The IS Relation in an Open Economy

When we were assuming the economy was closed to trade, there was no need to distinguish between the domestic demand for goods and the demand for domestic good: They were clearly the same. Now, we must distinguish between the two: Some domestic demand falls on foreign goods, and some of the demand for domestic goods comes from foreigners.

The Demand for Domestic Goods

In an open economy, the demand for domestic goods is given by:

$$Z = C + I + G - \varepsilon IM + X$$

The first three terms–consumption, C, investment, I, and government spending, G–constitute the domestic demand for goods. If the economy were closed, $C + I + G$ would also be the demand for domestic goods.

Now we have to make two adjustments:

- First, we must subtract imports (that part of domestic demand that falls on foreign goods).Foreign goods are different from domestic goods, so we cannot just subtract the quantity of imports, IM. If we were to do so, we would be subtracting apples (foreign goods) from oranges (domestic goods). We must first express the value of imports in terms of domestic goods. This is what εIM in equation above stands for.

  Where:

  ε : Is the real exchange rate – the price of foreign goods in terms of domestic goods

  εIM : The value of imports in terms of domestic goods

- Second, we must add exports (the demand for domestic goods that comes from abroad).

C + I + G: Domestic demand for domestic goods

IM: Domestic demand for foreign goods (imports)

X: Foreign demand for domestic goods (exports)

Demand for domestic goods = Domestic demand for domestic goods - Domestic demand for foreign goods + Foreign demand for domestic goods

The Determinants of the Demand for Domestic Goods

The Determinants of C, I, and G

Now that we are assuming the economy is open, how should we modify our earlier descriptions of consumption, investment, and government spending? The answer: Not very much, if at all. How much consumers decide to spend still depends on the income and their wealth. While the real exchange rate surely affects the composition of consumption spending between domestic goods and foreign goods, there no obvious reason why it should affect the overall level of consumption.

The same true of investment: The real exchange rate may affect whether firms buy domestic machines or foreign machines, but it should not affect total investment.

We can use the descriptions of consumption, investment, and government spending that we developed earlier. Therefore,

Domestic Demand: $\underset{(+,-)}{C}(Y-T)+\underset{(+,-)}{I}(Y,i)+G$

We assume that consumption depends positively on disposable income, $Y-T$, and that investment depends positively on production, Y, and negatively on the interest rate, i. We continue to take government spending, G, as given.

The Determinants of Imports

What does the quantity of imports, IM, depend on?
Primarily on the overall level of domestic demand: The higher the level of domestic demand, the higher the demand for all goods, both domestic and foreign. $(Y \uparrow \rightarrow IM \uparrow)$
But IM also clearly depends on the real exchange rate $(\boldsymbol{\varepsilon})$: The higher the price of foreign goods relative to the price of domestic goods, the lower the domestic demand for domestic goods, and so, the lower the quantity of imports. $(\boldsymbol{\varepsilon} \uparrow \rightarrow IM \downarrow)$.

$$IM = \underset{(+,-)}{IM}(Y,\varepsilon)$$

- The quantity of imports depends on income (or, equivalently, on output, Y): Higher income leads to higher imports. $(Y \uparrow \rightarrow IM \uparrow)$

- The quantity of imports also depends on the real exchange rate (the price of foreign goods in terms of domestic goods). A higher real exchange rate makes foreign goods relatively more expensive, leading to a decrease in the quantity of imports, IM. This negative effect of the real exchange rate on the quantity of imports is captured by the negative sign under **ε** in equation.
  $(\boldsymbol{\varepsilon} \uparrow \rightarrow IM \downarrow)$.

The Determinants of Exports

The export of one country is, by definition, the import of another. We know that foreign imports are likely to depend on foreign activity; and on the relative price of foreign goods. Let Y^* denote output in the rest of the world, call it foreign output.
Thus, we can write exports as:

$$X = \underset{(+,+)}{X}(Y^*,\varepsilon)$$

- An increase in foreign output (Y^*) leads to an increase in the foreign demand for all goods, some of which falls on domestic goods, leading to higher domestic exports. $(Y* \uparrow \rightarrow X \uparrow)$.

