

Tradable and Nontradable Goods

So far, we have assumed that all commodities are subject to international trade. Now, in this chapter, we introduce a simple and important reality that has profound implications for the workings of an economy. The fact is that some goods are *nontradable*. Nontradable goods, of course, can only be consumed in the economy in which they are produced; they cannot be exported or imported. And their presence affects every important feature of an economy, from price determination, to the structure of output, to the effects of macroeconomic policy.

Consider the proverbial barber shop. The barber's clientele probably comes from the neighborhood, and it certainly comes from within the domestic economy. If the demand for the barber's services drops, he cannot conveniently export the excess capacity to give haircuts. If foreign barbers raise their prices for haircuts, the local barber will not experience a rush in international demand for his services. Haircuts in India are much cheaper than they are in the United States, perhaps \$20 per haircut cheaper, but it does not make sense to buy a \$2,000 air ticket from, say, New York to New Delhi to save \$20 on a haircut.

This nontradable character of the barber's services has several direct implications. Without the possibility of net exports or imports, local demand and supply must balance. Without international trade, a drop in domestic demand cannot be met by an increase of net exports, and domestic prices can differ from foreign prices without setting in motion a shift of international demand.

There are many goods and services like haircuts that are not part of international trade. Housing rental markets are generally nontradable as well. Even if rents are cheaper in Santiago, Chile, than in Tokyo, it is hard for a Japanese household to take advantage of that fact. Thus, housing rentals differ widely, often by thousands of percent, among cities in different parts of the world. Various activities of service sectors, those of lawyers, doctors, teachers, housekeepers, and the like, also provide largely nontradable goods and services.

Although we recognized the existence of nontradable goods in earlier chapters (especially in Chapter 10, where we pointed out that non-

tradable goods undermine the case for purchasing power parity), we have based our formal models on the assumption that all goods enter into international trade. In Chapters 4 to 10, we assumed that only one good is produced and consumed in the world economy, and that that good is traded between the home country and the rest of the world. In Chapters 13 to 16, we made a distinction between imported and domestic goods, within the framework of the differentiated goods model. But in that model as well, all the goods that are produced are assumed to trade internationally.

Explicit consideration of the role of nontradable commodities was given early on by the classical economists such as John Stuart Mill and David Ricardo. Their analysis, however, generally considered all final goods to be tradable, and production inputs—capital, labor, and land—to be nontradable. Only in the late 1950s and early 1960s has the role of nontradable goods been considered in formal economic models.¹

Perhaps the most important implication of the presence of nontradable goods is that the *internal structure of production* in an economy tends to change when the trade balance changes. In particular, as absorption rises or falls relative to income (so that the trade balance rises or falls), the mix of production in the economy between tradable goods and nontradable goods tends to change. And as we shall see, some of those production shifts, which involve the movement of workers and capital between the nontradable and tradable sectors of the economy, can be quite wrenching in their economic and even political impact.

Suppose, for example, that a government which has borrowed heavily in the past now needs to repay its foreign debt. In order to do this, it increases taxes. As a result, consumption declines. If all the goods in the economy are tradable, the effect of this fall in consumption will be a rise in output relative to absorption, and thus an increase in net exports. Steel manufacturers facing a fall in domestic demand for their product, for example, will simply export more steel abroad.

But this adjustment can take place only with tradable goods. If some goods are not tradable, the process cannot be so easy. Take the barber who faces the fall in domestic demand. He cannot simply sell more haircuts abroad when fewer local customers show up at his shop. And he may not be able to cut his prices much either, if his costs remain unchanged. Perhaps haircut prices will fall (relative to steel prices), but at the same time some barbers will go out of business, unable to cover costs at the lower prices. Unemployed barbers will have to look for other jobs, presumably in sectors of the economy in which production is being sustained (or increased) by exports.

Thus, the presence of nontradable goods in an economy makes the process of adjusting to downturns more complex and often more painful than

¹ Among the pioneers in the development of the tradable and nontradable goods model were James Meade, "The Price Adjustment and the Australian Balance of Payments," *Economic Record*, November 1956; W. E. Salter, "Internal and External Balance: The Role of Prices and Expenditure Effects," *Economic Record*, August 1959; T. Swan, "Economic Control in a Dependent Economy," *Economic Record*, March 1960; and W. Max Corden, "The Geometric Representation of Policies to Attain Internal and External Balance," *Review of Economic Studies*, October 1960.

it was in the economies we described in the previous chapters. In general, the prices of nontraded goods fall relative to the prices of traded goods, and at the same time, production of nontraded goods declines while production of traded goods rises. As workers shift out of the nontradable sector into the tradable sector, there is likely to be a period of at least temporary unemployment while they take time to match up with new job opportunities.

21-1 DETERMINANTS OF TRADABILITY AND A BROAD CLASSIFICATION OF GOODS

Now that we have described nontradable goods and offered some examples, let us see what kinds of goods tend to be nontradable or tradable. In principle, two main factors determine tradability or nontradability.

First, and most important, are transport costs, which create natural barriers to trade. The lower transport costs are as a proportion of the total cost of a good, the more likely it is that the good will be traded internationally. Goods with very high value per unit weight (and thus low transport costs as a proportion of value) tend to be highly tradable. The prime example is gold, which is nearly perfectly tradable, with almost identical prices on any given day in any of the major trading cities of the world. At the other extreme, remember the haircut that costs \$25 in New York and \$5 in New Delhi. It was the high transport costs that rendered this service nontradable. Many, but not all, services share this characteristic of high transport costs per unit of value. Technological progress in communications has recently allowed for the international trade of several kinds of financial services, including personal banking accounts, insurance, and so forth. Indeed, the developing world's exports of services have recently started to grow at a significant pace, especially in areas like data processing, engineering, computer software, and tourism. Workers in Jamaica, Manila, and South Korea, for example, feed basic information into computers for several multinational firms stationed in the United States.

The second factor that determines tradability or nontradability is the extent of trade protectionism. Tariffs and trade quotas can block the free flow of goods across national borders, even where transportation costs are low. The higher these artificial barriers to trade, the less likely it is that a good will be traded. Consider, for example, a 100 percent tariff on furniture. Suppose, for purposes of illustration, that a piece of furniture, say, a chair, costs \$80 in the rest of the world, and it costs \$20 to ship it to the domestic economy. The chair, then, would cost \$100 at the port of entry in the domestic country. If the country imposes a 100 percent tariff, the domestic cost of the imported chair is now \$200. Now suppose that the local industry sells this same chair at \$150. Clearly, there will be no imports because the domestic industry can undersell the imports. But at the same time, there will be no exports because the domestic industry could not hope to compete in foreign markets with foreign producers whose costs are only \$80. Thus, this chair will be neither imported nor exported: protectionism has rendered it a nontraded good.

The categories of what is tradable and what is nontradable are not immutable, of course. Technological improvements that reduce transport costs are likely to make more goods tradable. By contrast, increases in protectionism tend to increase the list of nontradable goods.

In practice, then, which goods belong to one category and which to the other? There are hundreds of thousands of goods and services, and we cannot hope to answer this question for each good. But we can try to classify goods into broad categories. One well-known classification used in most countries is the standard industrial classification (SIC) of the United Nations. According to the SIC, goods and services are divided into nine different categories by major industry:

1. Agriculture, hunting, forestry, and fishing
2. Mining and quarrying
3. Manufacturing
4. Electricity, gas, and water
5. Construction
6. Wholesale and retail trade, restaurants, and hotels
7. Transport, storage, and communications
8. Financing, insurance, real estate, and business services
9. Community, social, and personal services

Very roughly speaking, goods included in the first three categories, agriculture, mining and manufacturing, are typically the most tradable, while goods in the other categories are generally assumed to be nontradable. As a rule, construction (for example, homebuilding), services (categories 8 and 9), and domestic transportation (for example, bus and train services), are not easily tradable. But there are obvious and important exceptions. On the one hand, high transport costs render many kinds of agricultural products, such as garden vegetables, nontradable, while tariff barriers in agriculture and industry often impose formidable obstacles to trade. On the other hand, some construction activities are highly tradable, as shown by the work of huge South Korean construction firms on large building projects in the Middle East during the 1970s and 1980s. Some transportation services, such as international air travel and shipping, are obviously engaged in international trade. And, as we have noted, recent technological advances in communications have rendered many kinds of financial services internationally tradable.

21-2 THEORETICAL FRAMEWORK

Let us now try to develop a simple theoretical model of tradable and nontradable goods, which we shall call the TNT model. We turn first to the supply conditions in the model.

Aggregate Supply in the TNT Model

Suppose that the home country produces and consumes two goods, tradables (T) and nontradables (N). At this stage of the discussion, we shall assume that the production processes for the two goods use only labor and that production in each sector is a linear function of the labor input:

$$Q_T = a_T L_T \quad (\text{tradable goods}) \quad (21.1a)$$

$$Q_N = a_N L_N \quad (\text{nontradable goods}) \quad (21.1b)$$

L_T and L_N are the amounts of labor used in the production of tradables and nontradables, respectively, and a_T and a_N are the coefficients representing the marginal productivities of labor in the production of the two kinds of goods. An additional unit of labor in sector T leads to a_T units more of output. Because the production functions are linear in L_T and L_N , the coefficients a_T and a_N represent the average productivities of labor as well as the marginal productivities.

It is useful to derive the production possibility frontier (PPF) of the economy in the TNT model. We assume that there is a given amount of labor (L) that may be employed in sector T or sector N . Therefore, assuming that labor is fully employed, we have

$$L = L_T + L_N \quad (21.2)$$

Using equations (21.1a) and (21.1b), we can write the expression in terms of output levels and the productivity coefficients. Because $L_T = Q_T/a_T$ and $L_N = Q_N/a_N$, we can rewrite (21.2) as follows:

$$L = \frac{Q_T}{a_T} + \frac{Q_N}{a_N} \quad (21.3)$$

This equation can, in turn, be rearranged to express Q_N as a function of Q_T (as well as L , a_T , and a_N , which are assumed to be fixed):

$$Q_N = a_N L - \left(\frac{a_N}{a_T}\right) Q_T \quad (21.4)$$

Expression (21.4), then, is the equation for the production possibility frontier (PPF). It expresses the maximal amount of Q_N that can be produced for each amount of Q_T produced in the economy. For example, if $Q_T = 0$ (all labor is working in the nontradable sector), then $Q_N = a_N L$. If Q_T is maximized instead, by allocating all labor to tradables production, then $Q_T = a_T L$ and $Q_N = 0$. In general, positive amounts of labor will be employed in both sectors.

