Chapter 3

International Trade and Exchange Rates

This chapter provides an introduction to international macroeconomics. The main topics are trade and trade policy, exchange rates, exchange rate regimes, and currency crises. The following section develops some terminology that is needed for discussing trade. Afterwards, we will turn to the theory of international trade. The last part of this chapter will deal with exchange rates and currency crises.

3.1 The Balance of Payments

Before we can discuss international trade, we need to know how to measure it. The **balance of payments** records all international transactions of a country. Together with the National Income and Product Accounts (NIPA), which track production and its uses within a country, the balance of payments provides a complete picture of macroeconomic activity.

The balance of payments of a country accounts for all transactions with foreign countries. There is a simple rule which determines whether a transaction enters as a positive item or a negative item in the accounts. Every transaction that results in a flow of currency to the home country is entered as a positive item, while negative items result in a loss of currency for the home country.

The balance of payments accounts are separated into two parts. The **current account** tracks currently produced goods and services, while the **capital account** tracks asset transactions.

The current account consists of the following elements:

- **Exports** (+): Exports are sales of new goods or services to foreign countries. Since the exports have to be paid, they result into a flow of currency to the home country. Therefore exports are a positive item in the balance of payments.

- **Imports** (-): Imports are purchases of new goods or services from abroad, and enter negatively.

- **Net factor payments from abroad** (+): Factor payments include compensation for labor or capital. If people from the home country work and are paid abroad, their income is accounted for as a factor payment in the balance of payments. Also in this category are dividends paid on stocks of foreign corporations owned by people in the home country, and interest payments on foreign bonds.

- **Net transfers received** (+): This includes all transfers without compensation. The most important example is development aid.

Sometimes instead of entering exports and imports separately, **net exports** are shown in the balance of payments, where net exports are defined as exports minus imports. The **trade balance** is another term for net exports. If net exports are positive, we speak of a **trade surplus**, and otherwise of a **trade deficit**. The **current account balance** is defined as:

$$\text{Current account balance} = \text{net exports} + \text{net factor payments} + \text{net transfers}.$$

If the current account balance is positive, we speak of a **current account surplus**, and otherwise of a **current account deficit**.

The capital account consists of only two elements:

- **Net increase in foreign assets owned by home country** (-): This includes foreign stocks and bonds held by people in the home country, land and houses in other countries, and also loans to people or firms in other countries. An item in this category that is often mentioned separately are foreign reserves owned by the central bank (the Federal Reserve in the U.S.). Most often, theses reserves consist of foreign government bonds. Since increasing holdings of foreign assets results in payments to foreigners, this is a negative item in the balance of payments.

- **Net increase in home assets owned by foreigners** (+): The opposite of the previous item.

The **capital account balance** is defined as:

$$\begin{aligned}\text{Capital account balance} = {} & \text{increase in home assets owned by foreigners} \\ & - \text{increase in foreign assets owned by home country}.\end{aligned}$$

If the capital account balance is negative, we speak of a **capital outflow**, and otherwise of a **capital inflow**.

In theory, the current account balance and the capital account balance cancel:

Current account balance + capital account balance = 0.

The reason for this is that any transaction is accounted for twice in the balance of payments, once as a positive item, and once as a negative item. Since all transactions enter both with a plus and with a minus sign, in the aggregate the two accounts have to cancel. In practice this is not always the case because of statistical discrepancies. This discrepancies arise because not every international transaction is reported to the government, so the statistics miss certain transactions.

Tables 3.1 and 3.2 show the current and capital account for the U.S. in 1995. Clearly, current account and capital account do not sum to zero. Since it is generally easier to account for items in the current account, most of the discrepancy probably arises in the capital account.

Net exports			-105.1	(+)
Exports	786.5	(+)		
Imports	891.6	(-)		
Net factor payments			-8.0	(+)
Receipts	182.7	(+)		
Payments	190.7	(-)		
Net transfers			-35.1	(+)
Balance:			-148.2	

Table 3.1: U.S. Current Account, 1995, billion Dollars

Increase in foreign assets owned by U.S.			307.9	(-)
Federal Reserve	9.7	(-)		
Other	298.1	(-)		
Increase in U.S. Assets Owned by Foreigners			425.5	(+)
Foreign Central Banks	109.8	(+)		
Other	314,7	(+)		
Balance:			116.6	

Table 3.2: U.S. Capital Account, 1995, billion Dollars

In order to see why every transaction enters the balance of payments twice, here some examples of international transactions:

- Export paid in (home currency) cash: The export as such is a positive item in the current account. The cash payment lowers the amount of home currency held by foreigners. Thus it is a decrease of home assets held by foreigners, and enters negatively in the capital account.

- Export financed by government transfer. The export as such enters positively in the current account, while the government transfer enters negatively in the current account.
- A domestic bank gives a loan to a foreign corporation: The loan as such is a foreign asset, it therefore increases foreign assets held by the home country and enters negatively in the capital account. At the same time, when the loan is given the foreign corporation receives home currency. This is an increase in home assets owned by foreigners, a positive item in the capital account.

In this way every transaction is accounted for twice, so that the two accounts have to cancel.

The Connection of the Balance of Payments to National Income and Product Accounts

While the balance of payments records international transactions of a country, the national income and product accounts (NIPA) track production and its uses within the country. Connecting these two parts of macroeconomic accounting gives us an interesting perspective on the origins of current account deficits or surpluses.

Using EX for exports, IM for imports, FP for net factor payments, and TR for net transfer payments, the current account balance CB can be written as:

$$CB = EX - IM + F + T. \tag{3.1}$$

We will now link this equation to the national income and product accounts. Using C for consumption, I for investment, G for government expenditure, and Y for GDP, the familiar breakdown of GDP into its expenditure components reads:

$$C + I + G + EX - IM = Y. \tag{3.2}$$

National savings S are defined as national income $Y + F + T$ minus consumption and government expenditures $C + G$:

$$S = Y + F + T - C - G.$$

Solving this for Y gives:

$$Y = S + C + G - F - T.$$

Plugging this for Y into the right-hand side of (3.2) gives:

$$C + I + G + EX - IM = S + C + G - F - T.$$

Simplifying and rearranging gives:

$$EX - IM + F + T = S - I.$$

According the definition of the current account balance in (3.1), the left-hand side is equal to the current account balance CB:

$$CB = S - I.$$

Thus we find that the current account balance is given by difference between national savings S and investment I. This relationship is an accounting identity and has to hold by definition. The fact that the current account is negative exactly if investment exceeds savings is important to keep in mind when discussing the sources of current account deficits. In the press, a current account deficit often gets blamed on restrictive trade policies by other countries which limit the amount of exports for the home country. However, we now see that a different way of looking at a current account deficit is to say that given the level of investment, the nationals simply do not save enough.

The Current Account in the United States

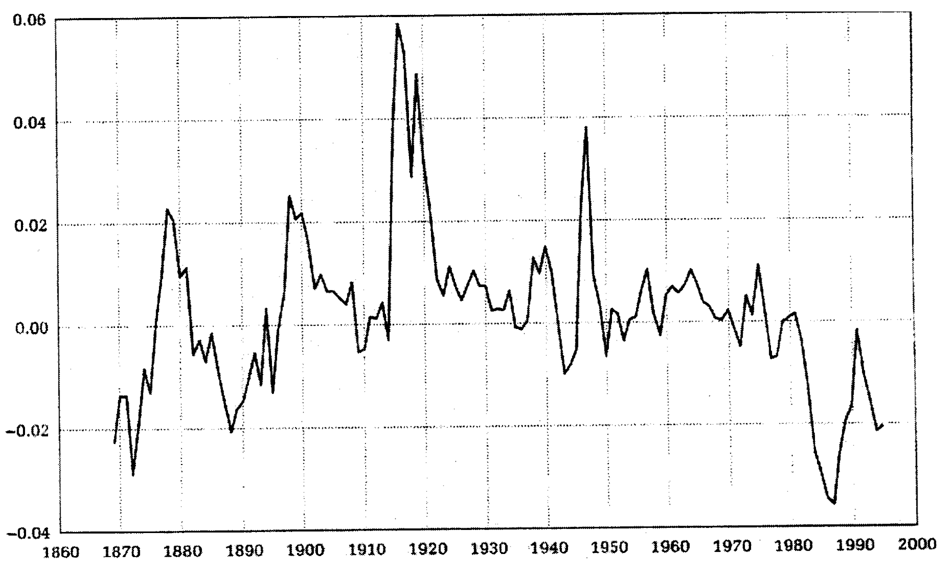

Figure 3.1: U.S. Current Account Balance relative to GDP

Figures 3.1 to 3.3 show how the current account balance and some of its components varied over time in the United States. Figure 3.1 shows the current account balance in the U.S. relative to GDP from 1870 to 2000. The balance never exceeds 6% of GDP. At the end of the 19th century, the current account was negative, reflecting capital inflows into the United States. Throughout most of the 20th century, the current account was positive. The main reason for this was that the United States used to own a lot of capital in foreign countries, which led to high net factor payments. In recent years, however, the current account has turned negative. One reason for this is a very low savings rate in the United States.