- An increase in real exchange rate (an increase in the relative price of foreign goods in terms of domestic goods) makes domestic goods more attractive relative to foreign goods, leading to an increase in exports. $(\boldsymbol{\varepsilon} \uparrow \rightarrow X \uparrow)$.

The Demand for Domestic Goods and Net Exports

Panel (a), the line DD plots domestic demand, $C + I + G$, as a function of output, Y. This relation between demand and output is familiar from Chapter 3 Under our standard assumptions, the slope of the relation between demand and output is positive but less than 1.

To arrive at the demand for domestic goods, we must first subtract imports. This is done in panel (b) and gives us the line AA. The line AA represents the domestic demand for domestic goods. *The distance between DD and AA equals the value of imports*. Because the quantity of imports increases with income, the distance between the two lines increases with income. We can establish two facts about line AA, which will be useful later in the chapter:

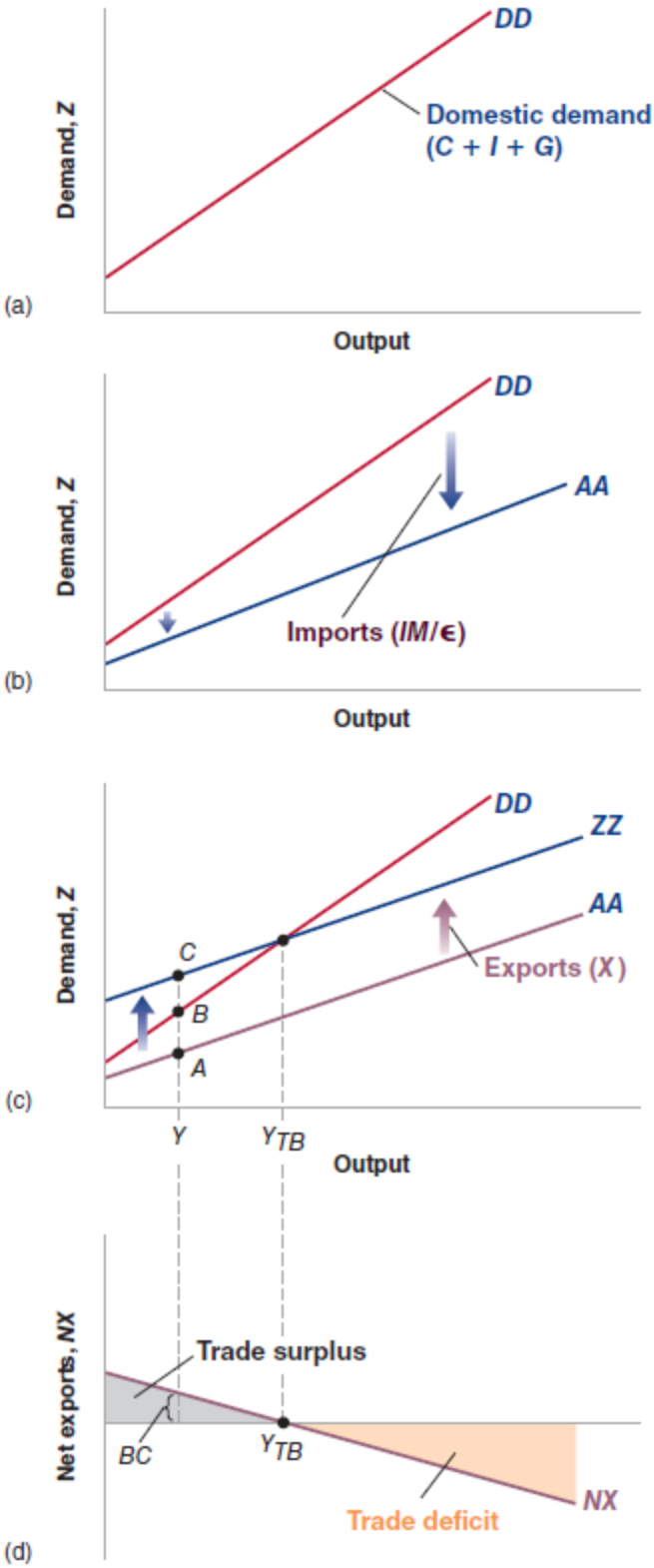
- AA is flatter than DD: As income increases, some of the additional domestic demand falls on foreign goods rather than on domestic goods. *As income increases, the domestic demand for domestic goods increases less than total domestic demand.*