The production possibility frontier is represented graphically in Figure 21-1. The X axis measures the production of tradable goods and the Y axis, the production of nontradables. If all labor is devoted to tradables, then production is at point A , with $Q_T = a_T L$ and $Q_N = 0$. If, instead, all labor is devoted to the nontradables sector, then production is at point B , with $Q_N = a_N L$ and $Q_T = 0$. The rest of the PPF consists simply of the line segment connecting points A and B , as shown in Figure 21-1. Any point on this line segment represents a possible combination of production of tradables and nontradables.

The slope of the PPF is equal to the relative price of tradables in terms of nontradables. Let us see why. For each type of good, the price of output is just equal to the cost of labor used in the production of a unit of the good (this results from the assumption of a production technology which is linear in labor input). Each unit of tradable output requires $1/a_T$ units of labor. With a wage level w , the labor cost of producing a unit of T is simply w/a_T . The labor cost of producing a unit of N is simply w/a_N . Thus,

$$\begin{aligned} P_T &= \frac{w}{a_T} \\ P_N &= \frac{w}{a_N} \end{aligned} \quad (21.5)$$

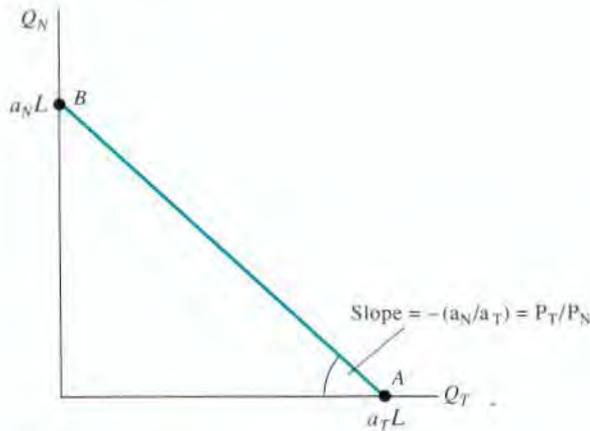


Figure 21-1

The Production Possibility Frontier with Labor as the Only Input

Note that the equation can also be interpreted as the profit-maximizing condition that the marginal product of labor should be equated to the product wage, where the product wage is measured as the ratio of the wage to the output price. That is, $a_T = w/P_T$ and $a_N = w/P_N$.

From (21.5) we see that $P_T/P_N = a_N/a_T$. We also know from (21.4) that $-(a_N/a_T)$ is equal to the slope of the PPF. Thus, the steeper the PPF, the higher the relative price of tradable goods to nontradable goods in the economy. This simple fact has important implications later on.

In the TNT model, it is usual to label the relative price of tradable goods in terms of nontradable goods as “the real exchange rate.” Letting e be the real exchange rate in this model, we have

$$e = \frac{P_T}{P_N} = \frac{a_N}{a_T} \quad (21.6)$$

Obviously, the slope of the PPF is also equal to (the negative value of) the real exchange rate ($-e$). (Note here an important semantical confusion in standard economics terminology. In models with differentiated products, like those in Chapters 13 and 14, the term “real exchange rate” is used to measure EP^*/P . In the TNT model, the *same* term is used to measure P_T/P_N .)

Aggregate Demand in the TNT Model

Now that we have talked about the supply side of the economy, it is time to introduce aggregate demand. We shall concentrate on *consumption* decisions and neglect investment spending,² a simplification that allows us to focus on the most important novelties of the TNT model.

Total absorption is equal to spending on tradable goods and nontradable goods. More formally, $A = P_T C_T + P_N C_N$, where A is total absorption

² In this basic scenario, we do not distinguish between the private sector and the government; thus, C should be interpreted as total consumption.

and C_T and C_N are the levels of consumption (in real terms) of tradable and nontradable goods. Absorption is divided between the two goods, and we would expect that consumption of each type of good would depend on the overall level of absorption and the relative price of the two kinds of goods. For our purposes, we can simplify this further and suppose (unless otherwise noted) that households consume C_T and C_N in fixed proportions, regardless of relative prices—that is, we assume that the ratio C_T/C_N is fixed. When total spending rises, both C_T and C_N rise in the same proportion; when total spending falls, both C_T and C_N fall in the same proportion.

With this assumption in mind, we can graph the spending choices of households, as shown in Figure 21-2. Household consumption choices lie on the line OC . When absorption is low, spending is at a point like B , where both C_T and C_N are low. When absorption is high, spending is at a point like D , where both C_T and C_N are high. Notice, however, that the ratio C_T/C_N is fixed as absorption rises and falls along the OC line.

The OC line will play a key role in the determination of market equilibrium, which is the subject of the next section.

Market Equilibrium in the TNT Model

The central assumption of the TNT model is that because there can be no exports or imports of N , the domestic consumption of N must equal domestic production of N . By contrast, tradable goods can be imported or exported, and thus domestic consumption of T can differ from domestic production. Specifically, we have the following key relationships:

$$\begin{aligned} Q_N &= C_N \\ TB &= Q_T - C_T \end{aligned} \quad (21.7)$$

Note that the trade balance (in units of the tradable good) is equal to the excess of production of tradables over consumption of tradables. We know from Chapter 6 that $Q_T - C_T$ can also be written as $X_T - IM_T$, where X_T is the level of exports of T and IM_T is the level of imports of T .

Let us consider the nature of market equilibrium in the TNT model by superimposing the OC schedule on the PPF, as we do in Figure 21-3. Suppose that household consumption is at point A on the OC curve. At that point, consumption of nontradables is given by C_N^A , and consumption of tradables

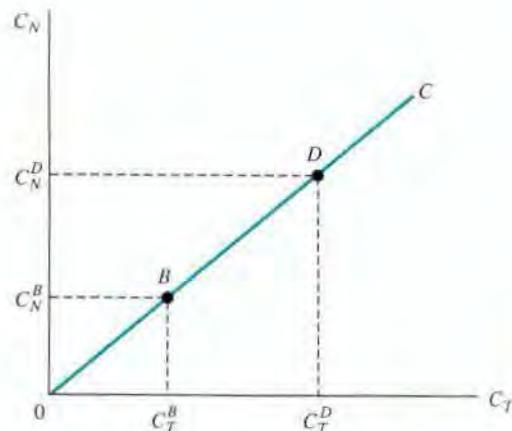


Figure 21-2
A Graphical Representation of the Consumption Path in the TNT Model

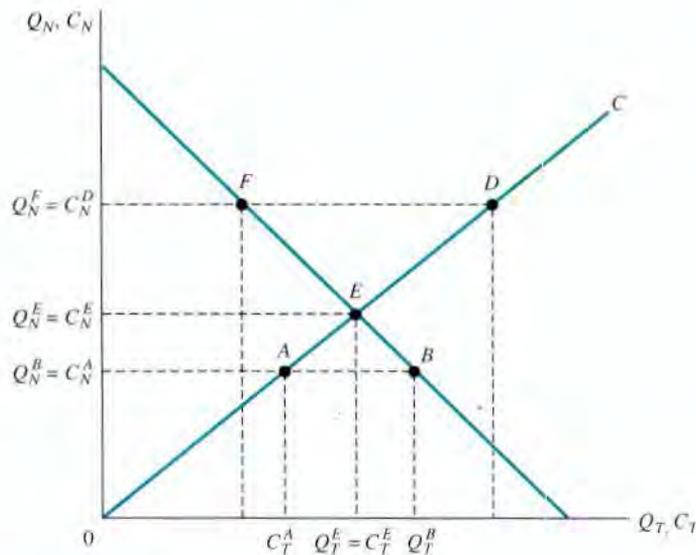


Figure 21-3

The PPF, the Consumption Path, and Equilibrium.

is given by C_T^A . With consumption of nontradables equal to C_N^A , the production of nontradables must also be C_N^A . That is, $Q_N^B = C_N^A$, as we said earlier. Thus, the production point must lie on the PPF at exactly the point where Q_N is equal to C_N . To be precise, the production point corresponding to absorption A must be at point B , which lies on the same horizontal line as point A .

Notice that at point B the production of tradables is at the level Q_T^B , which is greater than the absorption of tradables, given by C_T^A . Thus, when absorption is at A , and production is therefore at point B , the economy has a trade surplus, since $Q_T^B > C_T^A$. Consumption and production of nontradables are equal (as they must be). Now consider the situation if absorption is at point D . In this case, production must be at point F , which lies on the same horizontal line as point D . (Production must be at point F when absorption is at point D , of course, so that the nontradable goods market is in balance.)

Comparing the two absorption points, A and D , we can draw an important lesson. When overall absorption is high, there is more spending on both tradable and nontradable goods. The higher demand for nontradable goods requires greater production of nontradable goods in order that demand and supply for nontradable goods be in balance. But higher production of nontradables can occur only by shifting resources out of the tradable sector and into the nontradable sector. Higher overall demand therefore leads to a rise in the production of nontradable goods, but a *fall* in the production of tradable goods. This asymmetry reflects a simple fact. An increase in demand for nontradables can only be satisfied by greater domestic production; by contrast, an increase in demand for tradables can be satisfied by imports.

Point E at the intersection of the PPF and the OC curves, is the point at which consumption and production are equal for both tradable and nontradable goods. At this point, the trade account is exactly balanced; that is, the consumption of tradables, C_T , equals the production of tradables, Q_T . Point E is sometimes called the point of *internal balance* and *external balance*.

“Internal balance” refers to the fact that the demand for nontradables equals the supply of nontradables (which is always satisfied); “external balance” refers to the fact that the trade account is zero.

