Trade Policy and the Real Exchange Rate

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Some theoretical and practical applications for developing countries

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Introduction and Summary

This book consists of a series of essays, which were originally written as separate, self-contained explorations of their respective topics. The essays were meant to be used for didactic purposes, the main audiences being professionals dealing with policy matters—those who work in finance ministries, budget offices, planning bureaus, and central banks in the developing countries, and also those who deal with the same set of issues in international lending institutions or bilateral aid agencies.

I have tried to keep the exposition at a level that will be accessible to anyone conversant with the basic principles of economics and with the modalities and institutions that set the frame for international trade and finance in the 1980s. Thus, a regular or a sporadic reader of The Wall Street Journal in the United States, the Financial Times in Europe, or some other business journal elsewhere, should find these essays easy to understand even without formal training in economics.

In fact, the technical tools employed in this book do not go beyond the basic "supply and demand" analysis. Of that, however, there is an ample amount, as most of the propositions set forth here have been illustrated by supply-and-demand diagrams.

Chapter 1 of the book introduces the reader to the basic concepts and tools employed in analyzing the market for foreign exchange. These concepts and tools have great relevance and usefulness in interpreting economic events in the real world. Thus, the opening sections show how Brazil, the Republic of Korea, Spain, and Taiwan made a transition from inward-looking, protectionist, closed-economy policies and relatively little reliance on international trade to new outward-looking, liberalizing, open-economy policies, which resulted in dramatic, export-led economic growth. I have placed em-
phasis on the fact that closed-economy policies lead to low exports and low imports, while open-economy policies are conducive to high exports and high imports.

The real exchange rate plays a key role in producing this result. Protectionist policies curb the demand for imports, and with it the demand for foreign exchange. Thus, the real exchange rate received by exporters is driven down. Liberalization of imports, in contrast, increases the demand for foreign exchange; this drives up the real exchange rate received by exporters and produces the high-imports and high-exports combination which is characteristic of countries with an open-economy orientation.

Chapter 1 provides the analytical support for the conclusion in the preceding paragraph and shows how, when an economy fully adjusts to its trade policies, the resulting long-run equilibrium is the same regardless of whether the country is following a policy of fixed or flexible exchange rates.

In Chapter 2 the welfare or efficiency costs of tariffs and other trade restrictions are explored, and the concept of effective protection is introduced and explained. Briefly, the efficiency costs of protection stem from the fact that import restrictions provide producers of import substitutes incentives to use more resources to save a dollar, while makers of export products are given (through a low real exchange rate) much weaker incentives to “produce” a dollar through exports. In short, protection creates a situation where the domestic resource costs of saving a dollar via import substitution are much greater than the domestic resource costs of producing a dollar via export operations. The efficiency costs of protection are the result of this discrepancy between the domestic resource costs involved in the two ways (import substitution and export expansion) of generating an extra dollar of foreign exchange.

The analysis of effective protection extends the idea of the domes-
tic resource costs of the dollar to cases where the productive
operation in question uses inputs of tradable goods (either import-
ables or exportables). In such cases, protecting a particular final
product may not result in a full saving of foreign exchange, because
imported inputs may be needed to produce the domestic substitute.

Chapter 2 shows how, in the presence of imported inputs, the
nominal rate of protection to a final product can be magnified.
Thus, a tariff of 30 percent on a final product turns into an effective
protection rate of 60 percent if imported inputs (entering duty-free)
reduce the net saving of foreign exchange to half, and into an
effective protection rate of 120 percent if such inputs reduce the net
saving of foreign exchange to one quarter of what it would be in the
absence of imported inputs.

We also show how a uniform tariff, applying equally to all imports
of raw materials and component parts (that is, to all imported in-
puts) as well as to all final products, guarantees that the rate of
effective protection will equal the rate of nominal protection rate for
each activity. (Some necessary qualifications to this statement are
presented in the Appendix to the chapter.)

We have shown how easy it is for effective protection to turn out
different from what was intended. Even within a single narrow
customs classification, the rate of effective protection can vary
greatly from product to product in the absence of a uniform tariff.
Likewise, fluctuations in the world prices of raw materials can
easily double, or cut in half the rate of effective protection applying
to products whose domestic production uses those materials.

At least four lessons can be drawn from the exposition in Chapter 2:

1. It is wrong to think that protection (if it exists at all) should
   be reserved exclusively for those products that the country is
capable of producing.
2. It often makes sense to levy duties on imported inputs simply to maintain a rational pattern of protection across different domestic activities.

3. When liberalization does not go all the way to free trade, a country can gain by "squeezing" its tariff structure (in other words, moving it by steps toward uniformity).

4. It is rarely advisable to impose high tariffs on luxury goods; they only stimulate the high-cost production of luxury goods at home. If luxury items are to be heavily taxed, the wise course is to use excise taxation, which strikes the luxury good equally regardless of whether it is produced at home or abroad.

Chapter 3 presents the basic framework for real exchange-rate analysis. It deals explicitly with how the real exchange rate is affected by:

- a. import restrictions;
- b. export restrictions;
- c. capital inflows spent on tradables;
- d. capital inflows spent on nontradables;
- e. changes in the world price of an export good; and
- f. changes in the world price of an import good.

The effects of these six types of disturbances on the real exchange rate are shown to be the same (after full adjustment) under both fixed and flexible rates. We have emphasized here (and elsewhere in this volume) the importance of thinking of exports and imports in units of the "dollar's worth." This alone is sufficient to show how a country's supply curve of foreign exchange has to shift when the world price of an export product changes.

There follows a discussion of conceptual matters. The nominal exchange rate, in a peso country, is the peso price of the dollar. For
many theoretical and practical purposes, the real exchange rate can
be defined as the real peso price of the dollar (that is, the nominal
exchange rate deflated by an index of the country’s domestic price
level). However, when the analysis deals with actual data (as dis-
tinct from an analytical problem), and where those data extend over
time so that the purchasing power of the dollar is itself changing,
then it becomes necessary to refine the definition of the real ex-
change rate to incorporate a correction both for changes in the
country’s domestic price level and in the purchasing power of the
dollar. In this variant, the real exchange rate can be said to measure
the real price (expressed in pesos of, say, 1980 purchasing power)
of the real dollar (measured also in units of constant purchasing
power).

We have given reasons for using a general index (like the country’s
consumer price index) to convert into pesos of constant purchasing
power, while aiming an index at prices of tradable goods to correct
for changes in the purchasing power of the dollar. This latter index
need not be based only on United States prices, but can be drawn
from prices throughout the world. One useful index can be the
special drawing rights-wholesale price index (SDR-WPI), which is
a weighted average of the wholesale price indexes of France, Ger-
many, Japan, the United Kingdom, and the United States. It is
called the SDR-WPI because the weights used in this index corre-
spond to the weights each of the country’s currency has had (in
recent years) in the composition of the currency package defining
special drawing rights at the International Monetary Fund (IMF).

In calculating the SDR-WPI, the separate wholesale price indexes
of the different countries are shifted to a U.S. dollar base by multi-
plying by the relevant exchange rate (dollars per mark, dollars per
yen, dollars per franc, and dollars per pound.) This shift is needed
because the index is applied to a nominal exchange rate expressed
in units of pesos per dollar. (The SDR-WPI is not really dollar ori-
ented, however. We have shown that the resulting real exchange
rate would be just the same if the original nominal rate were ex-
pressed as pesos per yen or rupees per yen. The only difference is
that in such a case all the component WPIs would have to be shifted to a Japanese yen base by multiplying by a yen-per-dollar or a yen-per-mark exchange rate.)

Chapter 4 is written to show some of the ways in which the real exchange-rate analysis can be used to help in our diagnosis and understanding of real-world problems. We have given examples of how to calculate the real rate from data available in the IMF's publication, *International Financial Statistics*, and have also presented actual time series for the SDR-WPI. The history of real exchange-rate variation is then explored for many different countries; this reveals that the decade of the 1960s was characterized by relatively moderate swings, while the period since 1970 reflects much greater volatility in real exchange rates.

There follow a series of case studies; each illustrates how a particular cause of real exchange-rate variation can work. Thus, Japan's long-time trend of real exchange-rate appreciation is explained in terms of her phenomenal rate of technical advance. Ecuador's real appreciation is the result of her development of oil reserves and the boom in oil prices. In Iraq, the oil boom did not have its expected effect of reducing the real exchange rate; instead, the oil boom permitted the government to relax the severe import restrictions. In Turkey's case, the dominant force operating on the real exchange rate was a massive trade liberalization, in the wake of which the real exchange rate rose and gave the expected stimulus to exports. In both Uruguay and Jamaica, massive capital inflows drove down the real price of foreign exchange. However, there is a difference in the nature of the inflows in the two countries. In Uruguay, the inflows reflected the natural working of the international capital market; in Jamaica, the inflows mainly represented foreign assistance designed to help the country cope with a difficult situation of disequilibrium.

Cases in which fiscal deficits gave rise to runaway inflation are represented by Chile (1968-75), Ghana (1979-82), Uganda (1973-78).
and Zaire (1974-79). In all of these cases, the nominal exchange rate was not adjusted with sufficient speed to reflect the ongoing inflation. The result was in each case a drastic fall in the real exchange rate, a great deterioration of the incentive to export, and a massive loss of international reserves. In every case, the ultimate stage was a massive real devaluation of the currency, designed to restore export incentives and recoup reserves.

Real exchange-rate analysis is further applied in four cases dealing with the onset of a debt crisis and its aftermath. These include Argentina (1977-84), Chile (1979-84), Mexico (1978-84), and the Philippines (1979-84). In each case, there was initially a massive inflow of capital, which could not be sustained in the long run. The inflow of funds in each case drove the real exchange rate steadily downward, until it reached a crisis point. The crisis was really a sharp reduction in the rate of capital inflow, which “required” a major adjustment in trade patterns. In each case, the adjustment entailed a sharp devaluation of the real exchange rate, and produced a major shift (from deficit to surplus) in the trade balance. Graphs of the real exchange rate and the trade balance for these four countries reveal the close connection between capital flows and the real rate.

Chapter 4 concludes with capsulated histories of Uruguay (1970-82) and Mexico (1985-86). In each case, the intent is to show how the intelligent use of real exchange-rate analysis enriches our vision of events and understanding of historical processes.

Chapter 5 is somewhat more analytical and technical than the others. It is in no sense a “necessary reading” that must accompany the other chapters. However, it reveals facets of the economics of protection and provides the basis for appropriate qualifications of the more simplified treatment of the earlier chapters. This is done through a series of five steps.
The first step shows how a reduction of a single tariff (taken as the only relevant distortion) would produce a gain in economic efficiency and in welfare.

The second step shows that if we take an initial tariff on one category of goods as given, there is usually some efficiency or welfare gain realized from introducing a tariff on a second category of goods producing a substitute product. The gain stems from the fact that the second tariff causes imports of the first category to increase.

The third step is taken to reassure readers that the logic of freer and more liberal trade still prevails. As long as we deal with ordinary substitutes, it always pays to reduce the highest tariff. Sequential application of this rule leads us to the familiar conclusion that free trade is best (in the absence of distortions due to national monopoly power over exports or monopsony power over imports).

The fourth step analyzes the case of an imported input. If a particular imported input enters into the production of a protected final product in rigidly fixed proportions, a surprising result emerges: by raising a tariff in the input sufficiently high, we can in effect undo the protective effect of a tariff on the final good. This is simply a consequence of the notion of effective protection: tariffs on final products add to their rate of effective protection; tariffs on inputs into the final products subtract the final products’ rate of effective protection. If this is so, there should be a tariff on inputs sufficiently high to effectively annul any given rate of nominal protection to a final product.

The fifth step shows that when a final product has several imported inputs, there are many different ways in which its effective protection might be annulled. If one input accounts for 10 percent of the final product’s cost, and another for 20 percent, the protection-destroying power of a tariff on the second will be twice as great as that of a tariff on the first. Thus, a 30-percent tariff on the first
input has the same effect as a 15-percent tariff on the second, or as a 10-percent tariff on the first and the second combined.

One unexpected consequence of the fifth step is that a tariff on an imported input can help expand, rather than contract, trade. The logic is simple. If it takes $50 worth of wool imports to make a coat worth $120, then a tariff that cuts wool imports by $5 million will (in the simple case where wool is only used to make coats) cut coat production by $12 million. If coats are tradable (as we have assumed here), this will lead to an increase of coat imports of $12 million—that is, to an induced expansion in import demand that outweighs the primary contraction of $5 million.

Tariffs on inputs can thus create trade dramatically when those inputs enter the production of import substitutes. Tariffs can destroy trade equally dramatically if the inputs in question enter into the production of export goods. The mechanism is exactly the same. If coats were an export product, the reduction of $12 million in their production (occasioned by the $5 million reduction in imports of wool) would be reflected in reduced exports of a like amount. The negative effect on exports of increased tariffs in inputs is a matter of serious policy concern. One way of dealing with this concern is to apply “border tax adjustment” by rebating to exporters the amount of tariffs (or other indirect taxes) that may be embodied in their cost structure. Where this is not feasible (usually because of a lack of sufficient administrative capacity), a country faces a policy dilemma. Such tariffs have beneficial results to the degree that the tariffed inputs are used to produce import substitutes, but undesirable results to the degree that these same inputs enter into the production of exports. In such cases (where imported inputs are important in the production of exports and where tariffs on them cannot feasibly be rebated to exporters), the case favoring tariffs on inputs is significantly weakened.
A certain amount of overlap exists among the various chapters. While an effort has been made to reduce such overlap, we decided not to carry it to such a degree as to seriously impede the reading of any one chapter by itself.