As long as some of the additional demand falls on domestic goods, AA has a positive slope: An increase in income leads to some increase in the demand for domestic goods.

Next we must add exports. This is done in panel (c) and gives us the line ZZ, which is above AA. The line ZZ represents the demand for domestic goods. *The distance between ZZ and AA equals exports*. *Because exports do not depend on domestic output, the distance between ZZ and AA is constant*, which is why the two lines are parallel. Because AA is flatter than DD, ZZ is flatter than DD as well.

From the information in panel (c) we can characterize the behavior of net exports–the difference between exports and imports ($X - \varepsilon IM$)–as a function of output. At output level Y, *for example, exports are given by the distance AC and imports by the distance AB, so net exports are given by the distance BC*.

This relation between net exports and output is represented as the line *NX* in panel (d). *Net exports are a decreasing function of output: As output increases, imports increase and exports are unaffected, leading to lower net exports*. Call Y_{TB} (TB for trade balance) the level of output at which the value of imports is just equal to exports, so that net exports are equal to zero. Levels of output above Y_{TB} lead to higher imports, leading to a trade deficit. Levels of output below Y_{TB} lead to lower imports, and a trade surplus.



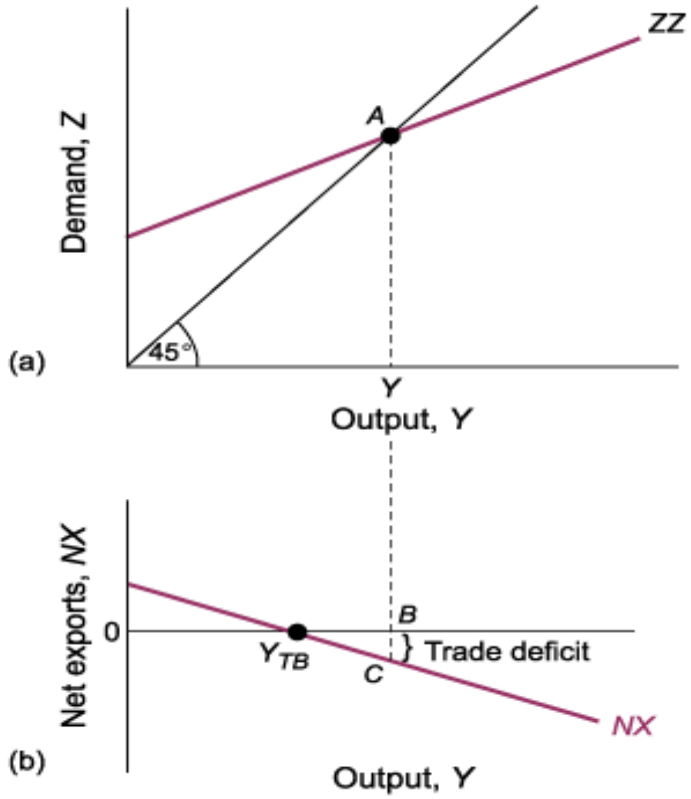
Equilibrium Output and the Trade Balance

The goods market is in equilibrium when domestic output equals the demand for domestic goods: $Y = Z$
Collecting the relations we derived for the components of the demand for domestic goods, Z:

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

In panel (a), demand is measured on the vertical axis, output on the horizontal axis. The line ZZ plots demand as a function of output. ZZ is upward sloping, but with slope less than 1.