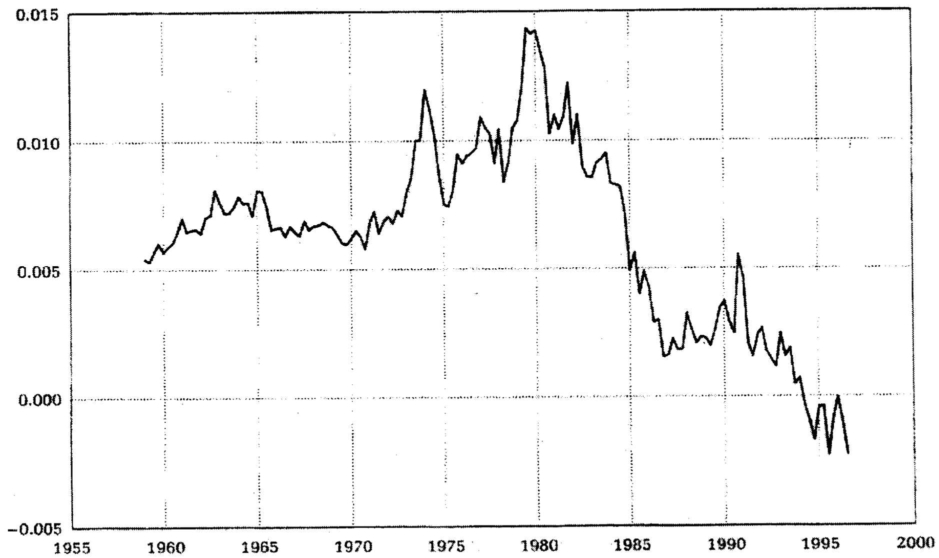

Figure 3.2: U.S. Net Factor Income from Abroad relative to GDP

Figure 3.2 shows net factor income as a fraction of GDP since 1960. Net factor payment was positive and increasing until about 1980. Afterwards, there was a rapid decline, so that net factor income is negative by now. Part of the explanation are the large recent capital flows to the United States. Many foreign firms and people have bought assets in the U.S. (for example, buildings, companies, stocks, or government bonds). Interest, dividends, and rents paid for these assets have a negative impact on net factor payments.

Figure 3.3 shows imports and exports relative to GDP since 1960. Both imports and exports have been rising over time, reflecting growing importance of international trade. Even today, however, imports and exports make up less than 15% of GDP. This is a low number in international comparison. Many European countries export 30 to 40% of their GDP, and in Singapore the number exceeds 100%.

In the media or in politics, the trade or current account balance is often treated as an issue of national pride. A current account surplus or a trade surplus is taken as a sign of good economic performance, while deficits are taken as indicators for serious problems. From an economic perspective, these simplified views lack merit. There are many situation when a trade or current account deficit is beneficial. Consider, for example, the case of a poor country that starts to industrialize. With free trade, we would expect that

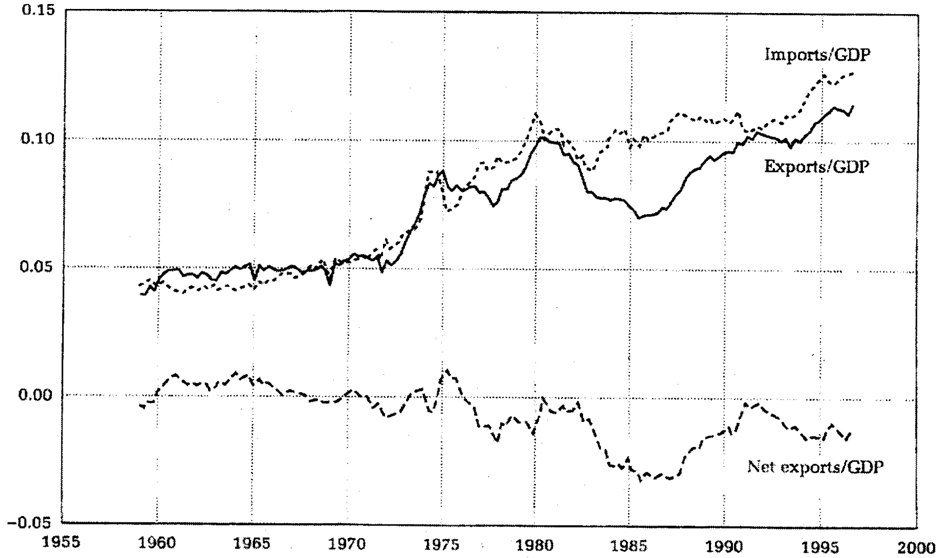

Figure 3.3: U.S. Exports and Imports relative to GDP

many foreign companies move factories to the country, in order to profit from low wages. Such large capital inflows will result in a positive capital account and a negative current account. Yet the negative current account is beneficial for the country, because foreign investment leads to increased employment opportunities for nationals and faster growth. In the United States, we often hear a concern that a trade deficit with a certain country (think of Japan or China) is a reason for concern. But again, there is no fundamental reason why trade balances should be balanced between each pair of countries. As an analogy, think of your trade relationship with your local grocery store. You constantly buy things from the grocery store, but presumably the grocery store buys nothing from you. If you and the store were countries, you would have a large and persistent trade deficit with the grocery store. Yet there is nothing bad about that at all, in fact, it would be rather annoying if you had to sell something to the grocery store yourself each time you want to get a beer or a pizza. The whole point of a market economy is to allow people to specialize and have many one-way trades. By the same token, it is only natural to have trade deficits with some countries, and surpluses with others.

3.2 International Trade

This section will provide an introduction to the theory of international trade. We want to answer why countries trade with each other in the first place, who trades what, and why some people are opposed to free trade. We will start with the centerpiece of the theory of international trade, the principle of comparative advantage. Afterwards, I will discuss distributional effects of trade, strategic trade policy, and trade agreements.

Comparative Advantage

The most fundamental question for the theory of international trade is why countries trade with each other in the first place. In other words, we would like to know under which conditions a country can gain by opening its borders for trade. The answer is is one of the most important insights in macroeconomics: countries can always gain from free trade, even if they are more productive in the production of every good than the countries they are trading with. This result is also called the **principle of comparative advantage**. Exactly what is meant by comparative advantage will become much clearer once we look at a specific example.

Consider a world with only two countries, called United States and Mexico, and two products, beer and pizza. We also assume that the production functions for each good are linear, and that there is exactly one worker in each country. The United States are assumed to be more productive at producing both products. In one unit of time the U.S. can produce 10 pizzas or 10 bottles of beer. Mexico, on the other hand, produces only 8 pizzas or 4 bottles of beer per unit of time. At first sight, one might think that the United States have nothing to gain from trading with Mexico, since Mexico is less efficient than the U.S. in the production of either product. The key point, however, is that while Mexico is less productive than the U.S. in absolute terms, Mexico is more productive in producing pizzas in relative terms. In the time that is necessary to produce one beer, the U.S. can produce one pizza, while Mexico can produce two. Therefore we say that Mexico has a comparative advantage in the production of pizza, and as we will see, this implies that both Mexico and the U.S. can gain from trading with each other. Since every country has a comparative advantage at doing something, this implies that every country stands to gain from free trade. This is the fundamental reason why economists on the whole are overwhelmingly in favor of free trade.