The process of preparing this book has meant for me a return to my original field of specialization, international trade, after a considerable period in which my interest and writings ranged over other areas, principally applied welfare economics and public finance. This return to my original field made me think of Lloyd A. Metzler, who was my first and principal instructor and guide in international economics. It also led me to remember Fritz Machlup, who as a colleague at the Johns Hopkins University in 1949-53, added new perspectives to my understanding of the field.

The motivation for the papers that ultimately were assembled into this book came from F. Leslie C. H. Helmers, an esteemed colleague and a friend of long standing. I am deeply grateful to him, for without his perseverance and drive, the daily pressures of my busy existence could surely have impeded this book's completion.

Finally, I owe special thanks to Emmanuel D'Silva, who served as editor of the final version. Rarely will any author be favored by the degree of care, involvement, and insightful professionalism that he showed in monitoring the production of this book down to each last detail.
Trade policy and real rate

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Case histories of open and closed economies

In the entire debate on tariffs, quantitative trade restrictions, and protectionism, not enough attention has been paid to the grand dichotomy between having an "open" or a "closed" economy. Obviously, "open" and "closed" do not represent a dichotomous choice. Each tariff can be raised or lowered, percentage point by percentage point; so too can each quota or licensing restriction. Thus, economies can be more or less open, and more or less closed. Every now and then, however, an economy will undergo a dramatic shift, either from being quite open to quite closed, or in the reverse direction.

To bring home to readers that "all this talk" about open and closed economies is not simply a classroom exercise but rather a true reflection of the economic realities of the world we live in, I start this chapter by recounting a number of actual case histories. We should approach this material recognizing that economic events are almost always the product of numerous and complex forces. When emphasizing the decision to have an open or a closed economy, I thus play down to a degree the importance of other forces—like movements in the prices of principal exports, or important imports (such as oil), or major changes in the rate of international capital flows into or out of the country.

I do not want to mislead you into thinking that these "other forces" are not in themselves important; in particular, there may be episodes in the history of a country when one or another (for example, export-price movements) may be the dominant force at work. But I feel that in the particular episodes that I will recount here, the big issue at stake was the closedness or openness of the economy. This has been the judgment of history and of a great many professionals who have intimate knowledge of each particular case.
Taiwan

Taiwan has been not only one of the “miracle” economies of the last three decades, it was also one of the first to “take off.” The key element in Taiwan’s take-off was its shift from a closed- to an open-economy policy. One of the key architects of the policy shift, Professor S. C. Tsiang, puts it this way:

Taiwan at first was following the prevalent development strategy of the time, [namely] letting her currency be grossly overvalued while inflating domestically, but keeping her balance of payments in balance by means of strict quantitative controls and a high tariff wall. Under these policies the only exports which Taiwan was able to keep up were merely the few traditional ones, [namely] sugar, rice, pineapples, plus a few minor items going chiefly to markets established [prior to the war]. New export industries and new markets simply could not be developed.

When the late Professor T. C. Liu and I were called ... to advise on economic policy, we immediately [tried] to persuade the government to adopt a policy of devaluation coupled with trade liberalization; [that is] to devalue ... the domestic currency to a realistic level that would ensure ... balance of trade equilibrium without the need for stringent quantitative restrictions and high protective tariffs...

The effect on the foreign trade of Taiwan of this policy of devaluation, coupled with liberalization, [was] truly remarkable ... By 1970, the U.S. dollar value of Taiwan’s exports had already increased to $1,469 million, which, compared with $96 million at the low point of 1954, represented a 15.3-times increase in 16 years ... By 1980, the dollar value of Taiwan’s exports reached ... $19,575 million, ... more than two hundred times that of 1954. (Tsiang, 1984)
Spain
Spain followed a closed-economy policy throughout the 1940s and through most of the 1950s. The beginnings of liberalization began to appear at the end of the 1950s and reached their full fruition in the 1960s. The dramatic change that took place consequent upon the opening of the economy can be seen in the export data. Exports, which had ranged between $400 million and $500 million per year throughout the 1950s, increased to over $700 million in 1960, over $1 billion in 1963, about $1.5 billion on average toward the latter part of the 1960s, over $4 billion in the early 1970s, nearly $12 billion in the late 1970s, and over $20 billion in the early 1980s. These data, like those on Taiwan, are not corrected for U.S. inflation; however, the United States GNP deflator (the most general and comprehensive of all price indices) barely tripled between 1954 and 1980. (Details on the United States GNP deflator and other deflators are discussed in Chapter 3.)

Brazil
Brazil, like Spain, pursued an inward-looking, closed-economy policy during the period 1953-64, followed by a substantially more open-economy policy in later years. The export data tell a similar story. Brazil's exports were lower, even in nominal dollar terms, in 1963 and 1964 than they had been in 1953 and 1954. Throughout the interim, they never once reached the $1.15-billion mark (which had been exceeded in 1953 and 1954). After 1964, the economy was gradually opened. The exports reached $2.3 billion by 1969, $4 billion by 1972, $6 billion by 1973, over $8 billion by 1975, $10 billion by 1976, $12 billion by 1977, $15 billion by 1979, and $20 billion by 1980.

Korea
It is difficult to deal with the case of the Republic of Korea during the years of the Korean War, but, starting immediately thereafter
(1954), we encounter a restrictive trade policy and a virtual stagnation of exports. (Exports in 1957, 1958, and 1959 were below those of 1953 and 1954.) Suddenly, trade policy was reversed and the economy opened up. Dollar volume of trade increased by a factor of 12.5 between 1959 and 1966, then quadrupled by 1971, and quadrupled again by 1974. By 1982, dollar exports were a thousand times higher than those of 1959!

**Ghana and Côte d’Ivoire**

At her independence, Ghana started with a per-capita income higher than that of Côte d’Ivoire, and with exports (each year from 1956 through 1960) about double those of her neighbor. Twenty years later (1976 through 1980) their positions were reversed. Many factors played a role in explaining the dramatic inversion of their status—prudence and wisdom characterized Côte d’Ivoire’s economic policy, while mistake upon mistake piled up in Ghana. High on the list of Ghana’s mistakes was an inward-oriented trade policy that flew in the face of the country’s natural comparative advantage, while Côte d’Ivoire pursued a relatively liberal open-economy strategy. Incidentally, Ghana’s annual growth rate of per-capita income from 1960 to 1981 averaged a negative 1.1 percent; that of Côte d’Ivoire’s was a positive 2.3 percent.

**Burma and Thailand**

Here is another instance of two neighboring countries, of relatively similar size and economic potential, pursuing extremely different economic policies and coming to very different end results. Burma’s exports did not even double in dollar terms between 1953 and 1980 (while the U.S. price level had tripled). Thailand’s exports, in contrast, increased more than twentyfold. Per-capita income in Burma grew, during 1960-81, at a compound annual rate of 1.4 percent; in Thailand, it grew at 4.6 percent.
Protectionism and real exchange rate

The case histories just reviewed show that the countries pursuing closed-economy, inward-oriented policies experienced little growth in their international trade and in their economies, while those pursuing outward-oriented, open-economy policies generated more favorable export performance and real per-capita economic growth. I began this chapter by describing the actual experience of countries because experience tells us more than simple economic theory can. The superlative rates of growth were achieved by the open-economy countries not solely because of their stance on international trade policy, but also because of the technical soundness of their other policy decisions. In contrast, the losers in the growth game tended, almost as if hypnotized, to take technically unsound decisions when it came to policy choices. Many factors, besides trade policy, entered into the success of the winners and into the failure of the losers. Nevertheless, trade policy unquestionably played a critical role.

In this section I deal with basic principles governing links between a country’s economy and the rest of the world, and with ways in which economic policy influences the process of linkage. The focus is on trade restrictions, particularly import restrictions, and how they influence incentives to produce various classes of goods, especially incentives for exports. I show how similar restrictions have similar effects, regardless of whether a country follows a flexible or fixed exchange-rate policy. The underlying incentives for exports, import substitutes, and other categories of goods do not, it turns out, depend on the issue of fixed versus flexible exchange rates, but rather on the basic trade policies—tariffs, quotas, and other types of restrictions. The main effects of these policies, in turn, are largely transmitted through the real exchange rate. In the long run, paradoxically, the real exchange rate of a country depends on its trade policy, not on its nominal exchange-rate policy. (Here the term "the nominal exchange rate" refers to a
fixed- or a flexible-rate system; "trade policy" refers to restrictions on imports and incentives and disincentives governing different categories of tradable goods).

**Overview of key concepts**

I begin the expository part of this section with an overview in which the main points to be treated are outlined in an intuitive, nontechnical way. Subsequently, the complexities of the subject will force me to be more technical. I will proceed in easy stages and at each stage prepare you for the next.

**Market for foreign exchange**

A good starting point is to think about the market for foreign exchange. It is a market that exists wherever a country possesses an independent currency. This market may be quite free, or it may be riddled with distortions and imperfections, but it nonetheless exists. It will always exist because so long as the suppliers and demanders of foreign exchange are different groups or people (or companies or other economic agents), there must be some machinery by which the foreign exchange brought by the suppliers is channeled into the hands of the demanders.

**Notion of exchange rate**

The simplest definition describes the exchange rate as the price of foreign currency; in this sense, there is always at least one exchange rate in any market for foreign exchange. The trouble is that many situations exist where several different prices of the dollar prevail side by side. This can happen with multiple exchange rates, with import entitlements, with regulations that wall off one segment of the foreign exchange market from another, with simple parallel or black markets, and so forth. In all these
circumstances, the dollar has differing degrees of scarcity—
different prices and different values-in-use—in different segments
of the market. In fact, different prices and different values-in-use
emerge (in effect, if not in name), even when the only distortions
affecting foreign trade are import tariffs (which can be found
virtually anywhere in the international trading community).

*Tariffs imply different internal values for exchange rate*

Thus, if a country has a tariff structure with rates of

a. 20 percent,
b. 50 percent, and
c. 100 percent

on different groups of imports, it may have an exchange rate of 10
pesos per dollar in the marketplace, but users of group a imports
pay 12 pesos per dollar's worth, those of group b imports pay 15
pesos per dollar's worth, and those of group c imports pay 20
pesos per dollar's worth. But that is only part of the story.

The fact that different prices prevail in the marketplace for a
dollar's worth of different kinds of tradable goods also means that
economic signals regarding the use of domestic resources to
produce or save a dollar will differ from one use to the next. Thus,
so long as exports are neither subsidized nor taxed, an exchange
rate of 10 pesos per dollar means that 10 pesos is the reward that is
given to those resources whose combined efforts produce a dollar's
worth of foreign exchange through exports. Yet, while this is true
for the production of a dollar by way of exports, the rewards for
saving dollars through import substitution are much higher. In the
example at hand, up to 12 pesos of resources can be used in pro-
ducing substitutes for a dollar's worth of imports of type a, up to
15 pesos for substituting away from a dollar's worth of imports of
type b, and up to 20 pesos for substituting away from a dollar's
worth of imports of type c. In this simple example, we have in
effect four different "prices" of the dollar.²

²The prevalence of
different prices in
the marketplace for
a dollar's worth of
imports can mean
that economic sig-
nals on the use of
domestic resources
to produce or save
a dollar will differ
from one use to
another.
Market exchange rate as point of reference

How do we begin to approach the study of economic policy and the exchange rate, when even a very simple case produces such a confusing picture? The answer is that we must from the outset adopt a clear conceptual guidepost to serve as a point of reference and to orient our thinking. Only by starting from a clear conceptual base can we hope to avoid incredible confusion as we try to analyze the complex maze of signals that emerge from real-world policy settings.

The simplest and clearest guidepost is the market exchange rate at which most export and import transactions take place. This would be 10 pesos per dollar in the above example. In the real world, it can be identified as the exchange rate that a typical exporter receives. But, of course, it is also the exchange rate relevant to any import-competing activity that is not protected by a tariff or other import restriction.

Tariffs with flexible rate and monetary stability

Let us now turn to a very simple situation in the market for foreign exchange. Consider a country with a flexible exchange rate and a stable monetary policy, and suppose that country imposes a uniform import tariff, starting from a situation with no exchange restrictions. Obviously, the tariff will reduce the demand for foreign exchange, and with a reduced demand the market price of foreign currency (that is, the market exchange rate) will fall. If there were no capital movements, trade would have been balanced (that is, the dollar value of imports would have equaled the dollar value of exports) in the initial situation without restrictions. Exports would also equal imports in the new equilibrium after the import tariff is imposed. The tariff would cause the demand for imports to be reduced; and the effect of the tariff on the exchange rate would cause the amount of exports to be smaller than it would be otherwise.
A numerical example will clarify the situation. Suppose we start with an exchange rate of 10 pesos to the dollar and no trade restrictions, with imports and exports both equal to $500 million. Now introduce a uniform tariff of 50 percent. We might think that this would lead to a new equilibrium with the exchange rate still at 10 pesos to the dollar and with a dollar's worth of imports selling for 15 pesos. But this is not correct under conditions of a flexible exchange rate and monetary stability; we have to consider how equilibrium in the trade balance would be maintained, and how monetary stability would be preserved.