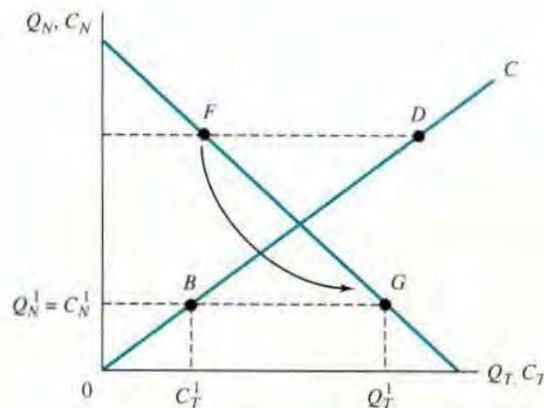
Borrowing and Repayment in the TNT Model

We can now use the apparatus just developed to enrich our analysis of international borrowing and lending. In earlier chapters, we noted that borrowing in one period requires repayment in later periods. Specifically, trade deficits must be balanced later on (in present value terms) by future trade surpluses. Now we can show a crucial point, that *a shift from a situation of borrowing to repayment also requires a corresponding shift in the patterns of domestic production.*

Suppose, for example, that an economy has been consuming more than its income and that domestic residents have been borrowing abroad to maintain this expensive life-style. In Figure 21-4, this pattern is depicted by consumption at point *D* and production at point *F*. The country’s net debt (not shown in the diagram) builds up over time as the economy’s firms, households, and government, in the aggregate, borrow from the rest of the world. But the country’s intertemporal budget constraint dictates that the situation must eventually change. At some point, the economy must shift back to trade surplus so that domestic residents can service the international debts they have accumulated.

We want to examine very closely the economic effects of the shift back to trade surplus. The shift from trade deficit to surplus, of course, requires a drop in consumption relative to output. Say that consumption falls from point *D* to point *B* on the *OC* curve. When that happens, the demand for nontradable goods in the economy declines (as does the demand for tradables). Workers in the nontradable sector—the barber from our initial example, together with fellow workers in construction and other services—begin to lose their jobs because domestic demand for their goods is declining. These workers now must find jobs in the tradable sector of the economy where, indeed, there is still growth. Despite the fall in domestic demand,

Figure 21-4
The Case of Foreign Borrowing and Repayment



firms in the tradable sector have expanded production because they can sell their output abroad on the world market.

Thus, the shift from trade deficit to trade surplus involves a shift in domestic production from point *F* to point *G* (which is on the same horizontal line as point *B*). Note that in the process of generating a trade surplus, the production of tradables has increased, while the production of nontradables has declined. To put this another way, the trade surplus comes about not merely because of a fall in demand, but also because of a shift in supply from nontradables production to tradables production.

A clear example of resources shifting from nontradables to tradables occurred in Chile after 1982. In the late 1970s, Chileans borrowed heavily, indeed too heavily, on the international capital markets. As happened in much of the developing world, international credits for Chile dried up in the early 1980s, after the period of heavy borrowing. Creditors became fearful of the ability of Chileans to service their debts, especially after the rise in world interest rates in the early 1980s.³ Chileans had to stop running large trade deficits and start running trade surpluses, as seen in Table 21-1. Domestic demand in Chile plummeted. In effect, absorption fell from a point like *D* to a point like *B* in Figure 21-4.

TABLE 21-1

CHILE'S ADJUSTMENT PROCESS, 1979-1985						
Year	National Unemployment Rate by Economic Activity*				Building Permits and Starts (area, thousands of squared meters)	Trade Balance/GDP (%)
	Total	Agriculture and Fishing	Construction	Industry		
1979	13.6	7.3	28.9	12.5	3,591	-1.7
1980	10.4	5.0	18.7	11.2	4,643	-2.8
1981	11.3	6.2	25.8	11.8	5,638	-8.2
1982	19.6	9.4	50.8	26.6	2,365	0.3
1983	14.6	5.8	38.2	17.9	2,771	5.0
1984	13.9	5.5	30.7	14.2	3,209	1.9
1985	12.0	4.9	23.8	5.4	3,831	5.3

* Figures correspond to the National Employment Survey, compiled every year by the National Bureau of Statistics in the period October-December.

Source: Central Bank of Chile.

The economy had to undergo a major reallocation of resources of the sort we have just described. As we see in Table 21-1, the shift from trade deficit to trade surplus was accompanied by the shift out of nontradables production, especially construction, and into tradables production, led by the agricultural sector. There was a large increase in unemployment among

³ We discuss the origins of the international debt crisis in Chapter 22.

Box 21-1***Structural Adjustment Programs***

The movement of resources from nontradable goods production to tradable goods production requires a significant economic restructuring of the economy. Many complications can arise during such structural transitions, especially high unemployment if workers are laid off jobs in nontradables production more rapidly than they can find new jobs in tradables production. The delay in finding new jobs may result from the costs of moving to where the new jobs are, wage rigidities in the tradables sector, problems in disseminating information about what the new work is and where it is, and so on. To minimize these social costs, governments may implement a package of policies, sometimes called *structural adjustment programs*, in order to facilitate the transfer of resources and to remove barriers that restrict factor mobility. These policy actions support the shift in resources to the tradables sector and reduce the economic rigidities that can hamper adjustment.

On the microeconomic side, structural adjustment programs often include the following kinds of measures: (1) policies that improve efficiency in the use of resources by the public sector, including the rationalization of public investment, the restructuring of state-owned companies, and the privatization of some public enterprises; (2) measures that improve the structure of economic incentives, such as trade liberalization (to develop the export sector and reduce the distortions caused by tariffs, quotas, and other trade restrictions) and reforms of the price system, especially in agriculture and public enterprises; and (3) measures that strengthen the economic institutions that are crucial for the success of the adjustment program, like the customs service and tax administration. These microeconomic measures, designed to enhance the flow of resources in the economy and the shift of labor and capital to the tradables sector, are typically supplemented by macroeconomic measures, which include fiscal austerity, a tight monetary policy, and often a currency devaluation (for reasons described shortly).

During the 1980s, the World Bank played a visible role in helping countries to design structural adjustment policies and in lending money to countries to help them reduce the costs of restructuring. At the same time, the International Monetary Fund (IMF) supervised the introduction of accompanying macroeconomic measures, including cuts in budget deficits and exchange-rate devaluations. The policy packages implemented jointly by the World Bank and the IMF generated considerable controversy, both as to their effectiveness and as to the adequacy of the money they were willing to lend to support the policy measures. Several criticisms have been aimed at the role of the World Bank in its support of adjustment programs. Among them, it has been said that (1) the amount of resources devoted to adjustment loans by the Bank has been insufficient in relation to the countries' needs; that (2) the conditions on which the loans were based have occasionally been unrealistic, being too optimistic either about the response of private agents to price incentives, or about the political sustainability of the programs; and that (3) the World Bank may pay too little attention to equity issues, some critics having suggested

that the overriding concern behind some of these programs has been economic efficiency at the cost of equity.⁴ Of course, these views are very different from the way the Bank evaluates its own role in supporting adjustment.⁵

However well designed the policy packages, it is clear that the costs of transition from trade deficits to trade surpluses among the debtor developing countries during the 1980s have been extremely high. Such countries have seen large increases in unemployment, and sharp declines in production and employment of nontradables have not been promptly matched by large increases in tradables production and employment.

construction workers, and many of these workers shifted to work in the fruit export business or in agroindustry.

In reality, the adjustment process is far from painless, as the Chilean experience attests. As we see in Table 21-1, unemployment soared at the time that workers were laid off from construction. Workers need time for retraining in order to adjust their skills to the newly available jobs. Also, as is frequently true, the economic restructuring in Chile required a geographical reallocation of labor, which took more time and occasioned significant economic and social costs. These factors, among others, explain why the unemployment rate increased so substantially when Chile underwent the fundamental economic restructuring that was necessary to bring about the shift from trade deficit to trade surplus.

The Dutch Disease

The shift of production between tradables and nontradables tends to occur whenever there are large shifts in the level of domestic spending. This can happen when an economy starts to repay its debts, but it can occur for other reasons as well. One common case that has received considerable attention from economists is that of a country which experiences a large change in wealth because of *shifts in the value of natural resources held by the residents of the country*. A nation can find itself dramatically enriched after major discoveries of natural resources in its territory (as when Norway discovered the magnitude of its North Sea oil deposits in the 1970s) or when the world price of its natural resources changes dramatically (as when the oil-exporting countries enjoyed a large jump in income at the end of the 1970s).

The effects of large changes in wealth resulting from resource discoveries or resource price changes can be very dramatic, indeed so dramatic that they have been given a special name, *the Dutch disease*.⁶ The name

⁴ For a critical analysis of the role of the World Bank in structural adjustment programs see, for example, Edmar Bacha and Richard Feinberg, "The World Bank and Structural Adjustment in Latin America," *World Development*, March 1986.

⁵ See, for example, a recent report prepared by the World Bank's staff on adjustment lending: Vittorio Corbo et al., *Report on Adjustment Lending: Policies for the Recovery of Growth* (Washington, D.C.: The World Bank, 1990).

⁶ For a good survey of the Dutch disease problem, see W. Max Corden, "Booming Sector and Dutch Disease Economics: Survey and Consolidation," *Oxford Economic Papers*, November 1984.

comes from the fact that the Netherlands, a large holder of natural gas deposits, experienced major shifts in domestic production following the discovery of substantial gas deposits in the 1960s. As the exports of this natural resource boomed, the guilder appreciated in real terms, thereby squeezing the profitability of other exports, especially manufactures. We shall see, however, that the “disease” part of the term is something of a misnomer. The shifts in production occasioned by changes in resource wealth are not really a “disease” of the economy.

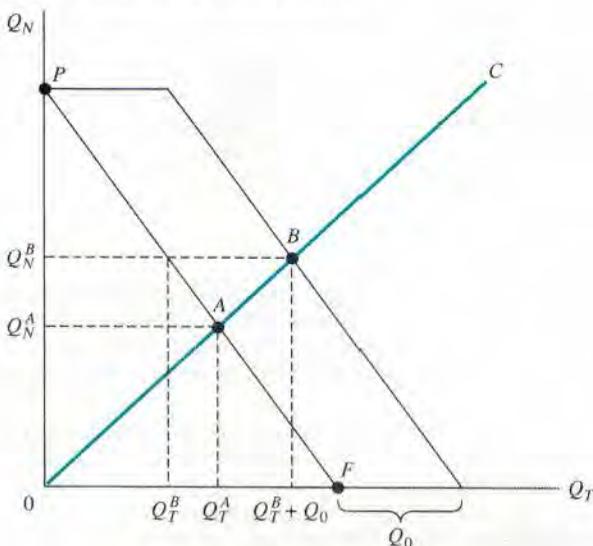
Let us consider the effects of a discovery of oil in a country which, say, had a tradables sector that consisted solely of non-oil industries, such as manufacturing, before the discovery. Suppose that the new oil reserves increase tradable output by the amount Q_0 . Before the oil discovery, the production possibility frontier is given by the PPF line (PF) in Figure 21-5. After the oil discovery, the country can now produce Q_0 more units of tradable goods than it could before the oil discovery, so that the PPF shifts horizontally to the right by the amount Q_0 , as shown in the figure.