Let us first go back to our example. To show that free trade is indeed optimal for both countries, I will first compute outcomes under autarky (without trade), and then compare the outcomes to free trade. I will assume that the utility function of the single worker in each country takes the form:

$$u(c_b, c_p) = 2\ln(c_b) + \ln(c_p).$$

In other words, the consumer cares more about beer than about pizza. Beer will serve as the numeraire in this economy, therefore the price of beer is normalized to one, and p will denote the price of pizza in terms of beer. The worker supplies one unit of labor inelastically and receives wage w. The budget constraint is:

$$c_b + pc_p = w.$$

If we solve this budget constraint for c_b and plug it into the utility function, we get the following maximization problem for the consumer:

$$\max_{c_p}\{2\ln(w - pc_p) + \ln(c_p)\}.$$

The first-order condition for this problem is:

$$\frac{1}{c_p} = \frac{2p}{w - pc_p}, \tag{3.3}$$

which gives:

$$3pc_p = w$$

or:

$$c_p = \frac{w}{3p}. \tag{3.4}$$

Using the budget constraint, we can now derive optimal beer consumption:

$$c_b = \frac{2w}{3}. \tag{3.5}$$

Equations (3.4) and (3.5) are the optimal choices of the consumer regardless whether this consumer lives in the U.S. or in Mexico, and regardless whether there is free trade or autarky. Location and the trade regime will affect prices and wages, however.

Next, we will have to consider the profit maximization problem of the firms. I will start with the problem of the beer producer in the United States under the assumption of autarky, i.e., no trade with Mexico. The production function is linear, and ten bottles are produced per labor unit. Therefore the maximization problem of the American beer producer is:

$$\max_{l_b}\{10l_b - wl_b\}$$

The first-order condition for this problem pins down the wage: $w = 10$. The American pizza producer solves:

$$\max_{l_p}\{10pl_p - wl_p\}$$

Notice that since beer is the numeraire, we have to multiply pizza production by the relative price of pizza to get revenue in terms of beer. The first-order condition gives:

$$w = 10p,$$

and since we have $w = 10$ from the beer-producer's problem, we must have $p = 1$.

Now that we have computed p and w, we just need to plug these values into the solutions for the consumer's problem (3.4) and (3.5) to compute consumption of the American consumer under autarky. Specifically, we get:

$$c_b = 2w/3 = 6\frac{2}{3}$$

and:

$$c_p = w/3p = 3\frac{1}{3}.$$

Let us now turn to Mexico. The consumers problem is the same as before, we only have to adjust the producer's problems to compute the prices and the wage in Mexico under autarky. Mexico can produce 8 pizzas or 4 bottles of beer per unit of time. Therefore the problem of the Mexican beer producer is:

$$\max_{l_b}\{4l_b - wl_b\},$$

and the first-order condition for this problem gives $w = 4$. The pizza producer solves:

$$\max_{l_p}\{8pl_p - wl_p\}$$

The first-order condition gives:

$$w = 8p,$$

and since we have $w = 4$ from the beer-producers problem, we must have $p = 0.5$. In Mexico, it takes less time to produce pizza than in takes to produce beer, therefore pizza is cheaper than beer.

Again, we now can use (3.4) and (3.5) to see how much beer and pizza the Mexican worker consumes. The results are:

$$c_b = 2w/3 = 2\frac{2}{3}$$

and:

$$c_p = w/3p = 2\frac{2}{3}.$$

Thus the Mexican ends up consuming equal amounts of beer and pizza. In the utility function, he likes beer more, but then pizza is cheaper, so the optimal choice turns out to be to equalize consumption.

After having computed consumption in both countries under autarky, the question arises why Mexico and the United States should be able to gain from trade. After all, the American worker already is more productive in either industry, and he already gets to consume more of either product. However, it will turn out that trade allows each worker to specialize in what he does relatively best, and gains will be possible.

To see this, let us assume that Mexico and the United States enter into free trade. Since Mexico is relatively more efficient at producing pizza, Mexico will specialize and produce 8 pizzas and no beer. With Mexico supplying pizza, the U.S. will choose to specialize as well and produce 10 bottles of beer, but no pizza.

If we divide (3.4) and (3.5), we get that the price p has to satisfy:

$$2p = \frac{c_b}{c_p}.$$

Notice that under free trade, their is just one price p for both countries, instead of a separate price in each country. Since the same condition holds in the United States and in Mexico, the ratio of beer to pizza consumption is equal in the two countries. This implies that the ratio of beer to pizza consumption has to be equal to the ratio of beer to pizza production. We therefore have:

$$2p = \frac{10}{8}$$

or:

$$p = \frac{5}{8}.$$

From the first-order condition of the beer producer in the United States we can compute the American wage:

$$w_{US} = 10$$

Similarly, the first-order condition for the problem of the Mexican pizza producer gives us the Mexican wage:

$$w_{MEX} = 8p = 5.$$

Now using (3.4) and (3.5) once again, we can compute consumption of each product in the two countries:

$$c_{bUS} = 6\frac{2}{3},$$

$$c_{pUS} = 5\frac{1}{3},$$

$$c_{bMEX} = 3\frac{1}{3},$$

and:

$$c_{pMEX} = 2\frac{2}{3}.$$

Thus Americans get to consume more pizzas than under autarky, while the Mexicans get more beer. Every party gains relative to autarky, even though Mexico does not have an

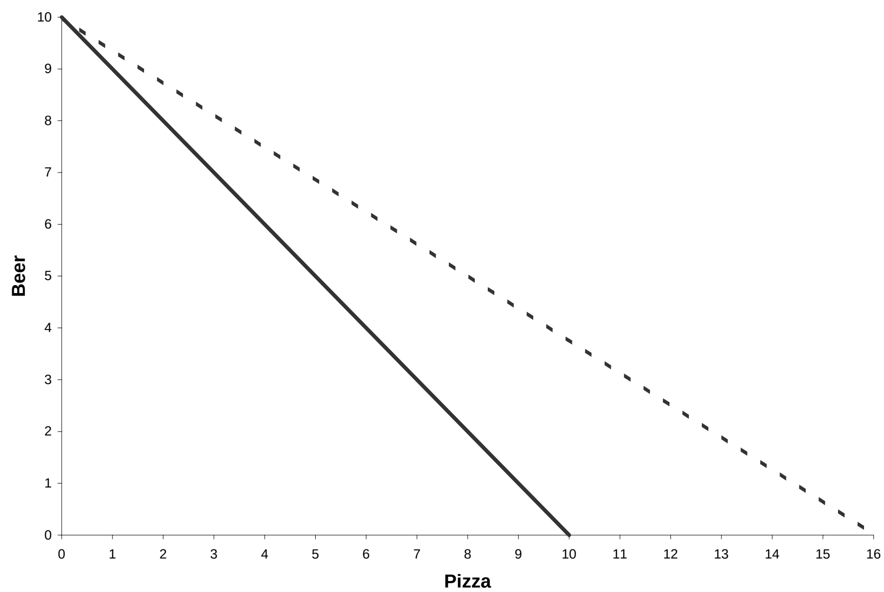

Figure 3.4: Production and Consumption Possibility Sets for the United States

absolute advantage at the production of either product. Every country can therefore gain from free trade, regardless of its productivity, resources, or industries.

The reason for this result becomes more clear if we graph the production and consumption possibility sets for the U.S. and Mexico under autarky and free trade. The solid line in Figure 3.4 displays the production possibility set in the United States. The extreme points are production of 10 beers and zero pizzas, and production of zero beers and 10 pizzas. Any linear combination of these points is also possible. Under autarky, the country is restricted to consume a bundle of beer and pizza that it can produce, i.e., a bundle that is within the production possibility set. Under free trade, however, the consumption possibilities are bigger than the production possibilities, because goods can be exchanged with foreigners. The dotted line in Figure 3.4 shows the boundary of the consumption possibility set under free trade with Mexico. This line is a budget constraint for the whole country. With free trade, the wage in America is $w = 10$, and the price of pizza is given by $p = \frac{5}{8}$. The budget line for the country is given by $c_b = 10 - pc_p$. Clearly, the consumption possibility set is bigger than the production possibility set, and indeed the Americans choose a consumption bundle that they could not produce themselves. Regardless of the price p, the consumption possibility set is always bigger than the production possibility set under free trade.