Both of these conditions are met in the following example: when the 50-percent tariff is imposed, the reduced demand for foreign exchange causes the exchange rate to fall from 10 to 8 pesos to the dollar. This causes a reduction in the volume of exports. The new equilibrium might turn out to be one at which exporters received 8 pesos for the dollars they produced, and at which buyers of imports and import substitutes paid 12 pesos per dollar's worth. Both exports and imports could then have fallen—say to $400 million—and the general price level of the country in question could have remained unchanged, with prices of imports and of import substitutes rising, prices of exports and of exportables falling, and prices of various nontradable goods and services not moving significantly in either direction.

**Short-run disequilibrium and long-run equilibrium**

The above example is important in understanding the economics of exchange rates and trade restrictions. Far too often, people approach this subject thinking of the momentary situations of countries with "balance of payments problems." These are cases of disequilibrium, typically entailing a drainage of foreign exchange reserves and invariably requiring important economic adjustments to restore equilibrium. The deep and fundamental relations of economics do not refer to such transitory disequilibria, but to the
more abiding characteristics of the equilibria to which an economy will go under alternative sets of economic policies.

When we think in these terms, we quickly see how a concentration on transitory disequilibrium situations distorts our focus. Looking at a short-term balance-of-payments disequilibrium leads us to ask how we can increase exports and reduce imports at the same time. However, this is not the relevant choice for the longer term, when exports must equal imports (plus foreign aid plus voluntary capital inflows).

**Long-term choices**

The true long-term choice is the one revealed in the example: we must choose either higher imports and higher exports on the one hand, or lower imports and lower exports on the other. We must choose either close linkage with the world economy or relative isolation from it. We must go for either a relatively open economy or a relatively closed one.

The main lesson to be learned from the study of trade restrictions of all types is that such restrictions reduce imports and exports; that they weaken or break a country's links to the world economy; and that they turn a relatively open economy into a relatively closed one. Trade restrictions can operate directly either on imports or on exports; in either case the end result is a reduction of both. In actual practice, however, trade restrictions tend to be concentrated on the import side. These restrictions—whether in the form of tariffs, quotas, licenses, prior deposits, surcharges, credit limitations, or whatever—operate directly to cause internal prices of affected imports and import substitutes to rise and have the direct effect (in a setting of stable monetary policy and flexible exchange rates) of causing the exchange rate to fall, thereby producing an induced reduction in exports.
Tariffs under fixed exchange-rate regime

In this overview, we extend the analysis of trade restrictions under a flexible exchange rate to the case of a fixed exchange rate. Here, too, we can assume monetary stability, but we must recognize that monetary stability has a different meaning under a fixed-rate system than under a flexible-rate regime. Once this distinction is recognized and understood, we can see how, behind the facade of a different exchange-rate system, the very same underlying economic forces lead from increased import restrictions to reduced exports, to broken links with the world economy, and to a progressive closing of one’s own economy to world trade.

In our earlier example, we started from an economy without trade restrictions, with an exchange rate of 10 pesos to the dollar, and with an initial equilibrium of exports and imports at $500 million a year. We then imposed a uniform 50-percent import tariff, and reached a new equilibrium with an exchange rate of 8 pesos to the dollar. Exports and imports dropped to $400 million a year, and imports and import substitutes were sold in the internal market for 12 pesos per dollar’s worth.

We will repeat that example under the assumption of a fixed exchange rate. The key difference lies in the fact that the exchange rate is fixed at 10 pesos; this rules out the previous solution, which entailed the exchange rate falling to 8 pesos. Thus, for given world prices of exports and imports, the internal price of a dollar’s worth of exports must (under a fixed exchange rate) remain constant at 10 pesos and the internal price of a dollar’s worth of imports must (when a 50-percent tariff is imposed) rise from 10 to 15 pesos.

This will happen through the natural workings of the monetary mechanism of a fixed exchange rate. When the tariff is imposed, demand for imports will be curtailed, and a balance-of-payments
surplus will thus be created. This will generate a new supply of foreign exchange that the central bank, under its obligation to maintain the exchange rate, must buy. The money supply will expand and exert a general upward pressure on costs.

**Tariffs squeeze resources out of exportables production**

Another way to see how this pressure is generated is to look at the pattern of substitution set in motion by the imposition of the tariff. The rise in the price of imports draws purchasing power away from importables taken as a group. But recall that the tariff also causes a rise in the internal price of import substitutes. Production of these will thus tend to be stimulated. At the same time, the demand that was shifted away from importables will go toward exportables on the one hand and nontradable goods and services on the other. Increased local demand for exportables will cause the quantity of exports to decline, as their price (which is determined in the world market) does not change. But increased demand for nontradables will call for increases in their production.

We thus have import-substitution activities and those producing nontradable goods calling for additional resources, while at least initially there is no reason for the activities producing exportables to release them. Ultimately, however, the increased pressure of demand, facilitated by the increase in money supply already mentioned, causes the peso prices of local factors of production to rise. This is what ultimately squeezes resources out of the production of exportables.

**Tariffs cause real exchange rate to fall**

In the flexible exchange-rate example cited earlier, it was the fall in the nominal exchange rate that had squeezed resources out of the production of exportables. In the case of fixed exchange rate, it is the rise in the level of internal costs that has the same effect. At the
level of abstraction of both these simple examples, the resulting final equilibrium will be identical in real terms. In the flexible exchange-rate case, prices of importables rise to 12 pesos per dollar's worth, prices of exportables fall to 8 pesos per dollar's worth, and the general price level, including the price level of nontradable goods and services, remains constant.

It is perfectly compatible with this equilibrium that wages, in terms of pesos, should also remain constant. In contrast, under a fixed exchange rate, prices for importables would rise to 15 pesos per dollar's worth, and prices of exportables would stay the same at 10 pesos per dollar's worth. The general price level, the price level of nontradable goods and services, and the level of nominal wages would all rise. To maintain the same equilibrium assumed above for the flexible exchange-rate case, the general price level would need to rise by 25 percent under the fixed exchange-rate case.

Another way of expressing the result is to say that the introduction of import restrictions causes the equilibrium level of imports and exports to decline. To accomplish this equilibrium, resources are squeezed out of the production of exportables through a fall in the real exchange rate. In the first example, a reduction of the real exchange rate was achieved through a fall in the nominal rate, with the general level of prices and costs remaining constant. In the second example, the same result was obtained through a rise in the general level of prices and costs, with the nominal exchange rate remaining constant.

The same real equilibrium could also be reached by a combination of these effects, with the nominal exchange rate falling by less than 20 percent and the general level of prices rising by less than 25 percent. For given levels of world prices of all relevant imports
and exports, the final equilibrium simply entails a determinate fall (here 20 percent) in $E/P_d$, where $E$ is the nominal exchange rate and $P_d$ is the general level of domestic prices and costs.

**Inflation and real exchange rate**

Inflationary settings provide extreme examples of changes in the real exchange rate that result from combined movements of both nominal prices and nominal exchange rate. We should not think here that an inflationary process is caused by trade restrictions; rather we should think of inflation as stemming from causes independent of the country's trade-restrictions policy. Thus, in the absence of any trade restrictions, the inflation process would carry the nominal exchange rate from 10 to 20 pesos to the dollar, while the general price index $P_d$ would move from 100 to 200. The introduction of a 50-percent uniform tariff might result in the following alternate scenarios over the same period:

a. a nominal exchange rate rising to 16 pesos per dollar, the internal price of a dollar's worth of importables rising to 24 pesos, and the general price index $P_d$ rising from 100 to 200; or

b. a nominal exchange rate moving to 20 pesos per dollar, the price level of exportables rising to 30 pesos per dollar's worth, and the general price index rising from 100 to 250.

The real equilibrium would be the same in both of these cases, as well as in any other case that produced the same change in the ratio $E/P_d$. Exports would be squeezed by a fall in their relative price (just as in the earlier cases); the production of import substitutes would expand, and imports would decline by as much as exports.

**Tariffs on subset of imports**

While a general and uniform import tariff produces generalized incentives to expand the production of import substitutes and to reduce the production of exportables, the situation is different when it
comes to a tariff or other restriction that covers only a subset of imports. Here a distinction must be made between "covered" and "noncovered" imports. The covered group consists of imports affected by the restriction.

When only a subset of imports (here assumed to be final products) is affected by the restriction, incentives are created to expand the production of substitutes for those particular imports, but the producers of substitutes for the rest of imports suffer the same consequence as do the producers of exportables. Just like exports, the "noncovered" inputs have dollar prices that are determined in world markets. Thus, when the real exchange rate falls either through a fall in the nominal rate (E) with a constant level of domestic prices and costs, or through a rise in domestic prices and costs (Pd) with a constant nominal rate, or through combined movements in both E and Pd, the production of noncovered imports will suffer along with that of exports.

The effect of a trade restriction on any subset of imports is like that of a general import duty, in that it operates to reduce both imports and exports. Production of tradable goods expands only for substitutes of the covered imports; for the remaining tradables (taken as a group), production contracts owing to a fall in the real exchange rate. There must be a net fall in exports, owing both to reduced production of exportables and increased internal demand for them. Likewise, there must be a net fall in total imports, though the importation of uncovered imports will rise because of the combined effects of increased demand (as people substitute away from the now more expensive covered imports) and of reduced domestic supply of their substitutes (owing to a fall in the real exchange rate).

The lesson is clear. Tariffs on imports of any one (final product) class have the effect of "disprosecting" all other tradable sectors, regardless of whether they produce exportables or import substitutes.
Policy lessons

Choice between an Open and a Closed Economy. The policy lessons to be drawn from this brief overview are quite simple. The main policy choice is between a more open economy on the one hand and a more closed economy on the other. Generalized import protection closes the economy; it reduces imports by reducing people’s demand for importables while giving incentives to the local production of import substitutes; it reduces exports through its effect on the real exchange rate. The obvious path for improving resource allocation is to open the economy through trade liberalization. By putting in reverse gear the entire process we have been examining, trade liberalization will increase both exports and imports, and thus expand the economy’s links with the world market.

Guidelines for Trade Liberalization. The analysis also has implications regarding the manner in which a program of trade liberalization should be implemented. In general, we should design a liberalization process as a series of steps, each of which entails an across-the-board reduction in restrictions. We should avoid processes that contemplate the liberalization first of one category (say chemicals), then of another (say pharmaceuticals), then of a third (say textiles), etcetera. The reason for this is implicit in the general conclusions already derived.

1. The main policy choice is between a more open and a more closed economy.

2. The liberalization process should be seen as a series of steps. Each step should entail an across-the-board reduction in trade restrictions.

If any new import restriction, whether partial or general, has the effect of lowering the real exchange rate facing all tradables, it follows that any liberalization causes the real exchange rate facing all tradables to increase. It therefore ends up by attracting resources to the production of export goods and to the production of importables other than the category being liberalized. Thus, liberalizing the import of chemicals will drive resources out of the local chemical industry, but (through its effect on the real exchange rate) will attract resources to pharmaceuticals and textiles. Liberalizing imports of pharmaceuticals will push resources out of the corresponding local industry, but (again through the real exchange rate
effect) will attract them to the domestic production of chemicals and textiles (along with all other importable and exportable goods).

The guiding principle of liberalization, regardless of the commodity coverage involved, should be to avoid giving contradictory resource-allocation signals at different steps in the process. It makes no sense to send a signal which will lead to the attraction of resources in the domestic production of pharmaceuticals at step one, and to signal the opposite (even more sharply) at step two. Likewise, it makes no sense to follow up on the first-step signal for reducing the amount of resources devoted to chemical production by sending other signals (at steps two and three) for attracting some of the same resources back.

The obvious way to prevent the issuing of contradictory signals at different steps is to include, at each step, reductions of restrictions on all items to be covered in the liberalization process under way. In the case cited in the preceding paragraphs, the tariffs on chemicals, pharmaceuticals, and textiles should all be subject to reduction at each successive step. The process may be quite gradual, consisting of several steps, but at each step the goal should be to squeeze resources out of each of the categories to be liberalized. This goal can be pretty well assured if, step by step, each tariff to be affected is reduced by a certain fraction (say a fifth) of the total reduction that is contemplated in the entire liberalization process.

Making Liberalization Processes More Efficient. Certain subtleties can be employed to ensure a more efficient process of liberalization. A sensible first step would be to get the “water” out of the tariff structures. Tariffs sometimes get so high as to effectively prohibit imports of the affected category, or to reduce them to a small trickle to satisfy a specialized demand. Once a tariff is prohibitive, adding extra percentage points to the rate has no effect.
Similarly, when prohibitive tariffs already exist, it is usually possible to reduce them considerably without tariffs ceasing to be prohibitive. Thus, a tariff of 500 percent might be in place, say, on refrigerators, where 100 percent itself would be prohibitive. In this case, it would make little sense to follow a path of liberalization that reduced the tariff on refrigerators from 500 to 400 to 300 to 200 to 100 percent, while on, say, woolen cloth a 50-percent tariff was being reduced to 40, then to 30, 20, and 10 percent. No liberalization would be involved in lowering the refrigerator tariff by successive steps from 500 to 100 percent, because in this range all rates are prohibitive. And if the final step was to lower the tariff rates for the liberalized subgroup of imports to zero, all the force of tariff reduction would be concentrated in this last step for refrigerators, while for woolen cloth, it would be spread more or less evenly over all five steps of the liberalization process.