Suppose, now, that before and after the oil discovery, the country’s trade is balanced; that is, given world interest rates and household preferences, there is no desire for borrowing or lending. Thus, before the oil discovery, economic equilibrium is at the point A in Figure 21-5, at the intersection of the PPF and the OC curve. After the oil discovery, economic equilibrium shifts to point B . Note that the oil discovery has, naturally, led to an expansion of demand (reflecting the increased wealth of the nation) and that this expansion of demand has caused an increase in consumption of both tradable and nontradable goods.

Now let us look closely at the effects of this spending increase on the *production patterns* in the economy. The shifts in production patterns are somewhat subtle. As we can see in Figure 21-5, production of nontradables increases as a result of the spending boom, from point Q_N^A to Q_N^B . Production

Figure 21-5

Effects of Oil Discovery in a Hypothetical Country: A Case of Dutch Disease



of tradables also increases, but in a more complicated way. At point *B*, production of “traditional” non-oil tradables is at the level Q_T^B and production of oil is at the level Q_0 . Total tradable production is therefore at the level $Q_T^B + Q_0$. Thus, when we compare tradable production before and after the oil discovery, we find three things. First, non-oil production has *fallen*, from Q_T^A down to Q_T^B . Second, oil production has *risen*, from zero to Q_0 . And, third, total tradable production, that is, the sum of the two subsectors, has gone up, from Q_T^A to $Q_T^B + Q_0$.

The *Dutch disease*, then, is the term applied to the fact that non-oil tradable production declines as a result of the oil discovery. In concrete terms, an important discovery of oil—or gas, or diamonds, or other natural resource—is likely to lead to a shrinkage in traditional manufacturing. The reason should be clear. The positive wealth effect of the natural resource boom draws resources away from the traditional tradables sector and into the nontradables sector. And, as we have said, the higher demand for nontradables can only be met by greater domestic production of nontradables, while the higher demand for tradables can be satisfied by an increase in imports (with an actual drop of domestic production).

Note that the “disease”—the shrinkage of the manufacturing sector—may *seem* like a disease, especially to workers and owners in that sector, but in fact the production shift is the optimal response to an increase in wealth. It is only through the decline in tradables production that domestic households can enjoy the benefits of increased consumption of nontradables.

The Dutch disease phenomenon was evident in the major oil-exporting countries in the late 1970s when world oil prices soared.⁷ In these countries, the higher oil wealth prompted a shift toward nontradables, especially construction, and put a squeeze on traditional tradable sectors, including agriculture and industry exposed to international trade. When world oil prices collapsed in the mid-1980s, the Dutch disease was reversed. Domestic demand in the oil-rich countries plummeted, causing significant unemployment in the construction industry and a shift of employment back to agriculture and other tradable goods sectors.

A prime example of Dutch disease in Latin America (and one unrelated to oil) appeared in Colombia in the second half of the 1970s.⁸ Traditionally, Colombia has been heavily dependent on coffee, which accounted for almost two-thirds of its exports in the late 1960s and about 45 percent of its exports in 1974. Weather problems in Brazil and an earthquake in Guatemala contributed in 1975 to a significant scarcity of coffee in world markets. Thus, coffee prices boomed, increasing almost five times over the next two years.

⁷ For an analysis of the Dutch disease in the case of Indonesia, a large oil producer, see Wing Woo and Anwar Nasution, “Indonesian Economic Policies and Their Relation to External Debt Management,” in J. Sachs and S. Collins, eds., *Developing Country Debt and Economic Performance*, Vol. 3 (Chicago: National Bureau of Economic Research, University of Chicago Press, 1989).

⁸ Two interesting analysis of the Dutch disease in Colombia are Sebastian Edwards, “Commodity Export Prices and the Real Exchange Rate,” in S. Edwards and L. Ahamed, eds., *Economic Adjustment and Exchange Rates in Developing Countries* (Chicago: National Bureau of Economic Research, University of Chicago Press, 1986), and Linda Kamas, “Dutch Disease Economics and the Colombian Export Boom,” *World Development*, September 1986.

Coffee production in Colombia was quick to respond, and it increased by 76 percent between 1974 and 1981. As a consequence of this boom, Colombia enjoyed a surge in export revenues of almost 300 percent over the next five years. But, as the theory predicts, the country's real exchange rate appreciated considerably—about 20 percent between 1975 and 1980—and this hurt the competitiveness of the noncoffee tradables sector. The evolution of the real price of coffee and the real exchange rate is shown on Figure 21-6 for the period 1974–1980 (as usual, a fall in the real exchange rate in the graph signifies a real appreciation).

Thus, Colombia experienced a boom in the coffee sector and a substantial expansion of nontradable activities, especially in construction and government services. However, the growth rate of output among other tradable goods was reduced substantially, principally among manufactures, as shown in Table 21-2.

The general symptoms of the Dutch disease, although most widely associated with a natural resource boom, can also arise when other forces cause a large shift in domestic demand. For example, countries that receive vast increases in foreign aid are likely to experience a consumption boom. Recipients of foreign aid often find that the financial assistance from the outside world inadvertently squeezes the tradable sectors within its economy. When this happens, aid can actually damage precisely those economic sectors most in need of development.

Note that a domestic fiscal expansion is likely to have the same effects on production as a resource boom. Higher fiscal spending that is not offset by a decline in private spending can lead to an overall shift in demand toward nontradable goods and thus to a shift of production from tradables to nontradables. When Stephen Marris examined the sectoral effects of the large fiscal expansion during the first half of the 1980s in the United States, he

Figure 21-6

The Real Exchange Rate and the Real Price of Coffee in Colombia, 1975–1980

(From Linda Kamas, "Dutch Disease Economics and the Colombian Export Boom," *World Development*, September 1986.)

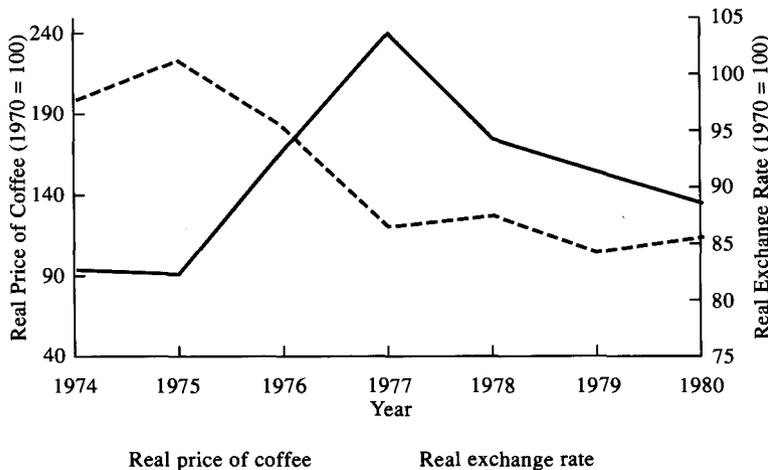


TABLE 21-2

**THE RECOMPOSITION OF PRODUCTION IN COLOMBIA DURING
DUTCH DISEASE, 1970-1981**
(ANNUAL AVERAGE PERCENT GROWTH OF PRODUCTION IN
SELECTED SECTORS)

	Growth		% Change
	1970-1975	1976-1981	
Nontradables			
Construction and public works	3.3	5.8	+2.5
Residential rent	3.7	4.3	+0.6
Government services	4.1	8.6	+4.5
Personal services	2.8	2.8	+0.0
Tradables (noncoffee)			
Textiles, clothing, and leather	5.1	-0.6	-5.7
Paper and printing	9.3	5.3	-4.0
Refined petroleum products	8.0	0.3	-7.7
Chemicals and rubber	10.2	3.7	-6.5
Manufactures of metals	6.1	3.6	-2.5
Other manufactures	4.8	1.9	-2.9
Transport materials	12.6	4.6	-8.0
Machinery and equipment	10.5	4.8	-5.7
Coffee	4.1	10.8	+6.7

Source: Linda Kamas, "Dutch Disease Economics and the Colombian Export Boom," World Development, September 1986.

found that significant parts of the tradables sector were squeezed, while the nontradable goods sector boomed.⁹ Historically, episodes of economic populism as well as sharp increases in military expenditures have also provided vivid examples of large increases in fiscal spending which constricted production in the tradables sector.

21-3 TRADABLES, NONTRADABLES, AND THE PRICE LEVEL

One of the striking regularities in the world economy is that rich countries are "more expensive" than poor countries. Tourists and international businessmen find that it is more expensive to visit Europe and Japan than it is to visit Latin America or Africa. Careful studies have confirmed what most of us believe, that the cost of living, represented by a basket of commodities

⁹ Stephen Marris, of the Institute for International Economics, has documented the pattern of response to the policies of the early 1980s among tradables and nontradables. See *Deficits and the Dollar: The World Economy at Risk*, Policy Analyses in International Economics 14, Institute for International Economics, updated edition, 1987.

that includes food, housing, and consumer goods, is indeed higher in the richer countries than in the poorer countries.

The reasons for this discrepancy are not obvious. Tradable goods should cost approximately the same throughout the world, aside from transport costs and tariffs which generally do not add a lot to the price of goods. Therefore, if most goods in the world were tradables, differences in price levels across countries would be small. The most pronounced differences lie in the prices of nontraded goods.

But why should nontraded goods be more expensive in richer countries? One obvious thought is that “wages are higher.” This is true, but labor productivity is also higher in the richer countries, and this can offset the higher wage costs. As it turns out, the TNT model gives a clear explanation of these differences in prices across countries.