Figure 3.5 shows the same situation for Mexico. The solid line is the production possibility

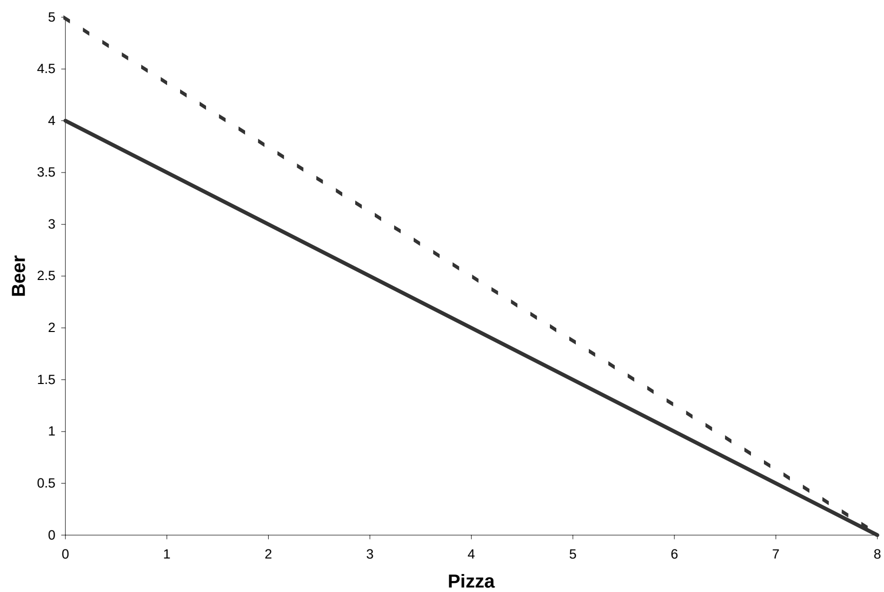

Figure 3.5: Production and Consumption Possibility Sets for Mexico

set, and the dotted line bounds the consumption possibility set. Clearly, the consumption possibility set is larger than the production possibility set.

Apart from showing that free trade can be beneficial for any country, the theory of comparative advantage also makes predictions for international specialization and trade flows. Every country should specialize in the goods in which it has a comparative advantage. For example, we would expect labor-rich countries to specialize in labor-intensive product. These can be exported to capital-rich countries, who specialize in capital-intensive goods instead. Also, countries which are rich in human capital (i.e., have a well-educated work force) would be expected to specialize in areas like education and research and development. We do observe that international specialization follows this pattern, though not to the degree that theory would predict.

The main conclusion of this section is that free trade is advantageous for each and every country. Still, in the real world we do observe plenty of opposition to free trade from a variety of groups. In the next sections, we will explore some arguments against free trade.

Trade and Distribution

In the United States, trade unions are among the most vocal opponents of free trade. The common concern among unions is that (domestic) workers suffer under free trade because of competition from other countries, where wages are lower. Such effects were ruled out in the example used above, since there was only a single person in each country (or, equivalently, everyone was identical). It was shown above that a country as a whole always gains from trade, therefore as long as everyone is identical, no negative effects from trade are possible. The situation changes if people differ in their specializations. The effects of trade on real-world steel workers, for example, are different than the effects on workers in the computer industry. In this section, we will work out a model where people have different specializations, in order to assess whether distributional effects of trade might provide arguments against free trade.

To keep the analysis simple, instead of analyzing different countries together as we did above, we will concentrate on a single country in this section. This country is small and therefore takes prices in the world market as given. There are two goods, beer and pizza, and the country is inhabited by two people, the beer guy and the pizza guy. The two people are completely specialized: As the name suggests, the beer guy only knows how to produce beer, while the pizza guy can produce only pizza. Because we assume specialization, the two people in this economy will be affected in different ways be free trade. This allows us to analyze the distributional effects of trade.

As before, I will assume that production functions are linear. Specifically, the technology for producing beer is given by:

$$y_b = l_b,$$

and the technology for pizza is:

$$y_p = l_p.$$

In other words, in each sector output equals labor input. The utility function for both people is given by:

$$u(c_b, c_p) = \ln(c_b) + \ln(c_p).$$

Since the two people have different jobs, their wages can be different. w_b will denote the wage of the beer guy, while w_p is the wage of the pizza guy. The budget constraint for either person can be written as:

$$c_b + pc_p = w_i,$$

where $i \in \{b, p\}$. As before, beer is the numeraire. The utility maximization problem is:

$$\max_{c_p}\{\ln(w_i - pc_p) + \ln(c_p)\}.$$

The first-order condition is:

$$-\frac{p}{w_i - pc_p} + \frac{1}{c_p},$$

which gives the solutions:

$$c_p = \frac{w_i}{2p} \tag{3.6}$$

and:

$$c_b = \frac{w_i}{2}. \tag{3.7}$$

The maximization problem for the brewery and the pizza bakery are:

$$\max_{l_b}\{l_b - w_b l_b\}$$

and:

$$\max_{l_p}\{pl_p - w_p l_p\}.$$

The first-order conditions for these problems determine the wages:

$$w_b = 1 \tag{3.8}$$

and:

$$w_p = p. \tag{3.9}$$

I will first solve for the equilibrium under autarky, and then determine how the equilibrium changes under free trade. Under autarky, consumption of each good has to equal production within the country. Both the pizza guy and the beer guy supply one unit of labor, and since the production technologies are linear, one bottle of beer and one pizza will be produced. We can now use the market clearing condition for beer to determine the wage of the pizza guy. We know from (3.7) above that each person demands $w_i/2$ units of beer. Using $w_b = 1$ and the fact the total supply of beer equals one, the market-clearing condition is:

$$\frac{1}{2} + \frac{w_p}{2} = 1,$$

or:

$$w_p = 1.$$

Because of (3.9) we then have $p = 1$, and using (3.6) and (3.7) we find that each person consumes $\frac{1}{2}$ units of each good. Utility for each agent is:

$$\ln\left(\frac{1}{2}\right) + \ln\left(\frac{1}{2}\right) = -\ln(4) \approx -1.386.$$

We therefore find that under autarky, both agents have the same consumption and achieve the same utility. I will contrast this to the equilibrium under free trade. I will assume that in the world market two pizzas are traded for one beer, thus $p = \frac{1}{2}$ is the world market price. Instead of using the market-clearing conditions, for the equilibrium under free trade we just take the price as given and solve for consumption. The market-clearing conditions no longer need to be satisfied within the country, since im- and exports are possible.

Since both agents still supply one unit of labor, production of beer and pizza will be one each. From (3.8) and (3.9), we get that $w_b = 1$ and $w_p = \frac{1}{2}$. The wage of the pizza guy falls, since his product can be bought cheaply in the world market. Here we see how trade can have asymmetric effects if people specialize in specific products.

Given the wages and $p = \frac{1}{2}$, we use (3.6) and (3.7) to compute consumption. For the beer guy we get $c_b = \frac{1}{2}$ and $c_p = 1$. Thus the beer guy gets the same amount of beer as before, but twice as much pizza, and is therefore clearly better off. Beer has a high value in the world market, thus the beer producer gains from free trade. In contrast, the pizza guy consumes $c_b = \frac{1}{4}$ and $c_p = \frac{1}{2}$. Thus consumption of pizza stays constant, but beer consumption goes down by a factor of two. The pizza guy is clearly worse off, since his product has a low price in the world market. It seems understandable that the pizza guy would be opposed to free trade, just as, for example, steel-worker unions are in the United States.