The way to handle situations like these is to eliminate the "water" first, before plugging a commodity like refrigerators into the pattern of step-by-step reduction. With full knowledge of the point at which the tariff became prohibitive (here 100 percent), we should ideally reduce the refrigerator tariff to 100 percent as a preliminary step, then link it to the rest of imports to be subject to the general stepwise reduction. Thus, while the tariff on woolen cloth was being reduced from 50 to 40 to 30 percent and that on, say, leather from 40 to 32 to 24 percent, the tariff on refrigerators would go down from 100 to 80 to 60 percent.

The squeeze on domestic production of substitutes would be felt at each stage for all commodities subject to the liberalization process. There would be no reversals of signals (dealt with earlier) nor would there be steps without liberalizing effect (like reducing the refrigerator tariff from 500 to 400 or from 400 to 300 percent) followed by others of drastic impact (like reducing the refrigerator tariff from 100 percent to zero at a single stroke).
At each step, resources would be squeezed out of each of the sectors to be covered. At the same time, through the effect of liberalization on the real exchange rate, there would also be at each step an incentive for resources to move into the export sector and into activities competing with imports (hopefully those with already low or zero tariffs) not incorporated in the liberalization program.

Because it is not easy to determine the exact point at which a tariff becomes effectively prohibitive, it is not possible to move with neat precision to get all the water out of the tariff structure in a preliminary step. One would have to estimate (or guess) the amount of water in each specific prohibitive tariff and try to eliminate this at the outset.

In practice, the tariff might be reduced from 500 percent to 120 percent or 140 percent at the preliminary stage, and from there lowered with the rest through successive stages of liberalization. Another way would be to make a rough judgment covering the whole set of goods subject to liberalization, and simply legislate that within this entire set of goods any tariff over some limit—say 100 percent—would at the outset be reduced to 100 percent, and thenceforward would be subject to the same dispositions as the rest of the tariffs to which the liberalization process was being applied.

Liberalization of Quantitative Restrictions. Special problems are also posed by outright import prohibitions, quotas, and other arrangements (like licensing) that restrict imports by operating directly on their quantity rather than working (as tariffs do) through their price. The broad rule to follow in these cases is to convert the quantity distortion (prohibition, quota, or licensing arrangement) into a tariff, and then, as in the cases just discussed, treat the commodity in question by following the same rules that apply to the rest of the imports being liberalized.
There are circumstances, however, in which one might deviate from a strict and immediate application of this broad rule. Where quantity distortions are in place for transitory reasons, little purpose will be served by trying to convert them to tariffs as part of the liberalization process. In such cases, it may be wiser to increase the quotas (or licensed amounts) in regular steps until the point is reached where the quantitative restriction is no longer effective. In this way, one may guard against the possibility—if the liberalization process is cut short before reaching its goal—of converting a transitory quota or licensing scheme into an institutionalized tariff regime with greater apparent legitimacy and staying power.

Another way is to increase quotas or licensing limits in the early steps of liberalization, and to convert the quantity distortion into a tariff in the later steps. This might be motivated by the relative difficulty of guessing at the tariff equivalent of a very restrictive quota. Of course, we presume that the tariff equivalent would become easier to determine with the progressive relaxation of the quantitative restriction. Among other things, an open internal market is more likely to emerge in which the restricted item is bought and sold as the amount of permitted imports is increased (the presumption being that in the cases of severe restriction, the beneficiaries of licenses or quotas are likely to be the direct users of the commodity in question). Of course, once such an open internal market exists, we can estimate the tariff equivalent of any prevailing set of quantitative restrictions simply by observing the difference between the internal price set and that prevailing in the world market.

1.03 Demand for imports and supply of exports

It is natural to be puzzled when economists talk of “the demand for imports” and “the supply of exports.” These are notions that we may initially accept without question, yet as we think further we recognize the problem: the imports of most countries cover a wide
range of commodities, most of which are very different from the rest; so do exports, though their range is usually somewhat narrower.

The problem does not arise at the casual conversation level; here it is usually enough to refer to the total dollar (or peso or rupee) value of imports or exports. The difficulty appears at the analytical level, where conceptual clarity must be maintained. To put it bluntly, if we are to avoid blunders and errors, we have to know what we are talking about.

The literature on international trade long ago incorporated a standard solution to the problem just posed. It is based on the so-called “small-country hypothesis” which builds upon the idea that a small country cannot influence world market prices. This is factually true in cases of goods imported by developing countries, and it is also broadly true of their exports.¹⁰

The small-country hypothesis enables us to speak unambiguously (at any point in time and space) of “a dollar’s worth” of a given import or export good. For Uganda, for instance, we might ask what is the free-on-board (f.o.b.) price of coffee, and then determine how much coffee, valued at that price, would sell for a dollar. This amount would be the unit for coffee exports. On the import side, we might ask what is the cost, insurance, and freight (c.i.f.) price of oil. The amount of oil, which at that price sold for a dollar, would be the unit of oil imports. The exercises that follow show how, once the units of different goods are defined as the “dollar’s worth,” it is possible to amalgamate the demands for different import goods into an overall demand curve for imports, and to similarly aggregate the supply curves for different export goods into an overall supply curve for exports.
Figure 1-1. Deriving the demand curve for imports

- **Wheat**
  - **Pesos per bushel**: 80
  - Quantity demanded (millions of bushels): 50, 100

- **Coffee**
  - **Pesos per pound**: 50
  - Quantity demanded (millions of pounds): 150, 200

- **Newsprint**
  - **Pesos per ton**: 8000
  - Quantity demanded (thousands of tons): 300, 600

- **Pesos per ¼ bushel**:
  - Quantity demanded (millions of units of ¼ bu each): 200, 400

- **Pesos per ½ lb.**
  - Quantity demanded (millions of units of ½ lbs. each): 100, 150

- **Pesos per 5 lbs.**: 20
  - Quantity demanded (millions of units of 5 lbs. each): 120, 240

Note: The world prices of wheat ($P_w$) are assumed to be $4 per bushel, coffee ($P_c$) at $1.25 per pound, and newsprint ($P_n$) at $400 per ton (2000 lbs).
Deriving demand curve for imports

Figure 1.1 shows, in the top panel, the demand curves for imports of wheat, coffee, and newsprint. The wheat is measured in bushels, the coffee in pounds, and the newsprint in tons. Obviously, no meaning can be attached to the summation of these three demand curves. In the lower panel, the three demand curves are transformed in such a way that the units on the horizontal axis in each case represent one dollar's worth of the commodity at the prevailing market prices (assumed to be $4 per bushel for wheat, $1.25 per pound for coffee, and $400 per ton for newsprint). Adding up these demand curves is conceptually meaningful under certain conditions.

The conditions are that these particular imports be free from restrictions and that the foreign exchange regime of the country be such that the same exchange rate applies to imports of all three goods. The first of these conditions ensures that each of the demand curves in the lower panel is in fact a demand curve for foreign exchange (say, dollars) arising out of imports of the good in question. The second condition ensures that the horizontal sum of the three demand curves is in fact a meaningful demand curve for foreign exchange to be used for imports of these three categories. This horizontal sum is shown as the solid curve in Figure 1.3.

When tariffs or other restrictions exist on the imports in question, the lateral sum of the demand curves in the lower panel of Figure 1.1 is no longer meaningful. Figure 1.2 illustrates the case where tariffs are imposed on two goods (coffee and newsprint). When a tariff exists, there is a difference between the demand curve for imports of the good on the one hand and the demand curve for foreign exchange arising out of those imports on the other. This is obvious; the money (local currency) that is collected by the government is not received by those who supply the dollars (foreign exchange).

In Figure 1.2, a convention is adopted of using a solid line to
Figure 1-2. Demand for Imports and for foreign exchange

**Wheat Imports**

- Price net of tariff and price gross of tariff do not differ because tariff - zero
- Net-of-tariff demand curve with quantity measured in units whose world price is $1

**Coffee Imports**

- Tariff = 100% of net price
- Net-of-tariff demand curve with quantity measured in units whose world price is $1

**Newsprint Imports**

- Tariff = 2000 pesos per ton

Note: The world prices of wheat ($P_W$) are assumed to be $4 per bushel, coffee ($P_C$) at $1.25 per pound, and newsprint ($P_N$) at $400 per ton (2000 lbs.). By convention, a solid line represents the fundamental demand curve for imports of a good and a dotted line represents the demand curve for foreign exchange arising out of those imports.
represent the fundamental demand curve for imports of a good
and of using a dotted line to represent the demand curve for
foreign exchange arising out of those imports. Because no tariff
is assumed on wheat, the solid and dotted curves coincide in this
case. For coffee, a 100-percent tariff (applied to the world price)
is assumed. Thus, the internal price is double the world price, and
the net-of-tariff (dotted) demand curve for the good has a height
only half that of the gross-of-tariff (solid) curve. For newsprint,
the tariff is assumed to be of a given amount (2,000 pesos) per
ton; in this case the dotted curve lies below the solid one by
precisely this amount.

The height of the dotted curves in the upper panel of Figure 1.2
represents that part of the price (of each successive unit of imports
of each good) that is effective as demand for foreign exchange to
buy that unit in the world market. It is thus from the dotted
curves that the demand curve for foreign exchange must be de-

erived. In the lower panel, the units of wheat, coffee, and news-
print are selected such that each of them represents one dollar’s
worth at world market prices. On the vertical axis, the prices are
expressed (per quarter bushel, per 4/5 lbs., and per 5 lbs.) net of
tariff and per dollar’s worth of each commodity. These lower-
panel demand curves can be added horizontally to yield the
demand curve for foreign exchange arising out of imports of the
three goods. When this is done, the result is the dotted curve in
Figure 1.3. Figure 1.3, with the analytical underpinnings leading
to it, shows how the demand curve for foreign exchange shifts
inward when tariffs are imposed.

Deriving supply curve for exports
Figure 1.4 does with the supply of exports and the supply of
foreign exchange what Figure 1.2 does with the demand for im-
ports and the demand for foreign exchange. We have carried both
the solid and the dotted curves into the lower panel, with the solid
curves being interpreted as representing the supply curve of
Figure 1-3. Demand curves for foreign exchange constructed from demand curves of different imports

Demand curve for foreign exchange with no tariffs

Demand curve for foreign exchange with tariffs at 100% on coffee imports and of 2000 pesos per ton on newsprint imports

Note: In constructing demand curves for foreign exchange, it is assumed $P_w = $4/bushel, $P_c = $1.25/lb, and $P_n = $400/ton (see Figures 1.2 and 1.3).

1. Based on Figure 1.1 (Panels d, e, f)
2. Based on Figure 1.2 (Panels d, e, f)
Figure 1-4. Demand for exports and for foreign exchange

**Palm oil exports**
- Supply curve as function of gross of tax price with export tax of 0.5 rupees per lb.

**Rubber exports**
- Supply curve as function of price received by exporter

**Tin exports**
- Supply curve as function of gross-of-tax price with export tax of 50%

**Note:** The world prices of palm oil are assumed to be $500/ton, rubber $0.50/lb., and tin $6/lb.
Figure 1-5. Supply curves of foreign exchange constructed from supply curves of different exports

Note. The world market prices of palm oil are assumed to be $500/ton rubber $0.50/lb., and tin $6/lb.
foreign exchange in the case where no restrictions on exports exist, and the dotted curves representing the supply of foreign exchange in the presence of a tax of 0.50 rupees per pound on rubber exports and a tax of 50 percent on the internal supply price of tin exports.11

Obviously, export taxes have the effect of reducing the quantity supplied at any given price, and of raising the price that buyers have to pay for any given quantity. This causes the dotted curves in Figure 1.4 to lie above and to the left of the solid ones.

**Import demand and export supply curves for analyzing trade restrictions**

In Figure 1.5, the curves of Figure 1.4 are summed to produce:

a. from the solid curves, the aggregate supply of foreign exchange stemming from the three export commodities in the case where there are no export taxes, and

b. from the dotted curves, the corresponding aggregate supply curve in the presence of the specified export taxes.

Figure 1.6 combines the results obtained up to this point. Case A shows how a tariff on imports causes the equilibrium quantity of both exports and imports to fall. Case B shows how a similar result is produced when an export tax is imposed. Case C shows how superimposing an export tax on an import tariff simply magnifies the resulting reduction in the equilibrium volume of trade.

In all the three cases, $E_0$ is the initial market exchange rate and $E_1$ is the equilibrium market rate in the presence of the tariff and/or export tax. We assume that the exchange rate is flexible (that is floating), and that monetary stability prevails (in the sense that the general level of prices and costs does not rise or fall).