Prices, Wages, and Productivity

To put the matter clearly, we need to compare the price levels of two countries in a common currency. Let P be the price level of the home economy, then, and P^* be the price level of the foreign country in the foreign currency. Then, the price level of the foreign country in the domestic currency is EP^* , where E is the domestic exchange rate (units of domestic currency per unit of foreign currency). We want to compare P and EP^* .

The price levels P and EP^* are weighted averages of the prices of tradable goods and nontradable goods. Let σ be the weight in the price index attached to the tradable good, and $1 - \sigma$ be the weight attached to the nontradable good. For simplicity, let us assume that this weighting is the same in the two countries:

$$\begin{aligned} P &= \sigma P_T + (1 - \sigma)P_N \\ EP^* &= (EP_T^*) + (1 - \sigma)(EP_N^*) \end{aligned} \quad (21.8)$$

Now, let us assume that purchasing power parity holds for the tradable goods. This means that the prices of tradables—cars, consumer durables, grains, oil, gold, and so on—are the same in the two countries:

$$P_T = EP_T^* \quad (21.9)$$

Since the prices of tradables are the same in both countries, P will be higher than EP^* if and only if P_N is greater than EP_N^* .¹⁰ In other words, assuming that purchasing power parity holds for tradable goods, the difference in price levels in the two countries depends only on the difference in the prices of nontradable goods.

But what determines the prices P_N and EP_N^* ? We can find these prices in the following way. The wage level in the economy is linked to the prices of tradable goods. We know from equation (21.5) that $P_T = w/a_T$, or, rearrang-

¹⁰ This can be established by simple algebra. By subtracting the expression for EP^* from the expression for P in equation (19.8), and using the purchasing power parity relation, we get

$$P - EP^* = (1 - \sigma)(P_N - EP_N^*)$$

Thus, $P > EP^*$ if and only if $P_N > EP_N^*$.

ing terms, $w = P_T a_T$. This equation determines the wage level in terms of the price of tradable goods (P_T), and the productivity coefficient in the production of tradable goods (a_T).

In turn, the cost of nontradable goods is given by the cost of labor used in producing a unit of N . Because each unit of production of N requires $1/a_N$ units of labor, the cost of labor is w/a_N . Therefore the price of nontradable output is given by $P_N = w/a_N$. And since $w = P_T a_T$ and $P_N = w/a_N$, we can combine these two expressions to find

$$P_N = P_T \left(\frac{a_T}{a_N} \right) \quad (21.10)$$

Notice that the nontradable price is simply a multiple of the tradable price, where the multiple depends on the productivity of labor in the two sectors.

In the foreign country, the comparable expression is¹¹

$$EP_N^* = P_T \left(\frac{a_T^*}{a_N^*} \right) \quad (21.11)$$

Notice that the foreign nontradables price is similarly a multiple of the tradables price, where the multiple in this case depends on the productivity of labor in the two sectors in the *foreign* economy.

Let us look more carefully at what these expressions mean now. Nontradable prices are *high* when labor is highly productive in the tradables sector, that is, when a_T is large. Here is why. Highly productive labor commands a high wage, and when labor productivity in tradables is large, the wage is high in terms of tradable goods. A high wage, in turn, means high labor costs in nontradable production as well. Thus, a high value of a_T means a high-price P_N . At the same time, nontradable prices will be *low* if labor is highly productive in the nontradables sector, that is, when a_N is large. When labor productivity in nontradables is large, the amount of labor used per unit of production in nontradables is small. Thus, a high value of a_N means a low price P_N .

For this reason, the price of nontradables (P_N) depends on the *relative* productivity of labor in the two sectors (a_T/a_N). High productivity in tradables means high wages in terms of tradable goods, but high productivity in nontradables means *low* labor input per unit of nontradables production. Thus, the price of nontradables P_N depends on the *ratio* a_T/a_N rather than on the productivity in either sector individually.

It is now possible to compare the prices of nontradables in the two countries. From equations (21.10) and (21.11), we see immediately that the domestic economy is “more expensive” than abroad when $(a_T/a_N) > (a_T^*/a_N^*)$. The domestic economy is “less expensive” than abroad when $(a_T/a_N) < (a_T^*/a_N^*)$. In simpler language, *one country will be expensive as compared to the other if the relative productivity in its tradable sector (a_T/a_N) is higher than abroad. What matters here is the difference in relative productivity, and not in absolute productivity between the two countries.*

Let us consider the implications of this finding. Suppose that the home

¹¹ The derivation is as follows. $P_N^* = (P_T^*)(a_T^*/a_N^*)$, just as in the home country. Now, multiply both sides of this equation by the exchange rate, to get the following equality: $(EP_N^*) = (EP_T^*)(a_T^*/a_N^*)$. Now, note that EP_T^* equals P_T , by the assumption of purchasing power parity. Thus, we find $EP_N^* = P_T(a_T^*/a_N^*)$, as in equation (21.11) in the text.

country is twice as productive as the foreign country in *both* sectors of the economy ($a_T = 2a_T^*$, $a_N = 2a_N^*$). The home wage (expressed in a common currency) will be twice as high as abroad. But the price of nontradable goods will be *identical* in the two countries. Even though the domestic wage is twice as high as abroad, the labor productivity in nontradable production is also twice as high, so the costs of labor per unit of output are the same in the two countries!

Now suppose that the home economy is twice as productive in the tradable goods sector, but exactly as productive in the nontradable goods sector ($a_T = 2a_T^*$, $a_N = a_N^*$). The home country might be better at producing automobiles than the foreign country, but no better at producing haircuts, let us say. Then, the wage at home will be twice as high as the wage abroad, as before, when expressed in a common currency. But now, the labor cost of producing the nontradable good will be twice as high than abroad because productivity is no higher in the nontradable sector. Haircuts at home will be twice as expensive as abroad. The overall domestic price level will be higher at home.

Suppose now that the home economy has the same productivity in tradables production, but twice the productivity in nontradables production ($a_T = a_T^*$, $a_N = 2a_N^*$). In this case, the wage will be exactly the same in the two countries when expressed in a common currency. But the cost of nontradables will be *less* at home than abroad, since less labor is used per unit of output in the nontradable sector. In this situation, the home economy will be cheaper than abroad.

We can now see the answer to the original question more clearly. Does a rich country tend to be more expensive than a poor country, and if so, why? On the one hand, labor costs are higher in the rich country, while on the other hand, productivity is also higher. We now know that what counts is the balance of productivity between the tradables and nontradables sectors. High productivity in tradables raises wage costs in the production of nontradables, while high productivity in nontradables lowers wage costs in the production of nontradables. A country is relatively expensive in the prices of its nontradables, then, if productivity is relatively high in the production of its tradables, which drives up labor costs in the production of its nontradables.

Can we say more than this? On the empirical level, the answer is yes. History has shown a particular pattern in the growth of productivity, one that is illustrated in Figure 21-7. When countries become richer through higher labor productivity, the rate of increase in productivity *tends to be fastest in the tradable sector*. Higher productivity means a shifting up and to the right of the production possibility frontier, as shown in the figure. But since productivity growth is fastest in tradables, the production possibility frontier shifts out faster along the X axis than it shifts up along the Y axis. In other words, the increase in production is biased toward the tradables sector.¹²

¹² Bela Balassa, in a classic 1964 paper, was one of the first to point out this systematic trend: “. . . in present-day industrial economies, productivity increases in the tertiary [services] sector appear to be smaller than the rise of productivity in agriculture and manufacturing. Data derived for the nineteen-fifties indicate, for example, that in the seven major industrial countries examined, productivity increases in the service sector were in all cases lower than the

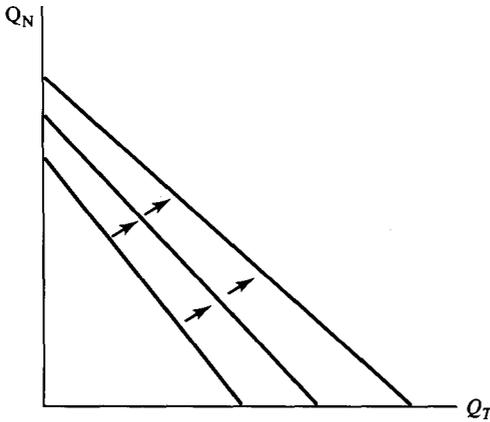


Figure 21-7
Productivity Growth with a Bias Toward Tradables

This bias toward rapid growth of productivity in the tradables sector means that as countries develop, the ratio a_T/a_N tends to grow. In fact, both a_T and a_N rise in the course of economic development, but a_T tends to grow more rapidly than a_N . Thus, rich countries tend to have higher values of a_T/a_N than do poorer countries. We can therefore conclude that *rich countries do tend to be more expensive than poor countries*, not because they are richer in general, but because they are richer in an unbalanced manner, with relatively higher productivity in the tradables sector than in the nontradables sector.

There is yet another noteworthy consequence of a faster productivity increase in the tradable goods sector. When a_T/a_N rises in a country, the price of nontradables rises relative to the price of tradables. If a_T/a_N rises more rapidly than a_T^*/a_N^* , then the home country will tend to have an appreciation of its real exchange rate relative to the foreign country, in the sense that P will rise relative to EP^* . In this case, *even if the two countries are linked by a fixed exchange rate, their inflation rates will differ* because the home country will experience a faster rise in the prices of nontradables.

This is why inflation rates tend to vary even among countries within a fixed-exchange-rate regime. Even though countries linked by a fixed exchange rate will tend to have the same inflation rate for tradable goods, the faster-growing countries tend to have higher inflation because they tend to have higher inflation rates for nontradable goods. This tendency was clearly evident during the 1960s, when the fastest-growing economy in the industrial world, Japan, also had one of the highest inflation rates. In Europe, the more rapidly growing countries also tended to have higher inflation rates than the more slowly growing economies. This pattern is documented clearly in Table 21-3.

rise of productivity for the national economy as a whole as well as for agriculture and industry taken separately." See Bela Balassa, "The Purchasing-Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, December 1964.