Thus the distributional effects of trade provide a rationale why some people are opposed to trade. Simply restricting trade would not be a good solution either, however, since the beer guy is much better off under free trade. And as we saw in the previous section, a country as whole can always gain from trade since overall consumption possibilities increase. A better way of dealing with the distributional effects would be to compensate those who suffer from trade. In our example, the beer guy could give some money to the pizza guy so that he agrees to free trade. Let us assume that the transfer between the two people is $\frac{1}{4}$, so that after the transfer and under free trade both have an income of $\frac{3}{4}$. Using (3.6) and (3.7), we can then compute the optimal consumption values as $c_b = \frac{3}{8}$ and $c_p = \frac{3}{4}$. The resulting utility is:

$$\ln\left(\frac{3}{8}\right) + \ln\left(\frac{3}{4}\right) = \ln(9) - \ln(32) \approx -1.269,$$

which is higher than the utility under autarky.

Different people have different specializations and therefore can be affected by trade in different ways. This implies that free trade is not always a Pareto improvement. On the other hand, it is still the case that free trade extends consumption possibilities for a country as a whole. Therefore it is always possible to find a redistribution scheme that makes everyone better off with trade than without. Distributional effects explain why certain groups are opposed to trade, but they do not provide a good argument against trade from a social perspective.

Strategic Trade Policy

All the models discussed so far assume perfect competition. This means that firms take prices as given and do not make any profits in equilibrium. Since the firms do not make profits, only consumer welfare matters for the welfare of a country. Consequently, in all the analysis above we only considered the welfare of consumers when comparing different trade regimes. On the other hand, in the real world perfect competition does not always prevail. There are a number of industries that are characterized by imperfect competition, i.e., monopolies or oligopolies. When there is imperfect competition, firms can influence market prices and earn positive profits in equilibrium. The profit of such firms will benefit the owners of the firm and therefore influence welfare in the country. Consequently, the effects of trade policy on profits due to imperfect competition are relevant for optimal trade policy.

It turns out that once we consider profits arising from imperfect competition, a rationale for an interventionist trade policy arises. The basic story goes like this. Many industries with imperfect competition are natural monopolies or oligopolies, which means that the world market can sustain only a limited number of suppliers. In which countries these suppliers are located is relevant for the welfare for these countries, since they gain from the profits arising from imperfect competition. Consequently, governments might be tempted to take measures that ensure that one of the suppliers, or even the only one, locates in their country.

As an example, consider the market for next-generation large passenger airplanes, "superjumbos." The development of this type of plane is very expensive, and only a limited number of firms is able to enter the market. We will assume that there are only two potential suppliers, called Boeing and Airbus, located in the U.S. and Europe, respectively. The question is which of these firms will enter the market for superjumbos. To answer this question, we need to know how much profit the firms are going to make if they enter the market.

To start, I will assume that only one firm enters the market. I assume that the demand x for superjumbos depends on the price p:

$$x = 110 - p.$$

The higher the price, the less planes can be sold. Alternatively, we can express the price as a function of quantity:

$$p = 110 - x.$$

I assume that there is a cost c for producing each plane in the amount of $c = 10$. Also, there is a fixed development cost f in the amount of $f = 1500$ that needs to be paid once the market is entered. The maximization problem of the entering firm is given by:

$$\max_x \{px - cx - f\}.$$

Plugging in the values for p, c, and f, this is:

$$\max_x \{(110 - x)x - 10x - 1500\}.$$

The first-order condition for this problem is:

$$100 - 2x = 0,$$

so that:

$$x = 50.$$

Given quantity, we find that the price of each plane will be $p = 110 - x = 60$, and the profit of the entering firm will be 1000.

The alternative is that both firms enter the market. I will assume that the firms compete Cournot-style, i.e., each firm chooses optimal output x taking output y of the other firm as given. In this case, the maximization problem of an entering firm is:

$$\max_x \{(110 - x - y)x - 10x - 1500\}.$$

The first-order condition for this problem is:

$$100 - 2x - y = 0.$$

Since both firms are in the same situation, in equilibrium they will choose the same quantity, so that we have $x = y$. Using this, we have:

$$100 - 3x = 0,$$

so that:

$$x = 33\frac{1}{3}.$$

Thus the total quantity produced is $66\frac{2}{3}$ and the price for each plane is $43\frac{1}{3}$. It turns out that in this case revenue is not sufficient to cover the development cost f: each firm will make a loss of $388\frac{8}{9}$.

We now have computed the profits for the cases of one or two firms entering. If no firm enters, profits are zero. We therefore have the following matrix of possible outcomes:

	Boeing in	Boeing out
Airbus in	$-388\frac{8}{9}$ / $-388\frac{8}{9}$	1000 / 0
Airbus out	0 / 1000	0 / 0

We can interpret this matrix as the payoff matrix for a market entry game, with Airbus and Boeing being the players. Which are the equilibria of this game? It is easy to check that there are two Nash equilibria in pure strategies, (Airbus in / Boeing out) and (Airbus out / Boeing in). To make sure that we have found a Nash equilibrium, we have to check whether any firm can gain by deviating. In the case of (Airbus in / Boeing out), if Airbus deviates to not entering, it loses profits in the amount of 1000. Therefore Airbus does not want to deviate. If Boeing deviates and enters the market as well, Boeing will incur a loss, instead of making zero profit. Thus Boeing does not want to deviate as well, (Airbus in / Boeing out) is an equilibrium. We can show that (Airbus out / Boeing in) is an equilibrium by the same method.

The outcome of the game is therefore that only one firm will enter. Which firm is going to enter is not clear. In practice, the game would probably decided by moving first: Once one firm credibly commits to entering the market, the other one does not have an incentive to follow.

Which firm enters the market, on the other hand, might be of interest to the governments of Europe and the United States. The entering firm is going to earn a profit of 1000 by selling planes in the whole world, and from the point of view of a government it would be preferable if this profit went to a national firm. Therefore a government could be tempted to try to influence the outcome of the entry game. Suppose that the government of Europe wants to make sure that Airbus, not Boeing, wins the market for superjumbos. One possibility would be to subsidize the fixed cost f for developing of the plane. Let us assume that Europe decides to pay a subsidy of 500 to Airbus if Airbus decides to enter the market. If Airbus enters alone, profits will increase to 1500. If both firms enter, Airbus will still make a small profit in the amount of $111\frac{1}{9}$. Therefore with the European subsidy, the game matrix is:

	Boeing in	Boeing out
Airbus in	$111\frac{1}{9}$ / $-388\frac{8}{9}$	1500 / 0
Airbus out	0 / 1000	0 / 0

Which are the equilibria of this modified game? It turns out that there is only one equilibrium, (Airbus in / Boeing out), thus Airbus wins the whole market for sure. To see this, let us first consider the situation of Airbus. Entering the market is a dominant strategy for Airbus. Regardless of Boeing's actions, Airbus gains by entering and hence will produce the plane for sure. Given that Airbus enters, it is optimal for Boeing to stay out, therefore Airbus wins the whole market.

We therefore see that paying a subsidy guaranteed that Airbus wins the whole market and achieves monopoly profits of 1500. It is understandable that the European government might be tempted to subsidize Airbus. On the other hand, paying the subsidy has a negative effect on the United States and is not efficient from a global perspective. There is a very real possibility that the United States might retaliate by paying similar subsides in the same or other industries. On the whole, the result will be worse for either country than abstaining from any intervention altogether. We just saw, however, that an intervention is rational from the perspective of an individual government. The best way to overcome such conflicts is to enter trade agreements that specify penalties for breaking the rules of the agreement. Once an agreement is entered, intervention is no longer individually rational, and free trade will prevail. This is the basic logic behind trade agreements like NAFTA or the WTO.

3.3 Exchange Rates

So far, we have considered only the real side of trade. All prices were expressed in terms of a numeraire good. In this section we will explore the nominal side of international trade. Different countries use different currencies, and the relative prices of these currencies (exchange rates) can have real effects on trade.