Together with the new equilibrium value $E_1$ of the market exchange
Figure 1-6. Volume of trade reduced by both import and export taxes

A. A uniform import tariff
shifts the demand curve
for foreign exchange from
$D_m$ to $D'_m$

B. A uniform export tax
shifts the supply curve
of foreign exchange from
$S_X$ to $S'_X$

C. Both taxes together cause
a greater fall in both
imports and exports

Note: A flexible exchange rate and monetary stability are assumed.
rate, two other values, $E_\$\$ and $E_\$\$, are presented. To interpret these values clearly, it is convenient to assume that we are dealing with a general and uniform import tariff (in cases A and C) and with a general and uniform export tax (in cases B and C).\textsuperscript{12} We can then consider $E_\$\$ to be the gross-of-tax price of the dollar's worth (of imports or exports, as the case may be), and $E_\$\$ to be the net-of-tax price of the dollar's worth.

When, as in Case A, a general import tariff is imposed, resources are squeezed out of the production of exports via a fall in the exchange rate from $E_\$\$ to $E_\$\$. $E_\$\$, the new market exchange rate is equal to $E_\$\$, the net-of-tariff price of the dollar. The users of imports have to pay $E_\$\$ per dollar's worth; this price includes the market exchange rate $E_\$\$, plus the tariff.

In Case B we have a different juxtaposition of net and gross prices, but a similar final outcome (a fall in both import and export volumes). Here it is the export tax that operates as the prime mover in squeezing resources out of export industries. With less exports, foreign exchange becomes scarcer, forcing the market exchange rate higher as the demanders for imports bid against each other for the reduced supply of dollars.

Finally, in Case C we have a situation where the market exchange rate hardly moves. (It would be easy, by appropriately choosing the relative sizes of import and export taxes involved, to construct a case where it didn't move at all.) Here, the price paid by users of imports rises because of the import tariff (equal in the final equilibrium to the difference between $E_\$\$ and $E_\$\$), and the price received by exporters falls, mainly due to the export tax (equal to the difference between $E_\$\$ and $E_\$\$). Thus, once again, the demanders of imports have good reason to demand less, and the suppliers of exports have good reason to supply less. The result, as before, is a lower volume of both imports and exports.
Trade restrictions under fixed rates

The fundamental forces by which trade restrictions influence the volume of exports and imports are no different under a fixed exchange-rate system than they are under a flexible-rate regime (see Section 1.02). The mechanism by which these forces make themselves felt is, however, different, and (unfortunately) somewhat more difficult to explain.

The proper starting point is to appreciate how a fixed exchange-rate system functions. Under such a system, the central bank commits itself to buy and sell foreign exchange at the established parity. When a balance-of-payments surplus arises, the bank buys foreign exchange (dollars) by issuing new local currency (pesos). When a balance-of-payments deficit appears, the bank sells dollars, thus absorbing pesos and contracting the local-currency money supply.

An import tariff (by curtailing the demand for foreign exchange) will tend to produce a balance-of-payments surplus, while an export tax (by curtailing the supply of foreign exchange) will lead to a balance-of-payments deficit. In this way, an import tariff (under a fixed exchange rate) causes an expansion of the quantity of money, while an export tax causes a contraction.

The general level of prices and costs, thus, tends to rise as the consequence of a tariff and to fall as the result of an export tax. How far this process goes depends exclusively on the size of the taxes. The cases presented in Figures 1.7 and 1.8 have been made comparable to each other by creating a situation in which, in the presence of trade restrictions under study, the price paid by buyers of a dollar's worth of imports is 50 percent higher than the price received by sellers of a dollar's worth of exports. The comparability of all of these cases is assured by the fact that the initial demand curves for imports (D^o) and the initial supply curves of exports (S^o) are identical in all the four cases.
Let us suppose there were a flexible exchange rate together with monetary stability (as assumed in Figure 1.6). The end result, either of an import tariff of 50 percent or of an export tax of the same amount, would be for E (the price paid by importers for a dollar’s worth of imports) to rise from 10 to 12 pesos, and for E_o (the price received by exporters for a dollar’s worth of exports) to fall from 10 to 8 pesos.

**Import tariffs with fixed exchange rate**

With a fixed exchange rate, the ratio of E/E_o continues to move from 1.0 to 1.5 as a result either of a 50-percent import tariff or of a 50-percent export tax. But the way in which this move occurs differs from case to case.

Case A in Figure 1.7 deals with a 50-percent tax on imports. Exporters will continue to receive the official, fixed rate of 10 pesos per dollar; importers will pay 15 pesos (the 10-peso exchange rate plus the 50-percent tariff) per dollar’s worth of imports. The initial surplus in the balance of payments thus created will cause upward pressure on prices and costs. As this internal “inflation” works its way through the system, both the supply curve for exports and the demand curve for imports shift upward.\(^\text{13}\)

The process comes to an end when the balance of payments is once again in equilibrium. At that point the central bank no longer has to buy dollars; there is no further monetary expansion, no further rise in prices and costs. The point of new equilibrium is reached when the demand and supply curves are in the positions denoted by D'_m and S'_x. These positions reflect vertical upward shifts of both curves by 25 percent. In the process of reaching this new equilibrium, the money supply, money income, and the general level of prices and costs will all be 25 percent higher than in the initial position which generated D_m as the demand curve for imports and S_x as the supply curve of exports. Compared to the intersection

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An initial surplus in the balance-of-payments will cause upward pressure on prices and costs. As this internal “inflation” works its way through the system, both the supply curve for exports and the demand curve for imports shift upward. The process comes to an end when the balance-of-payments is once again in equilibrium.
Figure 1-7. Volume of trade reduced by both import and export duties

A. A 50% uniform tariff on imports causes monetary expansion; new equilibrium has $E_g = 15, E_n = 10$.

B. A 50% uniform export tax causes monetary contraction; new equilibrium has $E_g = 10, E_n = 6.67$.

Note: A fixed exchange rate of 10 pesos per dollar is assumed.
Figure 1-8. Import and export tax under fixed exchange rate

C. No monetary expansion or contraction caused by restrictions
Export tax = 25%
Import tariff = 20%

D. Net monetary expansion caused by restrictions
Export tax = 11.11%
Import tariff = 35%

Note: A fixed exchange rate of 100 pesos per dollar is assumed.
point of $D^*$ and $S^*$ at 12.5 pesos per dollar, the new position with $E_x$ at 15 pesos, and $E_e$ at 10 pesos, is just like the flexible exchange equilibrium, which yielded $E_x$ at 12 pesos and $E_e$ at 8 pesos compared to the intersection point of $D^*$ and $S^*$ at 10 pesos to the dollar.

**Export taxes with fixed exchange rate**

Case B in Figure 1.7 deals with a 50-percent uniform export tax. As previously indicated, the effect of an export tax is a deficit rather than a surplus in the balance of payments. The central bank ends up a net buyer of pesos as it sells dollars to cover this deficit. The money supply therefore shrinks, exerting a downward pressure on prices and costs. It is this downward pressure that produces a gradual shift of the demand curve for imports from $D^*$ to $D^*$ and of the supply curve of exports from $S^*$ to $S^*$. The deflationary pressure comes to a halt at the point where the balance-of-payments equilibrium is restored.

To visualize the process, recall that with a fixed exchange rate of 10 pesos to the dollar, the price paid by importers for a dollar's worth of imports will remain 10 pesos, while $E_e$ (the price received, net of export tax, for a dollar's worth of exports) will quickly move to 6.67 pesos once the tax is imposed. The demand and supply curves will only move gradually, however, in response to the monetary contraction caused by the balance-of-payments deficit. At the point where the general level of prices and costs has been reduced by one-sixth, exports and imports will again be equal at $M^1 = X^1$. The payments deficit will no longer exist, and there will no longer be pressures for further deflation of prices and costs. A new equilibrium will have been reached, identical in real terms to that which would have been produced had the same export tax been imposed under conditions of a flexible exchange rate with monetary stability.
Export tax together with import tariff

Figure 1.8 depicts two cases in which a general import tariff is imposed side by side with the general export tax. As indicated earlier, these examples are calibrated (that is, the rates of tariff and export tax are specifically chosen) so that the final effect is exactly equivalent to that of a 50-percent import tariff or a 50-percent export tax. In Case C we have an export tax of 25 percent and an import tariff of 20 percent, and in Case D we have an export tax of 11.11 percent and an import tariff of 35 percent. The combined effect is obtained by multiplication—thus, $1.25 \times 1.20 = 1.50$ and $1.11 \times 1.35 = 1.50$.

Case C was chosen specifically to show that, with both an import tariff and an export tax under a fixed exchange-rate system, neither “inflationary” nor “deflationary” pressures would be unleashed. What occurs in Case C is that when the export tax drives down the net price of a dollar’s worth of exports to 8 pesos, the cutback in exports obtained by moving along $S^o$, turns out to be precisely the same as the cutback in imports that occurs moving back along $D^o$ as a result of an import tariff of 20 percent (which raises $E$ to 12 pesos). Equilibrium in the balance of payments is present, as it were, right from the point where the taxes are imposed. There is no process of monetary adjustment, such as would be called into play if either a deficit or a surplus initially appeared.

Case D is different. Here the export tax of 11.11 percent has the effect of reducing the price received by exporters for a dollar’s worth of exports from 10 to 9 pesos. The effect of this impact is a relatively modest reduction of exports along the solid curve $S^o$. The import tariff of 35 percent, however, has a big impact effect; it produces a large movement backward along the solid demand curve $D^o$. Thus, a balance-of-payments surplus is created, which causes the central bank to expand the money supply, and produces a rise in the general level of prices and costs, shifting upward both the supply curve of exports and the demand curve of imports. As
this happens, the quantity of imports at a price of 13.5 pesos per dollar's worth expands, and the quantity of exports at a price of 9 pesos per dollar's worth contracts. Finally, a point is reached when the two are equal. This point is $M^* = X^*$ and it is characterized by the ordinate of $D^*$ being 13.5 pesos while the ordinate of $S^*$ is 9 pesos, precisely at this quantity of exports and imports. This combination of imports being equal to exports, and at the same time $E^*$ being 50 percent higher than $E_0$, is what tells us that the situation is one of equilibrium.

Note that in Case D, the dotted curves $S^*$ and $D^*$ intersect at a quantity level of $M^* = X^*$ and at a price of 11.25 pesos to the dollar. Note, too, that taking 11.25 pesos as the reference price, the equilibrium of Case D exactly replicates the equilibrium of cases A, B, and C. Note that for Case C $E^*_0$ is 1.2 times the reference price of 10 pesos, and $E^*$ is 0.8 times this reference price. In Case D, similarly, we have $E^*_0 = 13.5$ pesos ($= 1.2 \times 11.25$ pesos), and $E^* = 9$ pesos ($= 0.8 \times 11.25$ pesos).

Changes in real exchange rate when nominal rate is fixed

The preceding exercises reveal that the mere fact the nominal exchange rate is fixed at, say, 10 pesos to the dollar does not in any way impede the process by which the economy adjusts to a new equilibrium in the presence of new tariffs, export taxes, or other trade restrictions. Even though the nominal rate is fixed, the real rate changes.

The most important single message of this chapter is that all trade restrictions work as disincentives to exports; it is, therefore, useful to focus on the real exchange rate facing exporters in the examples that have been cited. The cases dealt with in Figure 1.6 are easy to discuss because the underlying hypothesis is that monetary stability is maintained, in the sense that the general index of prices and costs $P_0$ is held constant. Thus, the real exchange rate facing exporters...
(E/Pd) will in this case move directly with E. In Figure 1.6, E goes down in all three cases—a general import tariff, a uniform export tax, and a combination of the two.

The fixed exchange-rate cases dealt with in Figures 1.7 and 1.8 are more interesting because the general price level Pd is not held constant. On the contrary, movements in Pd play a critical role in the adjustment process under fixed exchange rates. The real exchange rate facing exporters is E/Pd. Movements in E can be read directly off the graphs in Figures 1.7 and 1.8. Movements in Pd are implicit in the shifts taking place between the solid curves D°m and S°, and the corresponding dotted curves in each case. This can be read directly off the ordinates of the two curves at the quantity level M1 = X1.

In Case A, the dotted curves have ordinates of 15 (D°) and 10 (S°) compared with 12 and 8 pesos per dollar for the solid ones. Hence Pd has risen by 25 percent. In Case B the ordinates of the dotted curves are 10 and 6.67 pesos per dollar, again compared with 12 and 8. Here Pd has fallen by one-sixth. In Case C, Pd does not change; in Case D, it rises by 12.5 percent as the ordinate of the supply curve of exports shifts upward from 8 to 9 pesos per dollar at M1 = X1, while that of the demand curve of imports shifts upward from 12 to 13.5 pesos per dollar.