TABLE 21-3

**INFLATION AND GROWTH IN THE 1960s: THE
CASE OF THE INDUSTRIALIZED COUNTRIES
(AVERAGE RATES, 1960–1969)**

Country	Inflation Rate	Growth Rate
Japan	5.37%	11.59%
Spain	5.73	7.37
Italy	3.67	6.33
France	3.84	5.72
Finland	5.01	5.4
Denmark	5.3	5.2
Norway	3.48	5.02
Austria	3.34	4.87
Belgium	2.65	4.85
Switzerland	3.13	4.78
Ireland	3.98	4.47
Sweden	3.74	4.31
United States	2.31	4.19
New Zealand	3.23	4.07
United Kingdom	3.45	3.12

Source: International Monetary Fund, International Financial Statistics, various issues.

Comparing Real Income Levels in Different Countries

One of the most important and interesting kinds of international comparison is that made among living standards in various countries. Which country is the richest, or poorest? How large is the gap between standards of living in rich and poor countries? These questions are trickier than they seem at first glance because of differences in relative prices in different countries. We have, for example, good reasons to suppose that the price of nontradables is lower in poorer countries than in richer countries. These differences in relative prices cause important distortions in the basic measurements of real income and real living standards.

Consider this illustration. According to official data, per capita income in India in 1989 was \$340 (in U.S. dollars), compared with per capita income in the United States of \$20,910. Thus, the data said, the gap in real income was \$20,570, and the U.S. per capita income was over 61 times that of India. But these data neglect a crucial point. The cost of living, that is, the price level, is much lower in India than in the United States. Thus, a per capita income of \$340 can buy a lot more in goods in India, at Indian prices, than it could in the United States at U.S. prices. It is not very surprising, then, that the same dollar income goes farther in India.

Any international comparison of living standards must take this difference into account. To do this we need to measure India's income, not in actual dollars but in dollars corrected for purchasing power. The correct comparison of purchasing power is found by answering the following question: How many dollars *at U.S. prices* would be needed to reach India's level of real per capita income? To arrive at a dollars-per-capita figure that can be used for a comparison we let Y_{US} be the per capita income of the United States and let Y_I be the per capita income of India, with each expressed in its respective domestic currency. Let P be the U.S. price index in dollars, and let P_I be the Indian price index in rupees, *where the two price indices cover a common basket of commodities*.

The standard way of comparing incomes is to compare Y_{US} with Y_I/E , where E is the exchange rate in dollars per rupee. The correct comparison, however, would be $(Y_I/P_I)P_{US}$, because this expression tells us the number of dollars needed, at U.S. prices (P_{US}), to achieve India's real per capita income level. The ratio P_I/P_{US} is sometimes called the PPP exchange rate, which we denote as $E^{PPP}_{(I/US)}$. It answers the question, How many rupees are needed to purchase the same basket of consumer goods that one U.S. dollar purchases in the United States?

Alan Heston, Irving Kravis, and Robert Summers, of the International Comparisons Unit at the University of Pennsylvania, have used this method in a series of important articles and books over the past several years.¹³ The basic procedure is to take a broad basket of goods and services and value it both at domestic currency prices and at international dollar prices. The ratio of the domestic cost to the dollar cost of the basket is the PPP exchange rate, which then may be used to convert value of GDP in the domestic currency to a more meaningful dollar measure. This latter measure indicates more accurately the gaps between countries in the purchasing power of per capita income.

Table 21-4 helps to visualize the differences between the results achieved with both methods. Column (1) shows per capita GDP calculated using market exchange rates, column (2) shows the corresponding measure using PPP exchange rates, and column (3) shows the ratio between the two: (2)/(1). The differences between the two measures show an interesting systematic pattern. Market exchange rates tend to overstate the differences between rich and poor countries. Even after corrections for PPP, however, the gaps are still huge. In 1980, for example, per capita income at market exchange rates was \$140 in Ethiopia, and \$16,440 in Switzerland, a ratio of 117 to 1! The PPP measure of income for that year shows Ethiopia with \$325 and Switzerland with \$10,013, a much smaller ratio—although still sizable—of 30 to 1.

In summary, then, here are several "rules of thumb" that have some practical significance in making international country comparisons:

¹³ Two recent pieces are R. Summers and A. Heston, "A New Set of International Comparisons of Real Product and Price Level Estimates for 130 Countries, 1950–85," *Review of Income and Wealth*, March 1988, and A. Heston and R. Summers, "What We Have Learned about Prices and Quantities from International Comparisons: 1987," *American Economic Review*, May 1988.

TABLE 21-4

PER CAPITA INCOME: MARKET VERSUS PPP EXCHANGE RATES,
SELECTED COUNTRIES (US\$, 1980)

	Market Exchange Rate (1)	PPP Exchange Rate (2)	Ratio (2)/(1)
Low income			
Bangladesh	130	540	4.2
Ethiopia	140	325	2.3
India	240	614	2.6
Pakistan	300	989	3.3
Middle Income			
Bolivia	570	1,529	2.7
Egypt	580	995	1.7
El Salvador	660	1,410	2.1
Thailand	670	1,694	2.5
Philippines	690	1,551	2.2
Peru	930	2,456	2.6
Colombia	1,180	2,552	2.2
Turkey	1,470	2,319	1.6
Korea	1,520	2,369	1.6
Brazil	2,050	3,356	1.6
Mexico	2,090	4,333	2.1
Chile	2,150	4,271	2.0
Argentina	2,390	4,342	1.8
Venezuela	3,630	4,422	1.2
Singapore	4,430	5,817	1.3
Israel	4,500	6,145	1.4
High Income			
Spain	5,400	6,131	1.1
Italy	6,480	7,164	1.1
United Kingdom	7,920	7,975	1.0
Australia	9,820	8,349	0.9
Japan	9,890	8,117	0.8
Austria	10,230	8,230	0.8
United States	11,560	11,404	1.0
Netherlands	11,470	9,036	0.8
France	11,730	9,688	0.8
Belgium	12,180	9,228	0.8
Sweden	13,520	8,863	0.7
West Germany	13,590	9,795	0.7
Switzerland	16,440	10,013	0.6

Source: World Bank, World Development Report 1982 (Oxford: Oxford University Press, 1982), and R. Summers and A. Heston, "A New Set of International Comparisons of Real Product and Price Level Estimates for 130 Countries, 1950-85," Review of Income and Wealth, (New York: International Association for Research in Income and Wealth March 1988).

1. Richer countries tend to have higher price levels in dollars; that is, they tend to be more expensive. This is because richer economies tend to have a higher ratio of (a_T/a_N) .
2. Faster-growing countries tend to experience real appreciations in their currencies, in the sense that P/EP^* tends to increase.
3. For two countries linked by fixed exchange rates, the faster-growing country tends to experience higher inflation.
4. Dollar comparisons of per capita income tend to overstate the differences in real purchasing power between rich and poor countries, because of the fact that rich countries are systematically more expensive than poor countries.

21-4 DEMAND SHOCKS AND THE REAL EXCHANGE RATE

To introduce the TNT model in the simplest possible framework, we have assumed that production in each sector is a linear function of labor. Because of that assumption, relative prices between nontradables and tradables are determined by the technology of production, with $P_N/P_T = a_T/a_N$. Demand factors have played no role in the determination of relative prices. Now, we want to investigate a more realistic setting in which both labor and capital are used in the production of both goods. In this case, the relative price of tradables and nontradables is determined both by technology and aggregate demand.

The production functions now take the usual form:

$$Q_T = Q_T(L_T, \bar{K}_T) \quad (21.12a)$$

$$Q_N = Q_N(L_N, \bar{K}_N) \quad (21.12b)$$

We assume that the level of capital is fixed in each sector and that these production functions are subject to the usual condition of a *decreasing marginal productivity of labor*. These more realistic technological assumptions lead to an important change in the shape of the production possibility frontier (PPF) of the economy. When production was linear, the PPF was a straight line, as in Figure 21-1. Now, the PPF is “bowed out,” as in Figure 21-8.

What accounts for the new form of the PPF? As we go from point *A* to point *B*, the tradable sector is releasing units of labor which get reallocated to the production of nontradables. But every new worker added to nontradable production results in a lesser and lesser increase in the output of *N*, because the stock of capital in the *N* sector is fixed. At the bottom of the PPF, near point *A*, a small shift in labor from tradables to nontradables produces a large gain in nontradables production. At the top of the PPF, however, near point *B*, a small shift of labor from tradables to nontradables produces almost no increase in nontradables production.

The slope of the PPF at any point measures the decrease in nontradable production that must occur for a given increase in tradable production in the economy. That is, the slope measures the *cost* of producing an additional unit of tradable goods in terms of nontradable goods. In a competitive economy, this cost will be equal to the relative price of tradables in terms of nontradables, P_T/P_N . Therefore, the slope of the PPF at any point will be

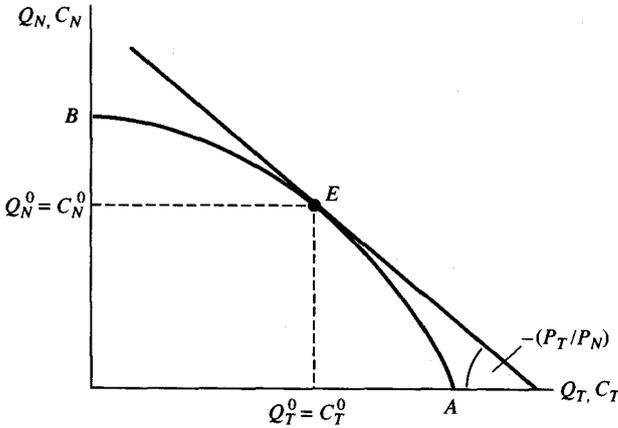


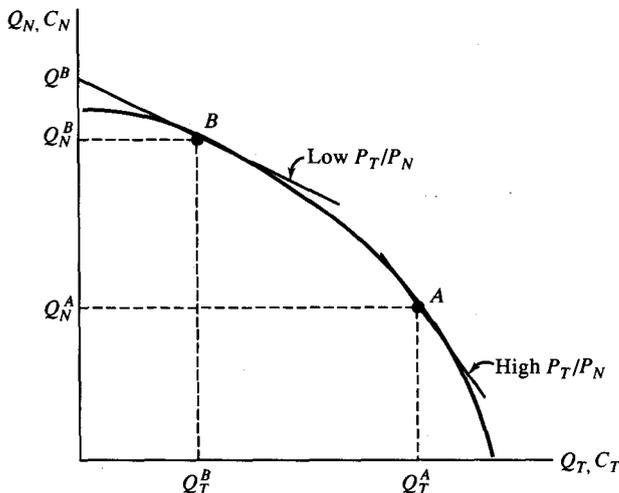
Figure 21-8
The PPF with Variable Labor and Fixed Capital

equal to the relative price P_T/P_N . When the relative price P_T/P_N is high, firms will choose to produce mostly tradable goods, at a point close to A . When P_T/P_N is low, firms will shift their production heavily toward nontradable goods, and away from the less lucrative tradable goods. They will tend to produce at a point closer to B . The linkage of production to the relative price P_T/P_N is shown in Figure 21-9.