The **nominal exchange rate** of a certain currency is defined as the price in terms of the home currency for one unit of the foreign currency. We will use the symbol e for nominal exchange rates. For example, if the United States is the home country, we would express the exchange rate of the Euro as:

$$e = 0.93 \text{ Dollars}/\text{Euro}.$$

The nominal exchange rate tells us at which rate the currency of one country can be exchanged into currency of another country. Often we will be also be interested in the rate at which goods in the one country can be exchanged into goods in the other country. This information is provided by the **real exchange rate**. We will use P for price level in the home country, and $P^\star$ for price level in the foreign country. The real exchange rate x is then defined as:

$$x = \frac{eP^\star}{P}.$$

The real exchange rate is the amount of goods that can be purchased in the home country with the proceeds of selling one unit of goods in the foreign country. As an example, consider the case where P is the price of a TV set in the the United States (say, 100 Dollars), and $P^\star$ is the price of a TV set in Europe (say, 200 Euros). Also assume that the nominal exchange rate e equals one, so that one Dollar is equivalent to one Euro. If we now sell one TV in Europe, we get 200 Euros, which can be exchanged into 200 Dollars. With 200 Dollars, we can buy two TV sets in the United States. Therefore the real exchange rate equals two.

Purchasing Power Parity

How are real and nominal exchange rates determined? We will not be able to give a complete answer to this question. Even today the behavior of currency exchange rates is not fully understood. On the other hand, we do have a theory that is successful in predicting exchange rates up to an approximation. This is the theory of **purchasing power parity**.

Simply put, the theory of purchasing power parity predicts that the nominal exchange rate e should adjust such that the real exchange rate x equals one. In other words, the prediction is:

$$x = \frac{eP^\star}{P} = 1,$$

which implies:

$$e = \frac{P}{P^\star}.$$

The term purchasing power parity (or PPP) derives from the fact that whenever $x = 1$, a given amount of money buys equal amounts of goods in the home country and the foreign country. Why should we expect PPP to hold? The argument is based on the possibility of arbitrage.

Assume, for the sake of argument, that the prices P and $P^\star$ correspond to a specific product, say, TV sets, and that the real exchange rate x is far from one, say, $x = 2$. Now the following arbitrage is possible: One could buy one TV set for price P in the home country, and sell the same TV set in the foreign country for price $P^\star$. Since we have $x = 2$, the proceeds from selling this TV are sufficient two buy two more TV sets in the home country. Again, these could be sold in the foreign country, yielding enough money to buy four TV sets at home. Going on this way, arbitrary profits can be achieved by shipping TV sets from the home country to the foreign country.

This arbitrage opportunity is ruled out if purchasing-power parity holds, since selling one TV in the foreign country yields just enough money to buy one TV on the home country. PPP is just another variant of the **law of one price**, which states that the same product should have the same price in different markets.

In reality, we would not expect for PPP to hold precisely. Shipping goods between countries involves transaction costs. If, for example, the cost of shipping a TV amounts to 10% of the value of a TV, in the example above we would expect PPP to hold only with a margin of error of 10%. Whether PPP holds for a specific product will depend on the cost of transporting this product. Computer chips, for example, are very expensive relative to their weight, therefore transportation cost (even air transport) makes up only a very small fraction of their price. Consequently, we would expect that PPP price holds almost exactly for computer chips. Building materials, on the other hand, have a very high weight relative to their price. Therefore transportation cost makes up a large fraction of their price, and we would not expect that PPP holds precisely. Some goods are not traded at all, for example services like haircuts. Consequently, we have no reason to assume that PPP would hold for such products. Indeed, when people from industrialized countries travel in developing countries, they usually notice that the prices of items that are expensive relative to their weight are similar compared to prices in their home country (cars, computers, cameras etc.), while nontraded goods like haircuts are dramatically cheaper than at home.

Evidence on Purchasing Power Parity

Figures 3.6 to 3.8 provide some evidence on purchasing power parity around the world. Figure 3.6 plots the log of the real exchange rate for barley between England and the Netherlands from about 1400 to our times. Up to the time of steam trains, water transport was by far the cheapest mode of transportation. Since England and Netherlands are only separated by a short stretch of sea, we would expect that PPP holds as an approximation for these two countries. Transportation of barley is not costless, so PPP does not need to hold precisely. Nevertheless, grain shipments were frequent even already hundreds of years ago, so we would not expect to see large deviations from PPP either. Indeed, we see that the real exchange rate was one on average over the whole period (the graph plots the log of the real exchange rate). In some centuries we do observe sizable deviations from the law of one price, but in the end prices adjusted towards PPP.

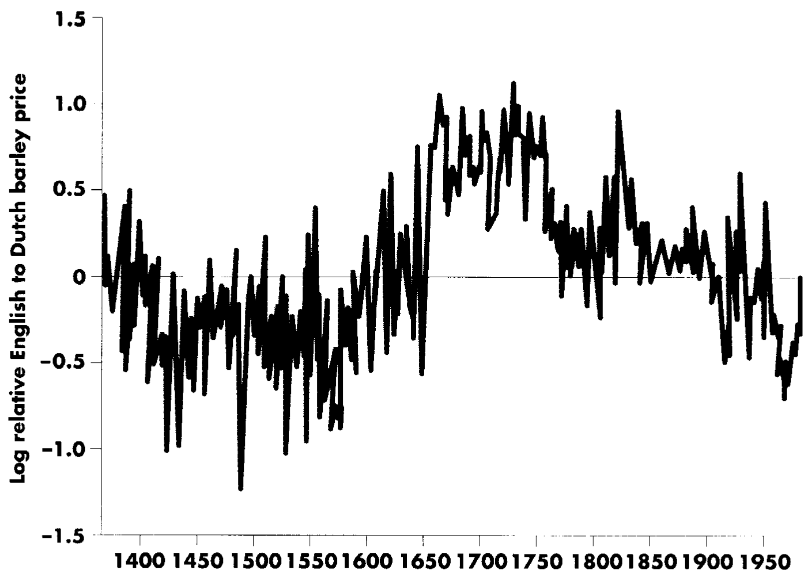

Figure 3.6: Log-Relative Price of Barley in England and Netherlands

Figure 3.7 shows more recent evidence on PPP for the United States and Germany. From the perspective of Germany, if purchasing power parity holds, we have:

$$1 = \frac{eP^{US}}{P^{GER}},$$

or:

$$e = \frac{P^{GER}}{P^{US}}.$$

Figure 3.7 shows the exchange rate and the ratio of consumer price levels in Germany and the U.S. from 1970 to 1995. Since the basket of consumer goods contains many items that are not traded or have a high transportation cost, we would not expect PPP to hold precisely. And indeed, the exchange rate and the ratio of prices are not identical throughout the period. Still, they clearly move in the same overall direction. While PPP does not predict the short-run behavior of the exchange rate in this case, it does seem to be a good indicator for long run trends.

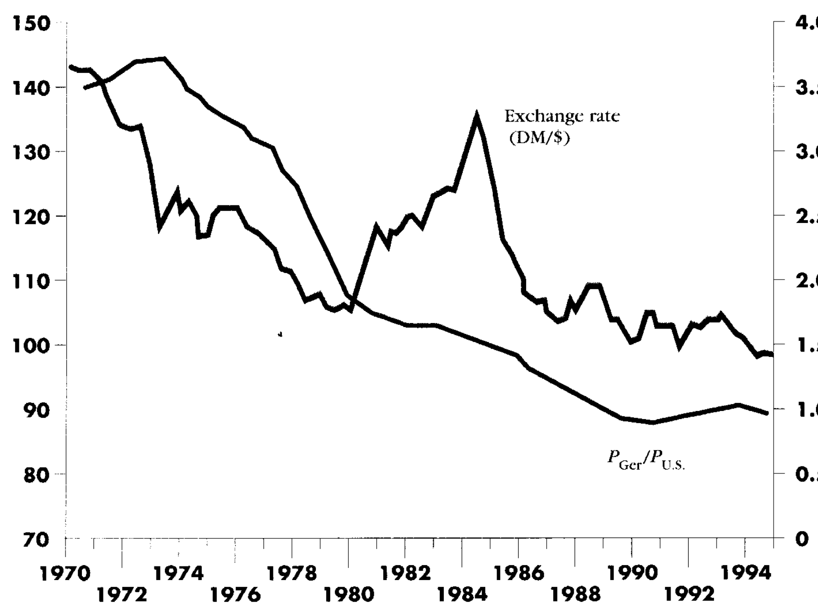

Figure 3.7: Prices Levels and Exchange Rate, U.S. and Germany

Figure 3.8 shows similar evidence for the U.S. and Mexico, as seen from the Mexican perspective. If purchasing power parity holds, we have:

$$1 = \frac{eP^{US}}{P^{MEX}},$$

or:

$$\frac{P^{MEX}}{e} = P^{US}.$$

Figure 3.8 shows the American price level versus the Mexican price level divided by the exchange rate from 1970 to 1992. Again, both series have the same overall trend. What is different in this picture is that the ratio of the Mexican price level to the exchange rate is more volatile, and exhibits a number of large sudden drops. The explanation for this is that Mexico has a fixed exchange rate (e is constant over time), but had to adjust the fixed exchange rates from time to time. The sudden drops in P^{MEX}/e correspond to the times when the exchange rate is adjusted. Each adjustment brings the exchange rate closer to purchasing power parity. Indeed, we can explain the need to adjust the exchange rate with an increasing deviation from PPP that in the end was unsustainable. In such cases, if the exchange rate is not adjusted in time, currency crises can occur, which force the devaluation of a currency. Exactly this is what happened to Mexico on a number of occasions. We will come back to this point later.

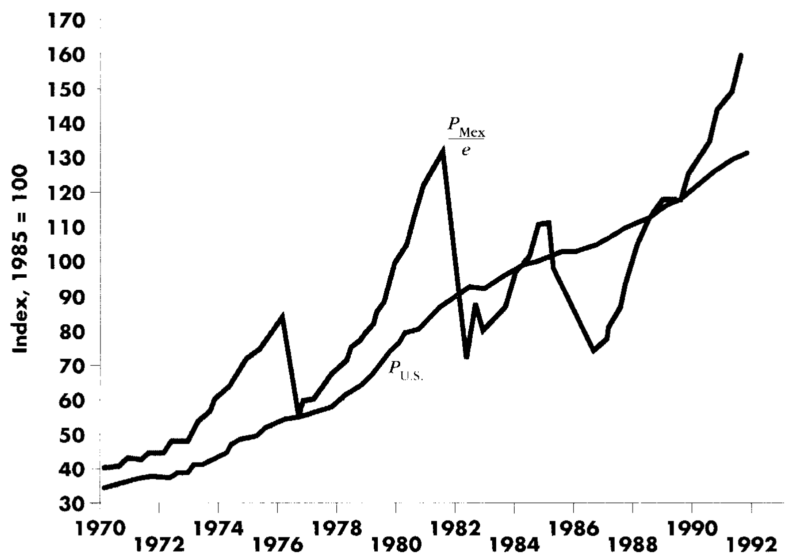

Figure 3.8: Prices Levels and Exchange Rate, U.S. and Mexico

Inflation and Exchange Rates

In the section on purchasing power parity we linked nominal exchange rates to the price levels in the home country and the foreign country. If their is inflation, these price levels will change from year to year. It is then a straightforward exercise to work out how inflation in the home country and the foreign country is going to affect exchange rates.

If PPP holds, the following relationship is satisfied at any time:

$$e = \frac{P}{P^{\star}}.$$

Specifically, in any period $t+1$ we have:

$$e_{t+1} = \frac{P_{t+1}}{P^{\star}_{t+1}}. \tag{3.10}$$

We will now use π and $\pi^{\star}$ to denote inflation in the home country and the foreign country, so that we have:

$$P_{t+1} = (1+\pi)P_t$$

and:

$$P^{\star}_{t+1} = (1+\pi^{\star})P^{\star}_t.$$

Using this in (3.10), we get:

$$e_{t+1} = \frac{P_{t+1}}{P^{\star}_{t+1}} = \frac{(1+\pi)P_t}{(1+\pi^{\star})P^{\star}_t},$$

and since we have $P_t/P^{\star}_t = e_t$, this is:

$$e_{t+1} = \frac{(1+\pi)}{(1+\pi^{\star})}e_t. \tag{3.11}$$

This equation implies that the exchange rate will fall (the foreign currency gets cheaper) if inflation is higher in the foreign country, and the exchange rate will rise if inflation is high in the home country.

Interest-Rate Parity

Our argument for purchasing power parity was that a given amount of currency should buy the same amount of goods in different countries. When we apply this same argument to investments in different countries, we get a theory of interest rates across country: **interest-rate parity**. The main idea is that in a market equilibrium, the expected return from investing a given amount of money in the home country should equal the expected return from investing in the foreign country. If this were not the case, all investments would flow either to the one or the other country. We observe people investing in different countries at the same time, however, so interest-rate parity should hold.

Consider the problem of an American investor who wants to invest $100 for one year in bonds. We will use r to denote the interest rate in the home country, and $r^{\star}$ is the interest rate in the foreign country. We frequently observe investors (especially big, institutional investors) buying domestic and foreign bonds at the same time. Therefore it should be the case that investing at home and abroad yields the same expected return.

If the investor uses the 100 Dollars to buy American bonds, after a year he will receive $(1+r)100$ Dollars. If the investor buys foreign bonds instead, he first has to exchange the Dollars into foreign currency. Thus he will buy bonds for $100/e_t$ units of foreign currency. After a year, he will receive $(1+r^\star)100/e_t$, which, exchanged into Dollars, is $(1+r^\star)100e_{t+1}/e_t$. In other words, the change in the exchange rate from one year to the next enters the return of the investment. Since we observe investors buying both foreign and domestic bonds, it has to be the case that expected returns are equal, or:

$$1+r=(1+r^\star)E\left(\frac{e_{t+1}}{e_t}\right),$$

where E denotes the expected value. We can rewrite this equation as:

$$\frac{1+r}{1+r^\star}=E\left(\frac{e_{t+1}}{e_t}\right).$$

This means that interest rate differentials should correspond to expected changes in the exchange rate. For example, if interest rates are lower at home than abroad, we would expect the exchange rate to fall.

In the last section, we linked changes in the exchange rate to differences in inflation. Using (3.11) above, we can rewrite the last equation as:

$$\frac{1+r}{1+r^\star}=E\left(\frac{1+\pi}{1+\pi^\star}\right).$$

If inflation abroad is higher, interest rates are lower at home, at the other way around. This is a prediction that can be easily verified in real-world data. Countries with high inflation generally also have high interest rates.

3.4 Exchange Rate Regimes

So far, we have discovered a number of links between exchange rates and other variables like inflation and interest rates. This still does not provide a complete answer to the question how exchange rates are determined, because inflation rates and interest rates are also determined by the whole economic system and not given exogenously. It will turn out that the ultimate answer depends on the exchange rate regime. In this section, I will discuss the implications of a number of alternative exchange rate regimes.

Fixed Exchange Rates

The first possibility for managing the exchange rate of a country is to fix it at a constant level. Of course, a country cannot force people to trade at a fixed exchange rate by decree.

Instead, in order to implement a fixed exchange rate, the central bank of a country has to be ready to exchange currency at the fixed rate at any time and in any quantity. If there is demand for the home currency, the central bank buys foreign currency with home currency at the fixed exchange rate. If currency traders want to sell the home currency, the central bank has to be ready to buy its own currency using its foreign reserves.

Even within a fixed-exchange-rate regime, the government can decide to change the fixed exchange rate from time to time. This is referred to as a **realignment** or **revaluation**. If the price of the home currency is lowered relative to foreign currency, we speak of a **devaluation**.

An important consequence of a fixed-exchange-rate regime is that the country loses control over its own monetary policy. In other words, each country can either control its money supply or its exchange rate, but not both independently. The reason for this is that since the central bank is permanently required to exchange home currency for foreign currency at a fixed rate, the demand for the home currency determines money supply.