Equilibrium output is at the point where demand equals output, at the intersection of the line ZZ and the 45-degree line: point A in the figure, with associated output level Y. Panel (b), drawing net exports as a decreasing function of output. There is in general no reason why the equilibrium level of output, should be the same as the level of output at which trade is balanced, Y_{TB}. As I have drawn the figure, equilibrium output is associated with a trade deficit, equal to the distance BC.



Increases in Demand, Domestic or Foreign

How do changes in demand affect output in an open economy?

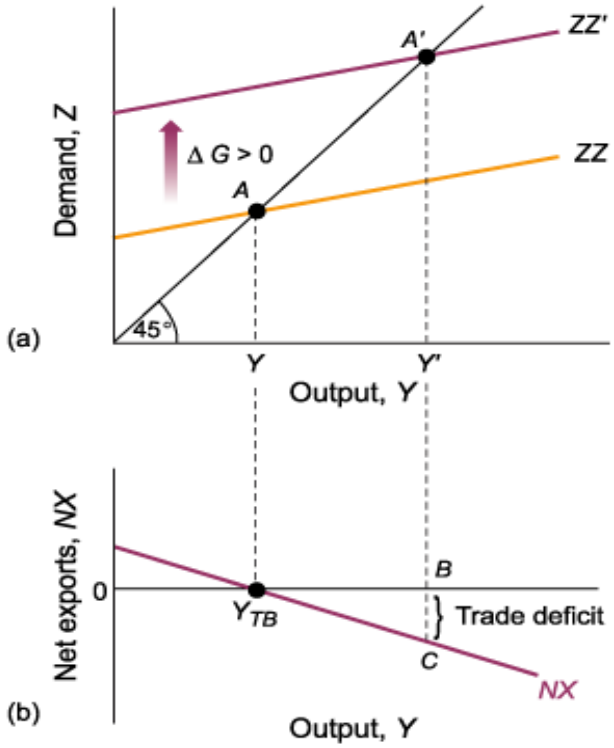
Increases in Domestic Demand

Suppose the economy is in recession and the government decides to increase government spending–so as to increase domestic demand and output. *What will be the effects on output and on the trade balance?*
The answer is given in Figure below. Before the increase in government spending, demand is given by ZZ in panel (a), and the equilibrium is at point A, where output equals Y. Let's assume that trade is initially balanced, so, in panel (b), $Y = Y_{TB}$.

What happens if the government increases spending by ΔG?

At any level of output, demand is higher by ΔG, shifting the demand relation up by ΔG from ZZ to ZZ'. The equilibrium point moves from A to A', and output increases from Y to Y'. *The increase in output is larger than the increase in government spending: There is a multiplier effect.*

There is now an effect on the trade balance. Because government spending enters neither the exports relation nor the imports relation directly, the relation between net exports and output in panel (b) does not shift. So the increase in output from Y to Y' leads to a trade deficit equal to BC. *An increase in government spending increases output. The multiplier is smaller than in the closed economy.*