We can use Figure 21-9 to measure the value of total GDP in the economy. Let us measure GDP, which we denote Q , in terms of nontradable goods prices:

$$Q = Q_N + \left(\frac{P_T}{P_N}\right) Q_T \quad (21.13)$$

Figure 21-9
Relative Prices and the Production Structure



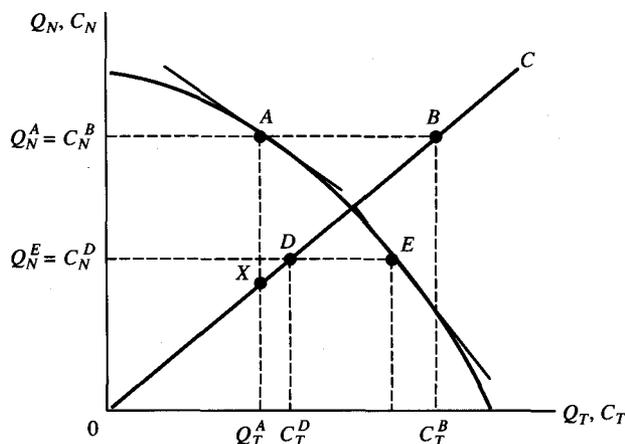
Clearly, GDP is the sum of nontradable goods production *plus* the value of tradable goods production (expressed in units of nontradable goods). Suppose that production takes place at point B in Figure 21-9. Output of tradables is Q_T^B , and output of nontradables is Q_N^B . The slope at point B is equal to the (low) relative price P_T/P_N . Note that the *value* of tradable goods production, $(P_T/P_N)Q_T^B$, is shown by the line segment from Q_N^B to Q_B on the Y axis. You can see this by noting that the line segment from Q_N^B to Q_B has a length that is equal to Q_T^B multiplied by the slope of the PPF at point B . In summary, the value Q_B measures total domestic output in units of the nontradable good.

As we now turn to the demand side, we shall continue to assume that households divide their consumption between nontradables and tradables in a fixed proportion. And, to keep things as simple as possible, we also continue to assume that this proportion is not a function of the relative price P_T/P_N .

Now let us look at the interaction of relative prices and the production structure of the economy as illustrated in Figure 21-10. Suppose that consumption is at point B . Production must therefore be at point A , on the same horizontal line as point B . There is a trade deficit, equal to the amount $C_T^B - Q_T^A$. The relative price of tradables to nontradables, (P_T/P_N) , is simply the slope of the PPF at point A . In this situation, the economy would be borrowing from abroad. Eventually, the economy must shift from trade deficit to surplus to service its accumulated debts, and this adjustment, as we have seen earlier, will involve a fall in the consumption of nontradables and tradables, combined with an increase in the production of tradable goods and a fall in the production of nontradables.

As this adjustment takes place, consumption shifts from point B to point D . At the new consumption point, production would have to shift from point A to point E , on the same horizontal line as the new consumption point. Note that the relative price of tradables increases (or, what is the same

Figure 21-10
Overconsumption and Adjustment: From Trade Deficit to Trade Surplus



thing, the relative price of nontradables falls) as a result of the decline in consumption spending. The slope of the PPF at the new production point E is steeper than it was at the original point A , showing that P_T/P_N increases in the adjustment process.

What are the economics of this adjustment process? When aggregate demand falls, the decrease in demand for nontradable goods causes unemployment in the nontradable sector. Prices for nontradable goods fall relative to tradable goods. The decline in the relative price of nontradable goods (and the rise in the relative price of tradable goods) causes tradable goods firms to hire the labor that has become unemployed in the nontradable goods sector. Thus, the increase in P_T/P_N , (or, equivalently, the decline in P_N/P_T) is the signal to firms to lay off workers in the nontradable sector and to hire them in the tradable sector.

The structural adjustment of the economy, then, requires a shift not only in production, but also in relative prices. Specifically, the shift from trade deficit to trade surplus requires three things: (1) a decline in consumption relative to income; (2) a real exchange-rate depreciation, meaning, in this context, a rise in P_T/P_N ; and (3) a shift in production from nontradable production to tradable production.

A Keynesian Version of the Tradable/Nontradable Model

So far, we have assumed that the economy is always at full employment, and therefore always on the production possibility frontier. Some shocks may require a fall in absolute prices and wages, however, and that may be hard to achieve under conditions of full employment. A transitory period of unemployment may prove necessary in order to restore a new full-employment equilibrium.

Consider the case in which the exchange rate and foreign prices are fixed, so that P_T is given. Suppose also the economy must shift from a trade deficit to a trade surplus through a cutback in domestic consumption. We have just seen that this adjustment typically involves an increase in P_T/P_N . With the price of tradables itself fixed in nominal terms, the adjustment would require an actual fall in the nominal price level of nontradables. With this problem in mind, let us return to Figure 21-10. If consumption falls but P_N is sticky downward, production will not shift to point E . Nontradable production will fall as the demand for N falls, but output in the tradable sector will not increase. The result will be production at point X , which is inside the production possibility frontier. There will be unemployment, and no rise in the production of tradable goods. Eventually, the unemployment will result in downward pressure on wages and nontraded goods prices. In the end, P_N will fall, and tradable production will eventually increase to the point E .

Is this hopeless situation inevitable? Does a negative demand shock have to produce unemployment until the price of nontradables (and the wage rate) falls enough to restore equilibrium? Not necessarily. Suppose that the authorities respond to the negative demand shock with a nominal *devaluation* of the domestic currency. If P_N is sticky, a devaluation can result in the necessary increase in P_T/P_N , not by cutting P_N but by raising P_T . In this way, production could remain on the PPF, at point E in the graph. This is a key

argument for devaluing the currency in response to a contraction in demand.¹⁴

Devaluation and the Structuralist Critique

The arguments we have just given suggest that a devaluation may be an important policy instrument when it is necessary to correct an external imbalance through an increase of net exports when nominal prices (or wages) are rigid. But not all economists share this view. Instead, some argue, devaluations are unnecessarily *contractionary*. The main argument of the “structuralist” economists is that the production structure of the economy might be rigid in the short run, *even if relative prices do change*. In that case, an increase in the relative price of tradable goods would not bring about a quick enough rise in the production of tradables.

The structuralists stress that there are important lags in an economy’s ability to increase exports. Production capacity in the tradable sector may be close to its upper limit, making it difficult to expand output in the short term. When this happens, the production possibility frontier is kinked, as in Figure 21-11. The capacity limits might take a long time to change, and lags may arise from the specific technological characteristics of the production process.

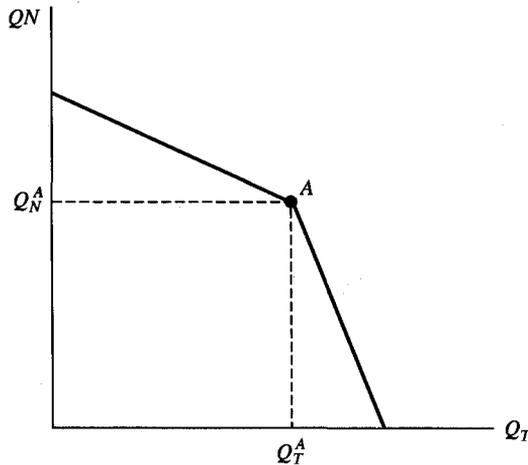


Figure 21-11
The Production Possibility Frontier under
Structuralist Conditions

Consider, for example, the production of fruit for export. Even after farmers have made the necessary investment decisions, trees need several years of development to produce fruit. In Chile, where fresh fruits had become in the late 1980s the third most important item among exports, the investment decisions responsible for this expansion had been mostly taken

¹⁴ A situation such as this one is analyzed at length by Rudiger Dornbusch, “Real and Monetary Aspects of the Effects of Exchange Rate Changes,” in Robert Z. Aliber, ed., *National Monetary Policies and the International Financial System* (Chicago: The University of Chicago Press, 1974).

during the 1970s. Or it may be that factors of production, including labor, may be specific to each sector, at least in the short run, and that is why they show little response to relative prices.

Lack of supply responsiveness to devaluation is not enough to make a devaluation contractionary, however. In addition, the structuralists point to the contractionary demand-side effects of devaluation.¹⁵ A first channel of demand contraction is the effect of devaluation on real money balances. A devaluation of the exchange rate provokes a rise in prices, which in turn reduces real money balances. In terms of the *IS-LM* model, both IS and LM shift back, and aggregate demand falls.

A second important channel is through redistribution effects. Suppose that the population is composed of two groups, those that primarily derive their income from wages and those that own the capital and receive profits. When nominal wages are sticky, a devaluation will redistribute income from workers to capitalists. If the former group has a higher propensity to consume than the latter, as evidence suggests, then aggregate demand will decline. The classic example of such a redistribution of income is the case of Argentina, which was studied by the late Latin American economist Carlos Díaz Alejandro. He showed that the Argentinian devaluation of 1958 redistributed income from wage earners to landowners, and thereby led to a fall in aggregate demand and output.¹⁶

Empirical evidence tends to support the view that devaluations are contractionary in the short run, but not over the longer run. The reason is clear. While contractionary demand-side effects act quickly in the economy, the beneficial supply-side effects take time to operate. Thorvaldur Gylfasson and Michael Schmid have studied the effects of devaluation for 10 countries, 5 developing and 5 industrialized, using data for the 1970s. They concentrated in the medium to long-run effects of this policy action and have reported contractionary effects in only two countries, India and the United Kingdom.¹⁷ More recently, Sebastian Edwards has studied the output effects of devaluation for 12 developing countries in the period 1965–1980. His results indicate that devaluations tend to provoke contractionary effects during the first year after the exchange-rate change, but that these contractionary effects are totally reversed in the second year.¹⁸

The importance of devaluations as a tool of economic policy has been highlighted during the 1980s, as developing countries have attempted to cope

¹⁵ See Paul Krugman and Lance Taylor, "Contractionary Effects of Devaluation," *Journal of International Economics*, August 1978. However, an extension of their framework to allow for some response of exports and nominal wages through time shows that the Krugman-Taylor result can be reversed and that a devaluation can give rise to a business cycle; see Felipe Larrain and Jeffrey Sachs, "Contractionary Devaluation and Dynamic Adjustment of Exports and Wages," National Bureau of Economic Research Working Paper, No. 2078, November 1986.