If we take 100 as the initial index level of Pd, we have E/Pd moving from 10/100 (in all cases) to 10/125 in Case A, to 6.67/83.3 in Case B, to 8/100 in Case C, and to 9/112.5 in Case D. Because (10/125) = (6.67/83.3) = (8/100) = (9/112.5), the fall in the real exchange rate facing exporters is the same in all four cases. This fall measures the disincentive to exports involved in each of the four tariff/export tax packages being examined.
Figure 1-9. Import demand with domestic production of the importable good

- Relative price of wheat ($P_w/P_d$)
- Domestic supply of wheat
- Hypothetical tariff $T_w$
- Increase of domestic supply in response to imposition of $T_w$
- Reduction of domestic demand in response to imposition of $T_w$
- Demand curve for wheat imports
- Demand for wheat imports (dollar's worth)

- Domestic demand and supply of wheat (dollar's worth)
Figure 1-10. Export supply with domestic consumption of the exportable good

- Relative price of cotton ($P_c/P_d$)
- Hypothetical export tax $T_c$
- Domestic demand for cotton
- Revenues from $T_c$
- Domestic supply of cotton
- Increase of domestic demand in response to imposition of $T_c$
- Reduction of domestic supply in response to imposition of $T_c$
- Supply curve for cotton exports
- Domestic demand and supply of cotton (dollar's worth)
- Supply of cotton exports (dollar's worth)
The exercises in Section 1.04 should convince us of the convenience of thinking in terms of *relative* rather than *absolute* prices. In this section, we introduce demand curves for imports and supply curves of exports defined in this way, and at the same time set forth the concepts of importables and exportables. These concepts take into account the fact that often there is domestic production, either of commodities that are identical to imported goods, or of close substitutes for imported goods; and invariably there is at least some domestic consumption of, or other use for, locally produced items of the types that are also exported. The analysis of tariffs, export taxes, and other trade restrictions in terms solely of the demand for imports and the supply of exports tends to gloss over the facts just mentioned. These facts are explicitly taken into account when, as is done in this section, the demand for imports is looked upon as an "excess demand" and the supply of exports as an "excess supply."

Figure 1.9 features import demand with the domestic production of the importable good, and Figure 1.10 shows export supply with the domestic consumption of the importable good. In the first place, the price axis in each case is measured in units of relative price—that is, the price of the good in question (such as wheat in Figure 1.9 and cotton in Figure 1.10)—deflated by the general level of prices and costs $P_e$. In the second place, the graphs show how the demand for imports and the supply of exports are derived from the underlying demand and supply functions for importables in one case and exportables in the other. Figure 1.9 shows how, at the price where the domestic supply and demand for importables are equal, the demand for imports is zero. At a lower price, the demand for importables is 850 and the supply is 300; the demand for imports is 550. At a still lower price, the supply of importables becomes zero. At and below this price, the demand curve for imports and the demand curve for importables are the same.

To see what happens when an import tariff is imposed, consider the
case of a hypothetical tariff $T$. Without the tariff, domestic output of wheat is zero and the quantity of imports is 925. When the tariff is imposed, the quantity of imports is reduced to 550 (see right hand graph in Figure 1.9). This reduction of imports reflects two component forces (shown in the left hand graph). First, there is an increase in domestic supply from zero to 300. Second, there is a reduction in domestic demand from 925 to 850. Together, these two add up to 375 (925 minus 550), which constitutes the total reduction in imports. Whenever there is domestic production of the importable good, movements along the demand curve for imports will simultaneously reflect movements along both the domestic demand and the domestic supply curves of the product in question.

In Figure 1.10, the supply of exports is zero at the price for which domestic demand for cotton equals domestic supply. As the price rises from that point, the export supply curve shows the excess of domestic supply over domestic demand. Thus, at the price for which domestic supply is 550 and domestic demand is 300, export supply is 250. When at the higher price for which domestic supply is 850 and domestic demand is 200, export supply is equal once again to their difference—this time 650.

A tax on exports will cause a reduction in export quantity that in turn will reflect changes in both domestic demand and domestic supply. In Figure 1.10, the export tax $T$ causes a reduction in the domestic supply of cotton from 850 to 550, and an increase in domestic demand (because the internal relative price of cotton has fallen) from 200 to 300. The total reduction in exports of 400 (650 minus 250) reflects both of these effects.

### Process of trade liberalization

Early in the paper we saw that tariffs and other import restrictions, by operating to restrict the demand for foreign exchange, tend to reduce the equilibrium exchange rate. That analysis was conducted
under conditions of a flexible exchange-rate system and a stable monetary policy. We subsequently found that even when the exchange rate is fixed, a similar set of adjustments occur. However, to see the similarity, we must focus on the real exchange rate. Indeed, the real exchange rate turns out to be the handmaiden of trade policy; it falls when import restrictions are imposed and rises when these restrictions are relaxed or eliminated.

In the literature on international trade, it is a habit to emphasize how restrictions on imports ultimately have the effect of curtailing exports as well. The lesson here is that such restrictions end up curtailing international trade—both imports and exports.

While the effect of import tariffs and other restrictions in reducing exports has been emphasized, less attention has been paid to the way in which restrictions on some imports affect other import-competing activities. The fact is that any one import restriction operates to curtail the domestic production of all tradable goods, other than the particular one being restricted. This result is produced through the effect of any import restriction in reducing the real exchange rate. The nominal price of a dollar's worth of an importable good \( j \) is the nominal exchange rate \( E \) augmented by the tariff rate \( t \); the relative price is therefore \( E(1+t)/P_d \), where \( P_d \) is a general index of domestic prices and costs. But this is simply the real exchange rate \( E/P_d \) augmented by the tariff rate \( t \) on the particular tradable good in question.

Thus, the act of imposing a new restriction on, say, textiles has the effect of stimulating the domestic production of substitutes for that particular tradable good, and of creating a disincentive to the domestic production of all other tradables, both export goods and substitutes for imports. The channel through which this disincentive works is the real exchange rate, which will tend to fall as a consequence of any import restriction.
Stimulating effects of trade liberalization

Just as the imposition of any new restriction on imports (or the increase of an old restriction) creates a disincentive to the production of all other tradable goods, so the elimination or reduction of any restriction acts as a stimulus to the production of all tradables other than the one (or ones) on which the restrictions are being loosened. Thus, trade liberalization does not bring bad news to domestic producers generally; in fact, it brings good news to the great bulk of them. Production disincentives appear in the process of liberalization only for those items from which protection is being lifted; the rest of tradables receive a production stimulus through the effect of liberalization on the real exchange rate. And it is not just export-oriented activities that are helped by liberalization; there is a generalized exchange-rate effect which extends to all tradables and which is offset or outweighed only in cases of the specific items being liberalized.

General and partial liberalization

There is little scope for doubt as to whether a liberalization process should ideally be general or partial. Trade restrictions, almost without exception, distort the allocation of resources and introduce inefficiencies into the organization of production in the economy. If a program is to be decided on for eliminating or reducing these distortions and inefficiencies, there are many reasons why it should be as general as possible.

One of the most convincing reasons builds on the idea that in the end a generalized liberalization is expected. The question is whether the liberalization should be attempted in a series—commodity by commodity or group by group—or by working on a very broad front and liberalizing simultaneously the restrictions affecting many commodities or groups. The argument for a general approach is to avoid giving signals at one stage of the process that contradict those given at another stage. It makes little sense to emit signals to attract resources to an activity or set of activities, only to later give out signals to drive those same resources away.
The broad message of a liberalization program is that resources that have been occupied in artificially protected activities should be relocated elsewhere. A general process of liberalization would send signals to expel resources from a wide band of protected activities, and to simultaneously attract these resources (through the effect of liberalization on the real exchange rate) to other sectors engaged in the production of tradables. Such a process is likely to occur gradually over a period of time, especially where the initial degree of protection was high. At the same time, it may strike simultaneously all sectors to be liberalized. The issue of gradualism then becomes one of spreading out over time the lowering of rates, not one of striking a limited group of goods at any one time, followed by successively striking other limited groups at later times.

**Gradualism in liberalization efforts**

The arguments for gradualism are strong. Gradual liberalization limits the size of the shocks that at any one time strike the resources that have to be reallocated; it extends the time frame of the adjustment process; it permits more of the adjustment to be borne through simple ongoing mechanisms, such as the normal depreciation of capital equipment and the continual process of labor force turnover that characterizes most economic activities. If thought of in these terms, gradualism is a good thing.

On the other side, there are two arguments. First, we must recognize that to the extent high protective barriers stand for (and indeed help to cause) economic inefficiency, gradualism will slow the process by which those barriers are reduced or eliminated, and the basic inefficiency will prevail longer. Second, there is an argument whose underpinnings are more of political economy than of technical economics. This concerns the capacity of the affected sectors, whose protection is being taken away or reduced, to organize resistance to, or mount a political counterattack against, the liberalization process itself. The longer and more drawn out the process is, the more likely it is that at one point or another a campaign of resistance will take root.
Economic science gives us no formula by which to weigh the costs and the benefits associated with each degree of gradualism. The wisdom and experience of those who have been involved in such processes suggest that three years is a "short" span for a thorough liberalization, while ten years is a "long" span. Under a three-year liberalization, the dominant element is the dislocation costs of displaced resources. These costs are fairly large and, therefore, an argument can be made for a more extended process. Under a ten-year program the very slowness of the process is its liability. On the side of the strict economics of resource displacement, it has been likened to "cutting off a dog's tail one inch at a time." On the side of political economy, gradualism gives maximum scope to those who would mobilize to maintain the status quo ante. Thus, the accepted wisdom would seek a term of liberalization of perhaps five to seven years, depending on the severity of the restrictions to be reduced, the degree of reduction to be implemented, and the magnitude of the resource-reallocation costs that might be involved.

The final word concerning liberalization should, however, emphasize its merits. We began this chapter by recounting the dramatic successes that many countries have achieved by enhancing their economic links to the world economy. There is little reason to doubt that future efforts in this direction will produce a record of performance as distinguished and impressive as those of the past.

Notes

1. Because the U.S. dollar is the most widely used medium for transactions in the world, we use it as the representative foreign exchange unit. The particular foreign currency chosen for this role has no special meaning so long as convertibility prevails, as, in fact, it does among the major currencies transacted in the international marketplace. When reference is made to a hypothetical currency of a developing country, units will be taken as pesos or rupees.
2. I have left out discussion concerning the concept of “effective protection” and its implications for economic policy. These matters are discussed in Chapter 2, Section 2.04.

3. When more than one effective rate appears for exporters, the explanation is usually to be found in a distinction between traditional and nontraditional exports, or perhaps even more often between one or two principal traditional exports (oil, coffee, groundnuts, rubber, etcetera depending on the country) and the great bulk of other exports. In such cases, the key issue is: in which category is the volume of exports most likely to adjust in response to changes in economic policy? Much of the time, principal or traditional exports are subject to special treatment because they are quite inelastic in supply, or because their quantity is otherwise constrained (for instance, by international commodity agreements). When this is so, it is reasonable to take as the benchmark the exchange rate applicable to the remaining exports (that is, those not subject to special treatment). Rarely, if ever, should exports subject to subsidy be treated as a benchmark category, because these are going to be limited to a relatively small subset of total exports since subsidy funds are subject to fiscal constraints.

4. The bias in favor of import restrictions has a very long history. It was embedded in our collective consciousness centuries ago, when customs receipts were a major source of government finance. It was sanctified by mercantilist thought, and has received constant sustenance in modern times from the pressures reflecting short-run balance-of-payments disequilibria.

5. In this analysis, for simplicity’s sake, we assume that the government spends the revenues from the import tariff in a pattern similar to the way the public itself would, had the money remained in its hands. In technical terms, we assume that the demand functions for imports, exports, and nontradables do not change as purchasing power is shifted from the public to the government, or vice versa.
6. Without a tariff, the total demand for importables might have been 100, with 60 of this demand being filled by imports and 40 by locally produced import substitutes. With the rise in price occasioned by the tariff, the total demand for importables might fall to 80, and local supply increase to 50, leaving a demand for imports equal to only 30.

7. Once again we must remind ourselves that this analysis concerns the long-run or permanent effects of trade restrictions. We do not conceive of the starting point as a disequilibrium situation with a huge pool of involuntary unemployment. Instead, we ask how the economic structure of an economy in 1990 or 1995 will differ, if it today moves toward greater protectionism, versus what it would be like under freer or more liberalized trade. The use in the text of terms like “initial” response and “ultimate” effects should not be interpreted as denying this basic approach. Rather, it is an expository device aimed at helping you to perceive the underlying mechanism more clearly.

8. Economic principles do not dictate that under a flexible exchange rate with a stable general price level, prices of exportables must go down by the same percentage as prices of importables go up. Nor do they require that prices of nontradables remain unchanged. What is required is that the equilibrium that is reached be established in real terms, and that this real equilibrium be no different under a fixed exchange-rate regime than under a flexible one.

9. Detailed issues concerning the choice of the deflating index \( P_d \) are presented in Chapter 3, Sections 3.05 and 3.06. For present purposes, let me simply note that whichever index is chosen—be it the GDP deflator, the consumer price index, a general index of prices of nontradables, or a general index of nominal wages—a given set of trade restrictions will imply a specific percentage fall in the real exchange rate, defined by using that specification.

10. The main exceptions are countries that account for a rather large share of the total world supply of a product. Examples are
Brazil with coffee, Malaysia with natural rubber or tin, Zaire or Chile with copper. The theory can be adapted to take care of these situations, as well as those of more minor export commodities for which a country might face a downward-sloping demand curve for reasons of product differentiation (for example, a country's exports of, say, wine, might face a downward-sloping world market demand curve not because the country is extremely important in the market, but because its wines are not homogeneous with the rest. Algeria, Argentina, Greece, Italy, and Spain are cases in point for wines.)

11. The example is roughly modeled on Malaysia, but I have used rupees to avoid implying, even slightly, that the particular policies being analyzed are in any way related to the Malaysian practice.