Increases in Foreign Demand

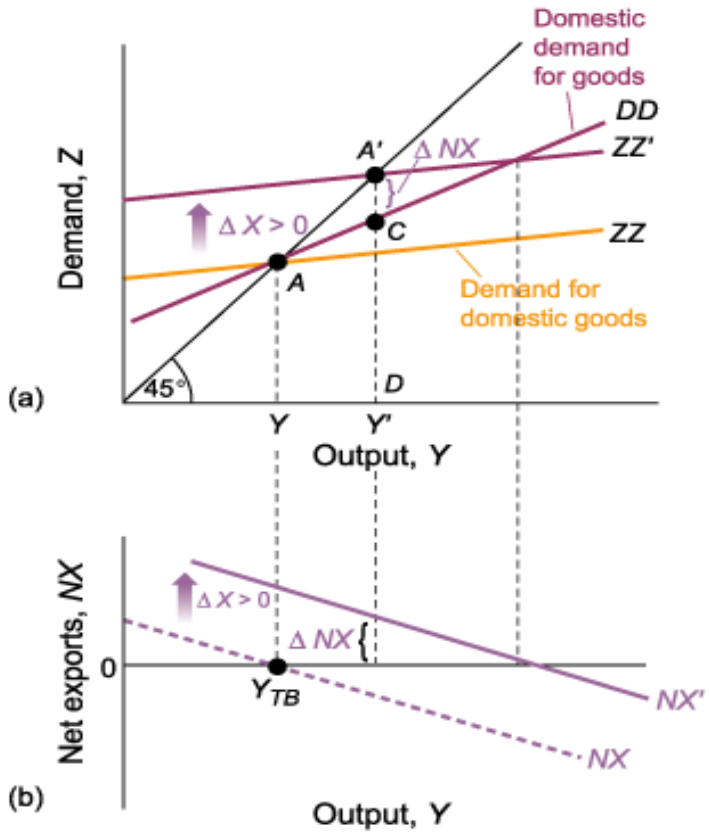
Consider an increase in foreign output (an increase in Y*). This could be due to an increase in foreign government spending (G*).

The figure shows the effects of an increase in foreign activity on domestic output and the trade balance. The initial demand for domestic goods is given by ZZ in panel (a). The equilibrium is at point A, with output level Y. Let's assume trade is balanced, so that in panel (b) the net exports associated with Yare equal to zero ($Y= Y_{TB}$)

Now consider the effects of an increase in foreign output. Higher foreign output means higher foreign demand, including higher foreign demand for domestic goods. So the direct effect of the increase in foreign output is to increase domestic exports by some amount, call it ΔX.

- For a given level of output, this increase in exports leads to an increase in the demand for domestic goods by ΔX, so the line giving the demand for domestic goods as a function of output shifts up by ΔX, from ZZ to ZZ'.

- For a given level of output, net exports go up by ΔX. So the line giving net exports as a function of output in panel (b) also shifts up by ΔX, from NX to NX'.



When foreign government spending (G) increase, an increase in foreign output (Y*), and an increase in exports and an increase in the Net exports (NX), that leads ZZ curve to shift upward and increase in domestic output(Y)*

Depreciation, the Trade Balance, and Output

The real exchange rate is given by:

$$\epsilon = \frac{E\ P}{P\ *}$$

The real exchange rate ,**ε**(the price of foreign goods in terms of domestic goods), is equal to the nominal exchange rate, E, times the domestic price level, P, divided by the foreign price level, P^*.
Given P and P*, as E↑ → **ε** ↑

Nominal exchange rate (E*)* ≡ *the price of foreign currency in terms of domestic currency*
The real exchange rate (ε) ≡ *the price of foreign goods in terms of domestic goods*

Under the assumption that the price levels are given, it follows that a nominal depreciation is reflected one for one in a real depreciation*. If the dollar depreciates vis-à-vis the yen by 10%, and if the price levels in Japan and United States do not changes, U.S. goods will be 10% cheaper compared to Japanese goods.*

Depreciation and the Trade Balance: The Marshall-Lerner Condition

Return to the definition of net exports:

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

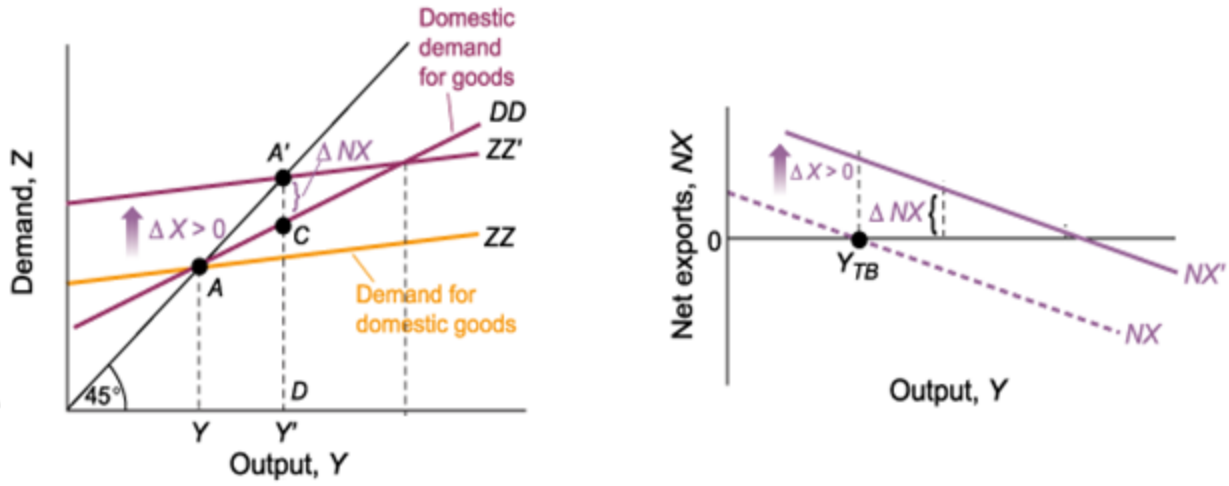
Note that: The real depreciation (an increase in ε) affects the trade balance through three separate channels.

1. Exports(X) increase. The real depreciation makes U.S. goods relatively less expensive abroad. This leads to an increase in foreign demand for U.S. goods—an increase in U.S. exports.

2. Imports (IM) decrease. The real depreciation makes foreign goods relatively more expensive in the United States. This leads to a shift in domestic demand toward, domestic goods, to a decrease in the quantity of imports.
3. The relative price of foreign goods, ε, increases. This increases the import bill (ε IM). The same quantity of imports now costs more to buy (in terms of domestic goods).

For the trade balance to improve following a depreciation, exports must increase enough (the first channel) and imports must decrease enough (the second channel) to compensate for the increase in the price of imports (the third channel). *The condition under which a real depreciation leads to an increase in net exports is known as the Marshall-Lerner condition.*

An increase in foreign output, a depreciation leads to an increase in net exports (assuming, as we do, that the Marshall-Lerner condition holds), at any level of output. Both the demand relation (ZZ) and the net exports relation (NX) shift up. The equilibrium moves from A to A'. And output increases from Y to Y'. By the same argument we used earlier, the trade balance improves: The increase in imports induced by the increase in output is smaller than the direct improvement in the trade balance induced by the depreciation.



To summarize: The depreciation leads to a shift in demand, both foreign and domestic, toward domestic goods. This shift in demand leads in turn both to an increase in domestic output and to an improvement in the trade balance.

Combining Exchange-Rate and Fiscal Policies

Suppose a government wants to reduce the trade deficit without changing the level of output. What should the government do?

Answer: Use the right combination of depreciation and fiscal contraction. *To reduce the trade deficit without changing output, the government must both achieve: a depreciation and decrease government spending.*
If the government wants to eliminate the trade deficit without changing output, it must do two things:

1. It must achieve depreciation sufficient to eliminate the trade deficit at the initial level of output. So, the depreciation must be such as to shift the net exports relation from NX to NX' in panel (b). The problem is that this depreciation, and the associated increase in net exports, also shifts the demand relation in panel (a) from ZZ to ZZ'. In the absence of other measures, the equilibrium would move from A to A', and output would increase from Y to Y'.

2. In order to avoid the increase in output, the government must reduce government spending so as to shift ZZ' back to ZZ. This combination of a depreciation and a fiscal contraction leads to the same level of output and an improved trade balance.