:

\[ Y = C(Y - T) + I(r) + G + NX(e). \]  
\[ M/P = L(r, Y). \]  
\[ r = r^*. \]

In addition, we assume that the price level is fixed in the short run, both at home and broad. This means that the nominal exchange rate \( e \) equals the real exchange rate.

a. If consumers decide to spend less and save more, then the \( IS^* \) curve shifts to the left. Figure 12–8 shows the case of floating exchange rates. Since the money supply does not adjust, the \( LM^* \) curve does not shift. Since the \( LM^* \) curve is unchanged, output \( Y \) is also unchanged. The exchange rate falls (depreciates), which causes an increase in the trade balance equal to the fall in consumption.

Figure 12–9 shows the case of fixed exchange rates. The \( IS^* \) curve shifts to the left, but the exchange rate cannot fall. Instead, output falls. Since the exchange rate does not change, we know that the trade balance does not change either.
In essence, the fall in desired spending puts downward pressure on the interest rate and, hence, on the exchange rate. If there are fixed exchange rates, then the central bank buys the domestic currency that investors seek to exchange, and provides foreign currency. As a result, the exchange rate does not change, so the trade balance does not change. Hence, there is nothing to offset the fall in consumption, and output falls.

b. If some consumers decide they prefer stylish Toyotas to Fords and Chryslers, then the net-exports schedule, shown in Figure 12–10, shifts to the left. That is, at any level of the exchange rate, net exports are lower than they were before.
This shifts the $IS^*$ curve to the left as well, as shown in Figure 12–11 for the case of floating exchange rates. Since the $LM^*$ curve is fixed, output does not change, while the exchange rate falls (depreciates).
this since \( NX = S - I \), and both saving and investment remain unchanged. Figure 12–12 shows the case of fixed exchange rates. The leftward shift in the \( IS^* \) curve puts downward pressure on the exchange rate. The central bank buys dollars and sells foreign exchange to keep \( e \) fixed: this reduces \( M \) and shifts the \( LM^* \) curve to the left. As a result, output falls.

The trade balance falls, because the shift in the net exports schedule means that net exports are lower for any given level of the exchange rate.

c. The introduction of ATM machines reduces the demand for money. We know that equilibrium in the money market requires that the supply of real balances \( M/P \) must equal demand:
\[
M/P = L(r^*, Y).
\]
A fall in money demand means that for unchanged income and interest rates, the right-hand side of this equation falls. Since \( M \) and \( P \) are both fixed, we know that the left-hand side of this equation cannot adjust to restore equilibrium. We also know that the interest rate is fixed at the level of the world interest rate. This means that income—the only variable that can adjust—must rise in order to increase the demand for money. That is, the \( LM^* \) curve shifts to the right. Figure 12–13 shows the case with floating exchange rates. Income rises, the exchange rate falls (depreciates), and the trade balance rises.
Figure 12–14 shows the case of fixed exchange rates. The $LM^*$ schedule shifts to the right; as before, this tends to push domestic interest rates down and cause the currency to depreciate. However, the central bank buys dollars and sells foreign currency in order to keep the exchange rate from falling. This reduces the money supply and shifts the $LM^*$ schedule back to the left. The $LM^*$ curve continues to shift back until the original equilibrium is restored.
In the end, income, the exchange rate, and the trade balance are unchanged.

2. a. The Mundell–Fleming model takes the world interest rate $r^*$ as an exogenous variable. However, there is no reason to expect the world interest rate to be constant. In the closed-economy model of Chapter 3, the equilibrium of saving and investment determines the real interest rate. In an open economy in the long run, the world real interest rate is the rate that equilibrates world saving and world investment demand. Anything that reduces world saving or increases world investment demand increases the world interest rate. In addition, in the short run with fixed prices, anything that increases the worldwide demand for goods or reduces the worldwide supply of money causes the world interest rate to rise.

b. Figure 12–15 shows the effect of an increase in the world interest rate under floating exchange rates. Both the $IS^*$ and the $LM^*$ curves shift. The $IS^*$ curve shifts to the left, because the higher interest rate causes investment $I(r^*)$ to fall. The $LM^*$ curve shifts to the right because the higher interest rate reduces money demand. Since the supply of real balances $M/P$ is fixed, the higher interest rate leads to an excess supply of real balances. To restore equilibrium in the money market, income must rise; this increases the demand for money until there is no longer an excess supply.

We see from the figure that output rises and the exchange rate falls (depreciates). Hence, the trade balance increases.
c. Figure 12–16 shows the effect of an increase in the world interest rate if exchange rates are fixed. Both the $IS^*$ and $LM^*$ curves shift. As in part (b), the $IS^*$ curve shifts to the left since the higher interest rate causes investment demand to fall. The $LM^*$ schedule, however, shifts to the left instead of to the right. This is because the downward pressure on the exchange rate causes the central bank to buy dollars and sell foreign exchange. This reduces the supply of money $M$ and shifts the $LM^*$ schedule to the left. The $LM^*$ curve must shift all the way back to $LM$ in the figure, where the fixed-exchange-rate line crosses the new $IS^*$ curve.

\[e\]
\[\text{Exchange rate}\]

\[\text{Income, output}\]

In equilibrium, output falls while the exchange rate remains unchanged. Since the exchange rate does not change, neither does the trade balance.

3. a. A depreciation of the currency makes American goods more competitive. This is because a depreciation means that the same price in dollars translates into fewer units of foreign currency. That is, in terms of foreign currency, American goods become cheaper so that foreigners buy more of them. For example, suppose the exchange rate between yen and dollars falls from 200 yen/dollar to 100 yen/dollar. If an American can of tennis balls costs $2.50, its price in yen falls from 500 yen to 250 yen. This fall in price increases the quantity of American-made tennis balls demanded in Japan. That is, American tennis balls are more competitive.

b. Consider first the case of floating exchange rates. We know that the position of the $LM^*$ curve determines output. Hence, we know that we want to keep the money supply fixed. As shown in Figure 12–17, we want to use fiscal policy to shift the $IS^*$ curve to the left to cause the exchange rate to fall (depreciate). We can do this by reducing government spending or increasing taxes.
Now suppose that the exchange rate is fixed at some level. If we want to increase competitiveness, we need to reduce the exchange rate; that is, we need to fix it at a lower level. The first step is to devalue the dollar, fixing the exchange rate at the desired lower level. This increases net exports and tends to increase output, as shown in Figure 12–18. We can offset this rise in output with contractionary fiscal policy that shifts the $IS^*$ curve to the left, as shown in the figure.