12. The results up to this point (concerning how the volume of imports and exports respond to tariffs and export taxes) in no way depend on the uniformity of either tax. It is convenient to assume general and uniform rates to be able to speak of a specific price paid for a dollar's worth of all imports and of a different specific price received by exporters for a dollar's worth of all exports.

13. "Inflation" is placed in quotation marks because of a simple once-and-for-all upward adjustment in prices to produce a balance-of-payments equilibrium in the face of a newly imposed import tariff. A genuine inflation is a continuing process with an underlying cause (such as a large fiscal deficit financed by printing new money) that will keep on raising prices period after period until it is corrected. The adjustment of prices following the imposition of a tariff in a fixed exchange-rate setting is not an inflation in this sense.

14. The intersection point of the dotted curves is at 8.33 pesos, one-sixth less than the 10 peso intersection of the solid curves; at $M' = X'$, the height of $D'$, is 10 pesos, one-sixth less than the height of $D^*$ at 12 pesos; similarly, at $M' = X'$ the height of $S'$ at 6.67 pesos is one-sixth less than the height of $S^*$ at 8 pesos.
Issues of tariff policy

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In this chapter, we are mainly concerned with the effects of tariff policy on the particular activities on which the tariff impinges directly—namely, the consumption of the tariffed product, the production and consumption of its domestic substitutes, the processing of imported raw materials and semifinished goods in the domestic manufacture of protected products, and so forth. The larger, more macroeconomic issues—of how policies of protectionism affect the real exchange rate, of the interconnections between import taxes and quantitative controls on the one hand and export taxes and controls on the other, and of the principles to follow in designing a strategy on general trade liberalization—were dealt with in Chapter 1.

2.01 Elementary analysis of tariffs

We begin with a straightforward application of simple supply and demand analysis to a tariff situation. Figure 2.1 shows how the tariff works to reduce the domestic demand and to increase the domestic supply of the protected product (wheat in this case). It also presents measures of what the demanders of the product lose and what its domestic suppliers gain as a result of the tariff.

Demanders lose the amount of the rise in price caused by the tariff times the quantity of the protected good ($Q^d_1$) which they continue to consume after the tariff is in effect. They lose something by way of reduction ($Q^d_{o} - Q^d_1$) that takes place in their demand because of tariff-induced price increases. This loss is measured by how much demanders would be willing to pay for each unit between $Q^d_{o}$ and $Q^d_1$, minus the price that they actually would have to pay in the absence of the tariff.

Domestic suppliers of wheat gain the full increase in the domestic price of the commodity that comes as a result of the tariff on the amount $Q^d_{o}$ that they would be producing anyway—even without
Figure 2-1. Effects of tariff on demanders and suppliers of protected product (wheat)

A

Relative price of wheat ($P_w/P_d$)

Domestic demand for wheat

Tariff on wheat $T_w$

Price with tariff

Price without tariff

Loss to demanders

Reduction of domestic demand caused by $T_w$

Quantity of wheat $Q_{d_0}$ $Q_{d_1}$

B

Relative price of wheat ($P_w/P_d$)

Domestic supply of wheat

Gain to suppliers

Increase of domestic supply caused by $T_w$

Quantity of wheat $Q_{s_0}$ $Q_{s_1}$
the tariff. With the increase in supply \( (Q'_1 - Q'_0) \) induced by the tariff, suppliers gain the excess of the price with tariff over their respective supply price (that is, the price that would just barely elicit that unit of supply) for each unit.

For visual reference, the losses of the demanders are shaded with lines drawn parallel to the domestic demand curve, while the gains of suppliers are shaded with lines drawn parallel to the domestic supply curve. It should be obvious from Figure 2.1 that the tariff on imports of wheat affects demanders in the same way as would a tax on the domestic consumption of wheat, while it affects the suppliers of wheat in the same way as would a subsidy on the domestic production of wheat.

Thus, a tariff on a commodity is equivalent to a tax on the domestic consumption (or purchase or use) of that commodity combined with a subsidy to the domestic production (or sale or delivery) of the same commodity. This is a very fundamental proposition in the economics of tariffs and it deserves to be underscored and remembered. In it we may find important clues to why the most convinced opponents of tariffs as an instrument of policy tend to be those who have studied them most thoroughly.

Consider, for example, the case where the policy objective is to stimulate the domestic production of the commodity in question. This might argue in favor of a subsidy to production, but it does not argue that all the subsidy should be financed by the domestic consumers of the favored commodity. Why would we want to stimulate production and at the same time curtail domestic use of a product? Why would we want to cause the very users of that product to bear costs that in total exceed the benefits that its producers perceive? In general, when a case exists that would, perhaps, justify the subsidization of a productive activity, it does not come side-by-side with a parallel case for taxing those who con-
Figure 2-2. Effects of tariff on demand for imports of protected product (wheat)

A

Relative price of wheat

($P_w/P_d$)

Demanders lose, suppliers gain

Demand for imports of wheat

Tariff on wheat $T_w$

Price without tariff

Price with tariff

Government revenue $A + B$

Increase of domestic supply caused by $T_w$

Reduction of domestic demand caused by $T_w$

Imports with $T_w$

Imports without $T_w$

Imports of wheat

Imports with $T_w$

Imports without $T_w$

B

Relative price of wheat

($P_w/P_d$)
sume that activity's output.

Now consider a situation where the policy objective is to raise revenue. This may provide a basis for taxing a particular set of commodities, but it is highly implausible that there would simultaneously exist reasons to use a good share of that revenue to subsidize by a like percentage (or amount) the local production of the very commodities being taxed. This is even more true in the case where one motive for taxing the commodities is the desire to limit or deter their use (as in the cases of alcoholic beverages and tobacco products). Creating incentives to expand local production seems totally out of focus under such circumstances.

In Figure 2.2, the effects on domestic demand and on domestic supply of the tariffed commodity are shown together (see Graph A). We can see how a part (but not all) of the cost borne by the demanders is translated into a gain for the suppliers. Another part—the area labeled “government revenue”—ends up as tariff receipts in the public treasury.

Special attention should be paid to the two remaining parts—the triangles labeled A and B—of the total loss experienced by demanders. Together, they measure the economic inefficiency (sometimes called “efficiency cost” or “welfare cost”) brought about by the tariff. Special terms have been used in the literature of international economics to distinguish between these two triangles. Triangle A is called the “production cost” (sometimes “producer cost”) of the tariff; triangle B is labeled the “consumption cost” (sometimes “consumer cost”) of the tariff. The reasoning behind the use of these labels is easy to see. If there were only a subsidy to production, equal to $T_w$ per unit, the quantity produced would rise from $Q^*_o$ to $Q^*_1$, but the quantity demanded would remain at $Q^*_o$. The government's outlays on the subsidy would equal $T_w$ times $Q^*_1$, and the trapezoid now labeled “demanders lose, suppliers...
gain" would have to be relabeled "cost to government, gain to suppliers." But the total outlays on the subsidy would include triangle A in addition to the trapezoid. This triangle would thus be a cost to the government not counterbalanced by a gain to suppliers. It would measure the loss of economic efficiency entailed in "artificially" stimulating the expansion of production from $Q_0'$ to $Q_1'$.

Just as triangle A is the efficiency cost that would be generated by a subsidy of $T_w$ per unit to the domestic production of the good in question, so triangle B is the efficiency cost that would be generated by a tax of $T_w$ in its domestic consumption. The tax would drive up the price faced by consumers, but would leave the price received by producers at the level determined by the world market (in this case, the world market for wheat). Domestic production would stay at $Q_o'$, but domestic demand would fall to $Q_d'$. Consumers would lose the full "loss of demanders" that is shaded in Figure 2.1, but government receipts from the tax would only be $T_w$ times $Q_d'$. Thus, the loss perceived by demanders would exceed the tax revenue of the government by an amount equal to triangle B (in Graph A).

The efficiency cost of a tariff ($T_w$) can be broken down into a production cost (which is what would result from a subsidy of $T_w$ per unit to domestic production) and a consumption cost (which is what would result from a tax of $T_w$ per unit on domestic consumption or demand). The equivalence of the tariff to a consumption tax plus a production subsidy, thus, carries through to the measurement of its economic costs. The efficiency cost of a tariff is the sum of the separately identifiable costs of a production subsidy and a consumption tax of like amount on the product in question.

Figure 2.2 shows how the analysis of the effects of a tariff can be done using the demand curve for imports rather than distinguishing separable effects of movements along the domestic supply and the
domestic demand curves for the product. The demand curve for imports of a product that is also produced within the importing country is the "excess demand curve" obtained by subtracting, at each price, the quantity of domestic supply from the quantity of domestic demand. Thus, we have a zero demand for imports (in Graph B) at the price at which the domestic supply is fully sufficient to meet domestic demand (in Graph A). Similarly, at what is labeled the "price with tariff," the difference, \( Q^d_1 \) minus \( Q^d_1 \) is reflected (in Graph B) as the amount \( M^d_1 \), while at the "price without tariff" the difference, \( Q^d_1 \) minus \( Q^d_1 \), is reflected as \( M^d_1 \). The rectangle representing government revenue from the tariff has the same base and the same altitude in Graph A as in Graph B in Figure 2.2. Triangles A and B in Graph A likewise have their counterpart in a single larger triangle (A+B) whose base is equal to \( M^d_1 \) minus \( M^d_1 \), and is necessarily the same as the sum of the bases of the separate triangles A and B. It is, therefore, possible to carry out analyses of the effects of tariffs by working with demand functions for imports, even in cases where there is domestic production of the tariffed good, and where movements in that production are an important part of the total effect of the tariff.

2.02 Tariffs in macroeconomic setting

In this section we take a brief look at the way tariffs fit into the macroeconomic setting of a country. The main conclusion drawn from this exercise is the insight that any policy of restricting imports, whether by tariffs or by other devices, will end up by also constraining exports below what would otherwise be their normal level. Restrictions on imports do indeed merit the label of "trade restrictions," for their end result is a reduction of the overall volume of trade, imports and exports alike. This proposition is demonstrated in the pages that follow.

Figure 2.3 depicts the demand for imports and the supply of exports as a function of the domestic prices of each of them—that is, rela-
Figure 2-3. Demand for imports and supply of exports as function of domestic prices

| Domestic price paid for one dollar's worth of imports, or received for one dollar's worth of exports (in pesos) |

Exports \( (X) \) and imports \( (M) \) (in dollars)

- Import demand
- Export supply

\[ \Sigma X_i(P_X) \]
\[ \Sigma M_j(P_m) \]

Equations:

\[ X = M, X_0 = M_0 \]
it falls to 8 pesos as a consequence of the imposition of a uniform 50-percent tariff on all imports. Hence, the tariff causes the market exchange rate to fall from 10 to 8 pesos per dollar. The price paid by domestic residents for imports and import substitutes rises to 12 pesos per dollar. A wedge, or a gap, is created between the amount that exporters get (8 pesos) for producing a dollar and the amount that import-substituters get (12 pesos) for saving a dollar of import. This wedge reflects the percentage rate of tariff (here 50 percent).

The consequence of all of this is a reduction in the volume of trade to $M_1 = X_1$. Exports fall because the price received for them (per dollar's worth) has fallen from 10 to 8 pesos. Imports fall because demand declines as a consequence of a rise in import price from 10 to 12 pesos per dollar's worth.

The above argument is built on the assumption that the country's monetary and fiscal policy is so regulated as to keep the general price level approximately constant. (In technical terms, the numeraire in Figure 2.3 is the general price level of the country.)

When, however, the exchange rate of the peso is fixed to the dollar, a different mechanism comes into play. Now, it is the prices of exportables that stay fixed, while those of importables again rise by 50 percent relative to those of exportables (this is virtually preordained by a 50-percent tariff). The monetary consequences of a tariff under a fixed exchange-rate policy cause a rise in the price level of nontradables (see Section 1.04, and in particular Graph A in Figure 1.7). In the end, the same real equilibrium is achieved under fixed exchange rates as under flexible rates. Import restrictions reduce trade, and curtail the incentive to export in the same way under either type of nominal exchange-rate policy.

The most important practical point is that the imposition of a tariff will result in a reduction in both imports and exports, and by the same amount, regardless of whether the country pursues a flexible or a fixed exchange-rate policy.
I introduce the concept of domestic resource cost working on the assumption that there are no imported inputs into the productive processes being discussed. This is clearly a simple assumption, which permits us to treat the problem of measuring the domestic resource cost of foreign exchange in a straightforward manner. Later, when the concept of effective protection is discussed, this assumption will be withdrawn.

Refer again to Figure 2.3. You will see that the real exchange rate facing exporters falls by 20 percent. In the new equilibrium (that is, after the imposition of a 50-percent across-the-board tariff), exporters will receive 8 pesos for every dollar’s worth of exports sold. Thus, they will be willing to incur costs of up to 8 pesos per dollar of exports.

On the side of imports, however, the local-currency price rises to 12 pesos per dollar’s worth. Producers of import substitutes will be willing to incur costs of up to 12 pesos per unit. Therefore, the domestic resource cost of saving a dollar via import substitution can rise as high as 12 pesos, while the domestic resource cost of producing a dollar via additional exports will be at or below 8 pesos.