¹⁶ Two of Díaz Alejandro's seminal works on this subject are "A Note on the Impact of Devaluation and the Redistributive Effect," *Journal of Political Economy*, December 1963, and *Exchange Rate Devaluation in a Semi-Industrialized Economy: The Experience of Argentina, 1955–61* (Cambridge, Mass.: MIT Press, 1964).

¹⁷ See their joint paper, "Does Devaluation Cause Stagflation?" *Canadian Journal of Economics and Political Science*, November 1983.

¹⁸ S. Edwards, "Are Devaluations Contractionary?" *Review of Economics and Statistics*, August 1986.

with the foreign debt crisis in part through significant devaluations of the exchange rate, an issue that we discuss in much greater detail in Chapter 22.

21-5 SUMMARY

Not all commodities are *tradable*, that is, subject to international trade. *Nontradable* goods and services—such as haircuts, housing rentals, and lawyers' services—can be consumed only in the economy in which they are produced. The existence of nontraded goods has several important economic implications. For such goods, local demand and supply must balance; a drop in domestic demand cannot be met by an increase in net exports; and domestic prices can differ from foreign prices without provoking a shift of international demand. As absorption rises or falls relative to income, the mix of production in the economy will tend to change. These production shifts involve the movement of workers and capital between the nontradable and tradable sectors of the economy and can take a significant amount of time.

There are two main *determinants of tradability*. First, and most important, are *transport costs*, which create natural barriers to trade. The lower they are (as a proportion of the total cost of the good), the more likely that the good will be traded internationally. Second, is the extent of *trade protectionism*, represented by tariff and nontariff barriers. These can block international trade even when transportation costs are low.

Goods can be classified between tradables and nontradables. The standard industrial classification of the United Nations distinguishes nine different economic sectors. Roughly speaking, agriculture, mining, and manufacturing are the most tradable types of goods. Construction, transportation, and the various services categories are not as easily tradable, though there are important exceptions. High transport costs and artificial barriers render several agricultural and industrial products into nontradables. On the other hand, recent technological advances in communications have allowed many kinds of financial services to be traded internationally.

The theoretical framework of the tradable-nontradable model assumes that the home country produces and consumes both tradables and nontradables. Specifying the production function of the two goods and the available amount of inputs allows us to derive the *production possibility frontier* between tradables and nontradables. The PPF represents the maximal amount of one type of good that can be produced for each amount of production of the other type. The slope of the PPF at a given point is the relative price between the two types of goods. In this model, the relative price of tradable goods in terms of nontradable goods is called the *real exchange rate*.

Total absorption in the TNT model is equal to spending on tradable goods and nontradable goods. The central assumption of the model is that domestic consumption of nontradables must equal their production because there are no exports or imports of such goods. The trade balance is equal to the excess of production of tradables over the domestic absorption of tradables. Equilibrium is found by superimposing the preferences of the economy on the PPF.

The TNT model is useful for analyzing some macroeconomic aspects of international borrowing and lending. If the economy has been borrowing abroad to consume more than its income (that is, running a trade deficit), the country's net debt builds up over time. Due to the intertemporal budget

constraint, at some point the economy must shift back to trade surplus in order to service its international debt. This requires a drop in absorption relative to output, which reduces the demand for nontradable goods. Firms in the tradable sector will expand their production despite the fall in domestic demand, because they can sell their output in the world market. Thus, a shift from a situation of borrowing to repayment also requires a corresponding shift in the pattern of domestic production.

This *adjustment process* may involve short-run declines in output and employment. To minimize these social costs, governments sometimes implement a package of policies aimed at facilitating the transfer of resources, under the rubric of *structural adjustment programs*. Such programs typically include public sector reforms, trade liberalization, strengthening of economic institutions, and tight macroeconomic policies. During the 1980s, international institutions assisted countries in designing structural adjustment policies and supported them through lending, and in some cases through a negotiated reduction of debt servicing.

The shift of production between tradables to nontradables may also result from large changes in a country's wealth due to shifts in the value of an economy's natural resources. There are cases of dramatic enrichment, such as Norway's discovery of huge oil deposits in the North Sea in the 1970s, or oil-exporting countries' large gain from the surge in oil prices at the end of the 1970s. In these cases, nontradables typically experience a boom (due to wealth-induced increases in spending), while tradables other than the natural resource may experience a significant production decline, as resources shift into nontradables production. This phenomenon is known as the *Dutch disease*. Not all cases of resource shifts due to commodity booms have been related to oil. Colombia experienced a "Dutch disease" as a result of the coffee boom in the second half of the 1970s.

The *cost of living* in rich countries is higher than that in poor ones, and the difference in prices is most pronounced in nontradable goods. The TNT model helps to explain this phenomenon. One country will be more expensive than another if the price of its nontradable goods is higher than abroad. This will be the case if the productivity of its tradable sector *relative* to its nontradable sector is higher than abroad. As countries become richer, it has been observed that the rate of increase in productivity tends to be faster in the tradable sector than in the nontradable sector. This explains why rich countries tend to be more expensive than poor ones.

International comparisons of living standards should take the phenomenon of differing prices of nontradables into account. The way to make correct comparisons is to measure the income of the different countries in a common currency, but corrected for differences in the price levels in the countries. When this correction is made, it becomes clear that simple comparisons of per capita income levels (in which each country's income is stated in dollars at the official exchange rate) tend to overstate the differences in real incomes among rich and poor countries. This is because the overall price levels tend to be lower in poorer countries than richer countries.

If both capital and labor are used in the production of goods, the PPF no longer is a straight line (as when labor is the only input in production), but rather has a "bowed-out" shape. In this case, a shift of resources between tradable and nontradable goods production must be accompanied by a shift

in the relative prices of the two sectors. In particular, the shift from trade deficit to trade surplus, which requires a decline in absorption relative to income, and a shift in production from nontradables to tradables, also requires a real exchange-rate depreciation (that is, a rise in the price of tradables relative to nontradables).

Under conditions of price and wage stickiness, unemployment may result when resources must be shifted between the tradables and nontradables sectors. If the nominal exchange rate is fixed and nontradables prices are sticky, then both P_T and P_N will be fixed. Now, if domestic absorption falls, the relative price of tradables to nontradables (P_T/P_N) will not increase as would be necessary to move resources from the nontradable sector to the tradable sector. The result will be a fall in nontradable goods production and absorption, but no compensating rise in tradable goods production. The economy will therefore suffer an increase in unemployment, and production will occur inside the PPF. In this case, a *devaluation* might produce the necessary increase in P_T/P_N , not by cutting P_N but by raising P_T . This is an argument in favor of devaluation when resources must be shifted from the nontradable sector to the tradable sector.

Structuralist economists, however, consider devaluations unnecessarily contractionary because they think that the production structure of the economy might be rigid in the short run even if relative prices change. In support of their view, they argue that productive capacity in the tradable sector may be close to its upper limit and that technological lags may exist, so that tradable production cannot be increased quickly. At the same time, structuralists stress several contractionary demand-side effects of devaluation, such as its effect on reducing real money balances and its induced income redistribution from workers to capitalists. Empirical evidence tends to support the view that devaluations are contractionary in the short run, but not in the longer run.

Key Concepts

tradable goods	natural barriers to trade
production possibility frontier (PPF)	relative price of tradable goods in terms of nontradable goods
structural adjustment programs	relative productivity differential
purchasing power parity	structuralist critique to devaluation
exchange rate	nontradable goods
redistributive effect of devaluation	real exchange rate
artificial barriers to trade	absolute productivity differential
Dutch disease	real balance effect of devaluation
contractionary devaluation	

Problems and Questions

1. Explain whether the following goods and services are tradable or nontradable. Are there special circumstances in which your answer does not hold?
 - a. Cement.
 - b. Cars.
 - c. Bread.

- d. Data processing services for a bank.
 e. Copper.
2. Suppose that $a_T = 3$ and $a_N = 2$ and that the total amount of labor available is 120,000 man hours per year. Only labor is used in production, and the wage rate is \$10 per hour.
- Write the equation of the production possibility frontier between tradables and nontradables.
 - Draw the PPF in a graph.
 - Determine the relative price (P_T/P_N).
 - Determine the slope of the PPF.
 - What is the price of tradables and that of nontradables?
3. Are absorption and aggregate demand the same thing in the model of Section 21-2? Why or why not?
4. Why is the TNT model essential to understand the equilibrium of a country that shifts from borrowing to repayment? What part of the story would the differentiated products model of Chapters 13 and 14 lose?
5. "International comparisons of living standards based on per capita income are problematic because protectionism creates important differences in the prices of tradable goods across countries." Discuss.
6. "Richer countries are more expensive than poor countries because their wages are higher," says economist X. "No, the reason is that richer countries have a more rapid growth in productivity," says economist Z. Who is right? Why?
7. Why do faster-growing countries tend to experience higher inflation rates than economies with slower economic growth?
8. Suppose a poor country, well described by the model of Section ~~18~~²¹-4, receives a massive amount of foreign aid, much larger than before. What will likely happen to the following variables?
- The relative price P_T/P_N .
 - The point of production in the PPF.
 - The point of consumption.
 - The trade balance.
9. Discuss the effects on GDP measured in terms of nontradable goods of the following shocks (use a graph):
- A sharp drop in the international price of coffee, the major export commodity of the country.
 - An announcement that huge oil reserves have just been discovered in the country.
 - A sharp contraction of fiscal policy.
10. "The argument of structuralist economists that devaluations are contractionary is based on the rigidity of relative prices P_T/P_N ." Discuss.