This can also be shown more formally. I will start with the quantity equation for each country. Using Y and $Y^\star$ for GDP at home and abroad, M and $M^\star$ for money supply, and V and $V^\star$ for velocity, we have:

$$PY = VM$$

for the home country, and:

$$P^\star Y^\star = V^\star M^\star$$

for the foreign country. Assuming that purchasing power parity holds, we also have:

$$P = eP^\star. \tag{3.12}$$

Since with a fixed exchange rate e is constant and $P^\star$ is not under control of the home government, the price level P needs to be adjusted to equal $eP^\star$.

We can rewrite the quantity equations as:

$$P = \frac{VM}{Y}$$

and:

$$P^\star = \frac{V^\star M^\star}{Y^\star}.$$

Plugging these equations into (3.12) gives:

$$\frac{VM}{Y} = \frac{eV^\star M^\star}{Y^\star}. \tag{3.13}$$

Solving for M we get:

$$M = \frac{eV^{\star}M^{\star}Y}{VY^{\star}}.$$

Notice that none of the variables on the right-hand side of this equation are under control of the central bank. Therefore money supply is predetermined, there is no scope for independent monetary policy.

What are the benefits and disadvantages of a fixed exchange rate? On the benefit side, a main reason that many countries prefer fixed exchange rates is that fixed exchange rates keep transaction cost low and make it easier for businesses to plan their activities. For businesses that rely on exports or imports, it is very hard to make good investment or production decisions if there is a lot of uncertainty over exchange rates. For example, if imports are important factors of production and the price of foreign currency rises, this will imply rising import prices. This would lead to lower profits or even losses. On the other hand, exporting firms are negatively affected if the home-country currency appreciates relative to foreign currency. For foreign buyers, products from the home country will become more expensive, which lowers demand. Having a fixed exchange rate prevents this kind of problems from occurring. Therefore a fixed exchange rate is useful especially when a country is very outward-oriented.

On the downside, we saw above that fixing the exchange rate implies losing the possibility of independent monetary policy. If you believe that having an independent monetary policy is important, this is a disadvantage of fixed exchange rates. On the other hand, it is far from clear how much can really be gained by having an independent monetary policy.

A more serious disadvantage of fixing exchange rates is the inherent risk of a currency crisis. In order to maintain the fixed exchange rate, the central bank has to be ready to buy its own currency using its foreign reserves. This is only possible, however, as long as there are foreign reserves left to be spent. If too many people sell home currency to the central bank, the central bank can run out of foreign reserves. In that moment, the fixed exchange rate can no longer be maintained. The country is forced either to lower the exchange rate, or abandon the fixed-exchange-rate regime altogether. This is precisely the situation that occurred in Mexico a number of times. The Mexican Peso used to be fixed against the Dollar. Inflation in Mexico was higher than in the U.S., which put downward pressure on the price of the Peso. The Mexican central bank was forced to buy up large amounts of Pesos. The amount of foreign reserves was limited however, forcing a number of devaluations. Those correspond the sharp drops in P^{MEX}/e in Figure 3.8.

Sometimes a coming devaluation is anticipated by currency traders. This opens a possibility for “speculative attacks,” which turn devaluation into a self-fulfilling prophecy. The basic story goes like this. If speculators anticipate that a country is running low on reserves and might have to devaluate, they will borrow currency of this country (say, Pesos) and immediately exchange it into a different currency (say, Dollars). If they do this operation on a sufficient scale, the central bank will be drained of resources, because each time it has to spend Dollars to buy Pesos. If the central bank ultimately runs out of reserves, the country has to devaluate. Thus the speculative attack forces a devaluation. Once the devaluation occurs, the speculators can exchange their Dollars into more Pesos than they originally borrowed (because now the value of the Peso is lower). Therefore they are able to pay back the original loans and keep a profit. Even large industrial countries can be subject to speculative attacks. In 1992, such an attack on the British Pound and the French Franc caused the Banks of England and France to run out of reserves, so that the European countries were forced to abandon the system of fixed exchange rates that was used at that time.

Floating Exchange Rates

Up until 1973 most major currencies had fixed exchange rates within the so-called "Bretton-Woods" system. All currencies that participated within this system had fixed exchange rates, and the key currency within the system was the American Dollar. All other currencies were tied to the Dollar. Moreover, the Dollar was tied to gold: There was a rate of conversion of Dollars into gold, and the American Federal Reserve Bank stood ready to exchange Dollars into gold if asked. The system worked well for a time, but came under pressure in the early 1970s. Rising inflation in the U.S. suddenly made it very profitable to exchange Dollars into gold, so that the Federal Reserve abandoned the convertibility of Dollars into gold. Other countries were dissatisfied with not being able to conduct independent monetary policy. Specifically, since the Dollar was the leading currency, other countries were forced to "import" American inflation rates.

For these and other reasons, in 1973 the Bretton-Woods system was abandoned. Many smaller countries continued to use fixed exchange rates, but the major currencies (American Dollar, German Mark, British Pound, Swiss Franc, Japanese Yen) were allowed to float. This means that no exchange rate is set in advance, all exchange rates are determined in unrestricted currency trading. We distinguish to different kinds of **floating exchange rates**: In a **free float**, the central bank does not participate in foreign exchange markets at all. In a **managed float**, sometimes also referred to as "dirty float," the central bank can intervene, without maintaining a fixed exchange rate.

The obvious advantage of a floating exchange rate is that any risk of speculative attacks and forced devaluations is removed. On the other hand, the experience after 1973 has shown that floating exchange rates are often very volatile, which is generally harmful for business. Therefore a number of countries have tried to use a currency regime that avoids large swings in the exchange rate, but at the same time avoids the risk of a currency crisis that arises when using fixed exchange rates.

Currency Boards

One way to achieve this aim is to use a **currency board**. In a currency board, the exchange rate is fixed relative to some other currency (often the American Dollar). By design, there is no possibility for realigning the exchange rate, as it is possible under the usual fixed-exchange-rate regime. The advantage of a currency board over a standard fixed exchange rate is that with the currency board the country acquires enough reserves to be able to buy back its entire currency. That is, each unit of home currency that is issued has to be backed by an equivalent amount of foreign reserves. It is therefore impossible by design that the central bank ever runs out of foreign reserves. Speculative attacks can never succeed, because the central bank can buy back the entire currency circulation without running out of reserves.

Important examples of countries using a currency board are Argentina and Hong Kong, both of which tied their currency to the American Dollar. A currency board provides most of the advantages of a fixed exchange rate, without being subject to the risk of a currency crisis. The disadvantage of a currency board is that realignments become impossible. This becomes a concern if the currencies of major trading partners are not tied to the same anchor currency. Consider the case of Argentina. Brazil is a major trading partner of Argentina. When the Brazilian currency was devalued two years ago, Argentina was unable to adjust its currency as well, because it is tied to the Dollar through a currency board. This implied that Argentinean goods suddenly were very expensive in Brazil, which hurt Argentinean exports. Generally, it is optimal to avoid large swings in the exchange rate relative to major trading partners.

Currency Unions

Even more radical than a currency board is a **currency union**. In a currency union, a number of countries gives up independent currencies and decides to use a common currency. The most recent example is the Euro in Europe, which was established at the beginning of 1999. Again, the tradeoffs are similar to the ones arising with fixed exchange rates. The major advantage is that transaction costs within the union become lower, and businesses have an easier time to plan production and investments. By having just one currency, the risk of a currency crisis (within the group of joining countries) is removed. For the Euro, this was probably an important motivation, after the earlier European Monetary System failed so spectacularly during the speculative attacks on the Pound and the Franc in 1992.

On the downside, a currency union prevents exchange rates to be used to react to country-specific shocks, and there is no possibility of independent monetary policy in the joining countries. It is not clear how large these disadvantages really are. It is quite clear, however, that the advantages of a currency union increase with the amount of trade that the joining countries do among each other. Since most countries in the European Union do most of their trade with other countries in the union, the Euro can be expected to have sizable beneficial effects. The same argument could be made for the United States. It is beneficial to have just one Dollar instead of separate New York Dollars, Illinois Dollars, California Dollars and so on, precisely because the volume of trade between the states in the union is very large.