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 abroad. This means that the nominal exchange rate \( e \) equals the real exchange rate \( r^* \).

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 12–8](image)

Figure 12–8 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.

![Figure 12–9](image)
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, shifting \( LM^* \) to the left. 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).

The trade balance does not change either, despite the fall in the exchange rate. We know this since \( NX = S - I \), and both saving and investment remain unchanged. When consumers prefer to buy foreign cars, this will decrease net exports. The resulting decline in the value of the exchange rate will increase net exports and offset the decline, such that net exports remains 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:

\[
\frac{M}{P} = L(r^*, Y).
\]

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. Intuitively, the decline in money demand will put downward pressure on the interest rate. This will cause capital outflow until balance is restored because in this model the interest rate will remain equal to the world interest rate. As capital flows out of the economy, the exchange rate will fall. This will increase net exports and output.

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.

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 12–16 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. Intuitively, when the world interest rate rises, capital outflow will increase as the interest rate in the small country adjusts to the new higher level of the world interest rate. The increase in capital outflow causes the exchange rate to fall, causing net exports and hence output to increase, which increases money demand.

![Figure 12–16](image)

We see from the figure that output rises and the exchange rate falls (depreciates). Hence, the trade balance increases.

c. Figure 12–17 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 \( LM^*_1 \) in the figure, where the fixed-exchange-rate line crosses the new \( IS^* \) curve.
In equilibrium, output falls while the exchange rate remains unchanged. Since the exchange rate does not change, neither does the trade balance.

3. In the text, we assumed that net exports depend only on the exchange rate. This is analogous to the usual story in microeconomics in which the demand for any good (in this case, net exports) depends on the price of that good. The “price” of net exports is the exchange rate. However, we also expect that the demand for any good depends on income, and this may be true here as well: as income rises, we want to buy more of all goods, both domestic and imported. Hence, as income rises, imports increase, so net exports fall. Thus, we can write net exports as a function of both the exchange rate and income:

\[ NX = NX(e, Y). \]

Figure 12–19 shows the net exports schedule as a function of the exchange rate. As before, the net exports schedule is downward sloping, so an increase in the exchange rate reduces net exports. We have drawn this schedule for a given level of income. If income increases from \( Y_1 \) to \( Y_2 \), the net exports schedule shifts inward from \( NX(Y_1) \) to \( NX(Y_2) \).

a. Figure 12–20 shows the effect of a fiscal expansion under floating exchange rates. The fiscal expansion (an increase in government expenditure or a cut in taxes) shifts the \( IS^* \) schedule to the right. But with floating exchange rates, if the \( LM^* \) curve does not change, neither does income. Since income does not change, the net-exports schedule remains at its original level \( NX(Y_1) \).
The final result is that income does not change, and the exchange rate appreciates from $e_1$ to $e_2$. Net exports fall because of the appreciation of the currency.

Thus, our answer is the same as that given in Table 12–1.

b. Figure 12–21 shows the effect of a fiscal expansion under fixed exchange rates. The fiscal expansion shifts the $IS^*$ curve to the right, from $IS^*_1$ to $IS^*_2$. As in part (a), for unchanged real balances, this tends to push the exchange rate up. To prevent this appreciation, however, the central bank intervenes in currency markets, selling dollars and buying foreign exchange. This increases the money supply and shifts the $LM^*$ curve to the right, from $LM^*_1$ to $LM^*_2$.

Output rises while the exchange rate remains fixed. Despite the unchanged exchange rate, the higher level of income reduces net exports because the net-exports schedule shifts inward.

Thus, our answer differs from the answer in Table 12–1 only in that under fixed exchange rates, a fiscal expansion reduces the trade balance.

4. We want to consider the effects of a tax cut when the $LM^*$ curve depends on disposable income instead of income:

$$\frac{M}{P} = L[r, Y - T].$$
A tax cut now shifts both the IS* and the LM* curves. Figure 12–22 shows the case of floating exchange rates. The IS* curve shifts to the right, from IS1 to IS2. The LM* curve shifts to the left, however, from LM1 to LM2.

Figure 12–22

We know that real balances M/P are fixed in the short run, while the interest rate is fixed at the level of the world interest rate r*. Disposable income is the only variable that can adjust to bring the money market into equilibrium: hence, the LM* equation determines the level of disposable income. If taxes T fall, then income Y must also fall to keep disposable income fixed.

In Figure 12–22, we move from an original equilibrium at point A to a new equilibrium at point B. Income falls by the amount of the tax cut, and the exchange rate appreciates.

If there are fixed exchange rates, the IS* curve still shifts to the right; but the initial shift in the LM* curve no longer matters. That is, the upward pressure on the exchange rate causes the central bank to sell dollars and buy foreign exchange; this increases the money supply and shifts the LM* curve to the right, as shown in Figure 12–23.

Figure 12–23

The new equilibrium, at point B, is at the intersection of the new IS* curve, IS2, and the horizontal line at the level of the fixed exchange rate. There is no difference between this case and the standard case where money demand depends on income.