You need to be aware that the precise way in which the result worked out in Figure 2.3, with the local price of importables rising from 10 to 12 pesos (per dollar’s worth), and that of exportables falling from 10 to 8 pesos, is not part of the necessary outcome. Depending on the elasticities of the two curves, it might work out that export prices fall only from 10 to 9 pesos per dollar’s worth, while those of imports and import substitutes rise from 10 to 13 1/2 pesos. Alternatively, at another extreme, prices of exportables might fall from 10 to 7, while those of importables might rise only from 10 to 10 1/2 pesos per dollar’s worth. These cases are illustrated in the two graphs in Figure 2.4 (see page 111).
Both these cases are characterized by relative prices of exportables and importables (per dollar's worth) being the same in the initial equilibrium \((X_e = M_e)\), and by prices of importables being 50 percent higher (per dollar's worth) in the new equilibrium \((X_i = M_i)\) after the 50-percent tariff is imposed. (Thus, \(1.5 \times 9 = 13.5; 1.5 \times 7 = 10.5\), just as, in Figure 2.3, \(1.5 \times 8 = 12\).) Relative elasticities determine the precise effect of a 50-percent uniform tariff on the real exchange rate, but it always ends up that the domestic price level of a dollar's worth of imports is 50 percent higher than that of a dollar's worth of exports.

When there are different tariffs on different imports, and subsidies or taxes on particular exports, the domestic resource cost will differ among these groups. Table 2.1 presents a case of this type.

Here we have three separate categories for both imports and exports. The example is calibrated to be similar to Figure 2.1. If \(M_1, M_2,\) and \(M_3\) are of equal importance in the presence of newly introduced distortions, the average tariff on imports will be 50 percent (which was assumed as the uniform tariff in Figure 2.3). Likewise, if the three export categories end up having equal weight, the average subsidy on exports will be zero. Thus, it is plausible to assume that the net effect on the real exchange rate will also be similar. All of this is built into Column 3 of Table 2.1. The average domestic price per dollar's worth of imports is 12 pesos; that of a dollar's worth of exports is 8 pesos. However, we have domestic prices as high as 16 pesos per dollar's worth on the import side \((M_i)\), and as low as 6 pesos per dollar's worth on the export side. This means that in the process of generating import substitutes for \(M_i\), producers will be willing to incur domestic resource costs of up to 16 pesos to save a dollar, while in the process of generating exports of \(X_i\), producers will be using only up to 6 pesos of domestic resources to produce a dollar. The contrasts among the domestic resource costs of producing dollars (via exports) and of saving dollars (via import substitution) can become vastly more acute under differentiated treatment.
Table 2.1. Domestic resource costs of producing and saving a dollar with differential tax or subsidy treatment of different imports and exports

<table>
<thead>
<tr>
<th></th>
<th>Domestic price per dollar's worth</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tariff rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foodstuffs ($M_1$)</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Clothing ($M_2$)</td>
<td>50</td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Durable goods ($M_3$)</td>
<td>100</td>
<td>10</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Domestic price per dollar's worth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subsidy rate*</td>
</tr>
<tr>
<td>Meat ($X_1$)</td>
<td>-25</td>
</tr>
<tr>
<td>Palm oil ($X_2$)</td>
<td>0</td>
</tr>
<tr>
<td>Manufactures ($X_3$)</td>
<td>25</td>
</tr>
</tbody>
</table>

a. Negative subsidy is a tax.
than it is when the treatment applying within each of the two broad groups (imports and exports) is kept the same.

2.04 **Concept of effective protection**

The stage is now set to introduce the concept of effective protection. This entails withdrawing the assumption, made in the previous section, that there are no imported inputs into the productive processes. When such inputs are present, the picture becomes more complicated.

Consider the example of a country with a tariff of 60 percent on steel, but where iron ore is imported free of duty. Suppose the iron ore accounts for 40 percent of the world price (say $300 per ton) of steel. Hence, by producing a ton of steel at home, a country saves $300 in steel-import costs, but incurs $120 (equal to 40 percent of $300) in iron-ore costs. The net saving of foreign exchange is $180. Assuming that domestic resources are indeed used up to the point where, at the margin, domestic steel is just barely competitive with imported steel, and assuming also that the exchange rate is 10 pesos per dollar, we have the picture as shown in Table 2.2.

The 60-percent tariff raises the domestic price of steel to 4,800 pesos (the counterpart of $480). The importation of iron uses up $120 or (at the official exchange rate of 10 pesos to the dollar) 1,200 pesos. Thus, the net saving of foreign exchange is $180 ($300 - $120), while the domestic resources used at the margin to save these dollars amount to 3,600 pesos (4800 - 1200). Hence, the domestic resource cost per dollar is equal to 20 pesos (3600/$180). The 60-percent tariff on imported steel has become an effective rate of protection of 100 percent on the conversion of imported iron ore into steel.
Table 2.2. Effective protection rate for converting iron ore into steel

<table>
<thead>
<tr>
<th>Assumptions:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on steel 60%</td>
<td></td>
</tr>
<tr>
<td>Tariff on iron ore 0%</td>
<td></td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
<td></td>
</tr>
</tbody>
</table>

| a. Dollars saved by reduced steel imports | 300 |
| b. Dollars newly spent on ore imports | 120 |
| c. Net dollars saved | 180 |
| d. Domestic value of steel with 60% tariff | 4800 |
|   (\$300 \times 10 \times 1.6) |  |
| e. Peso cost of iron ore imports at 0% tariff | 1200 |
|   (\$120 \times 10 \times 1.0) |  |
| f. Maximum profitable domestic resource cost | 3600 |
|   of converting iron ore into steel (d - e) |  |
| g. Domestic resource cost per dollar of net import substitution (f/c) | 20 |
| h. Effective rate of protection | 100 |
|   \[ \left( \frac{g}{E_m} - 1 \right) \times 100^a \] |  |

* a. The market exchange rate \((E_m)\) at which the protection rate is calculated is assumed to be 10 pesos per dollar.
Consider now an alternative possibility under the same tariff on steel—namely that instead of importing iron ore, the local producers import pig iron. Assume that this pig iron costs $66\frac{2}{3}$ percent of the world market price of steel, or $200 per ton of steel to be produced. In this case, the net saving of foreign exchange is only $100 ($300 - $200) per ton of steel produced, and (again with a 60-percent tariff) the domestic resource cost of effectuating this foreign-exchange saving can reach as high as 2,800 pesos. (This works out to a protected product price of 4,800 pesos minus 2,000 pesos of outlays for imported pig iron, which is assumed to have a zero tariff.) In this case, the country is in fact incurring up to 28 pesos of domestic resource costs to save one dollar of foreign exchange. The effective rate of protection thus becomes 180 percent.

The effective rate of protection changes not just with the proportion of the world price of the product (here steel) accounted for by imported inputs (here iron ore in the first case and pig iron in the second). The effective rate of protection also varies with the rate of tariff to which these inputs are subject. Table 2.3 deals with a case where the rate of nominal tariff protection is 60 percent for steel and 30 percent for iron ore.

The case presented in Table 2.3 is comparable to Table 2.1 in every respect, except that imported iron ore is subject to a 30-percent tariff. Row e amounts to 1,560 pesos instead of 1,200, and, as a result, the maximum profitable domestic resource cost of converting iron ore into steel falls from 3,600 to 3,240 pesos. As a consequence, the effective rate of protection of this steel-making operation falls from 180 percent to 80 percent.

If we do the same thing for the case where pig iron rather than iron ore is imported with a 30-percent duty, we find that $200 of pig-iron imports now have an internal cost of 2,600 pesos; hence, the maximum profitable domestic resource cost for converting iron
Table 2.3. Effective protection rate for converting iron ore into steel

<table>
<thead>
<tr>
<th>Assumptions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on steel 60%;</td>
</tr>
<tr>
<td>Tariff on iron ore 30%;</td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Dollars</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by reduced steel imports</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>b. Dollars newly spent on ore imports</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>c. Net dollars saved (a - b)</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>d. Domestic value of steel with 60% tariff</td>
<td>$300 x 10 x 1.6</td>
<td>4800</td>
</tr>
<tr>
<td>e. Peso cost of iron ore imports at 30% tariff</td>
<td>$120 x 10 x 1.3</td>
<td>1560</td>
</tr>
<tr>
<td>f. Maximum profitable domestic resource cost of converting iron ore into steel (d - e)</td>
<td>3240</td>
<td></td>
</tr>
<tr>
<td>g. Domestic resource cost per dollar of net import substitution (f/c)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>h. Effective rate of protection ([(g/E_0) - 1] \times 100^%)</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

a. The market exchange rate \((E_0)\) at which the protection rate is calculated is assumed to be 10 pesos per dollar
ore into steel is 2,200 pesos (4800 - 2600). Because the net foreign-
exchange saving in this case is $100, the maximum domestic re-
source cost is 22 pesos per dollar (instead of 28 when the duty on pig
iron was zero). This corresponds to an effective protection rate of
120 percent versus 180 percent in the earlier case.

The general formula for the rate of effective protection on product j
with imported input i is:

\[ t_{ij} = \frac{t_{nj} - a_{ij}t_{ii}}{1 - a_{ij}} \]

where \( t_{ij} \) is the effective rate of protection in the operation of
converting imported input i into final product j,
\( t_{nj} \) is the nominal rate of tariff on imports of final product j,
\( t_{ii} \) is the nominal rate of tariff on imported input i, and
\( a_{ij} \) is the cost (at world prices) of the amount of input i used to
make a dollar's worth (again at world prices) of final product j.

Formula (1) can be used to check the previous results. When steel
has a tariff of 60 percent, and iron ore costs amount to 40 percent of
the value of the steel, we have:

\[ t_{ij} = \frac{.60 - (.4)(0)}{1 - .4} = \frac{.60}{.60} = 100\% \]

When the tariff on iron ore is set at 30 percent, we have:

\[ t_{ij} = \frac{.60 - (.4)(.30)}{1 - .4} = \frac{.48}{.60} = 80\% \]

Turning to the case where pig iron is imported, at a cost amounting
to two-thirds of the world price of the steel it will be used to make, the formula reads, with a zero tariff on pig iron:

\[
t_{ij} = \frac{0.60 - \frac{2}{3} \cdot 0}{1 - \frac{2}{3}} = \frac{0.60}{\frac{1}{3}} = 180%
\]

When the tariff on pig iron is 30 percent, we have:

\[
t_{ij} = \frac{0.60 - \frac{2}{3} \cdot 30}{1 - \frac{2}{3}} = \frac{0.40}{\frac{1}{3}} = 120%
\]

**Uniform nominal tariff implies equal effective protection to all domestic operations**

From the preceding exercise we can see that when the nominal tariff \(t_{ni}\) on imported inputs is equal to the nominal tariff \(t_{nj}\) on the final product, this leads to an effective rate of protection \(t_{eij}\) that is equal to the nominal rate. Setting \(t_{ni} = t_{nj} = t^{*}\), we have, from the formula:

\[
t_{ij} = \frac{t^{*} - a_{ij}t^{*}}{1 - a_{ij}} = t^{*} \frac{(1 - a_{ij})}{(1 - a_{ij})} = t^{*}
\]

Similarly, in the numerical example with iron ore imports, if we place a 60-percent tariff on them we get:

\[
t_{ij} = \frac{0.60 - 0.4 \cdot 0.60}{1 - 0.4} = \frac{0.60}{0.60} = 100%
\]

Doing the same thing in the case with pig iron inputs, we get:

\[
t_{ij} = \frac{0.60 - \frac{2}{3} \cdot 0.60}{1 - \frac{2}{3}} = \frac{0.60}{1 - \frac{2}{3}} = 60%
\]

Whenever the average nominal tariff rate on imported inputs is equal to the actual nominal tariff rate of the final product, the effective rate of protection for the final product will be equal to the nominal rate of tariff.
The proposition is a general one. When there are many imported inputs, the formula for the rate of effective protection becomes:

\[ t_{ej} = \frac{t_{ej} - \sum a_{ij} t_{im}}{1 - \sum a_{ij}} \]

where \( a_{ij} \) represents the different fractions that the different imported inputs account for (at world prices) in the cost of producing a dollar's worth of product \( j \). A good numerical example is Table 2.4 which assumes to have a 60-percent tariff on steel, a 30-percent tariff on iron ore, together with a 10-percent tariff on coal. (Iron ore accounts for 40 percent and coal accounts for 20 percent of the cost of steel at world prices.) The results of Table 2.4 show that a dollar of net import substitution by way of producing more steel has a maximum profitable domestic resource cost of 21.5 pesos. The effective rate of protection (assuming a market rate of exchange of 10 pesos per dollar) is, therefore, 115 percent.

In Table 2.5 we perform the same exercise, but we use a 60-percent tariff rate on both iron ore and coal imports. We can see that as soon as we set the tariff rate at the same level (60 percent) for the final product and for the relevant imported inputs, the effective protection rate also turns out to be 60 percent. In a more formal way, if we call \( t_{ij} \) the average nominal tariff rate on the imported inputs \( i \) that are used in making final product \( j \) (or, \( t_{ij} = \frac{\sum a_{ij} t_{im}}{\sum a_{ij}} \)), we can then say that whenever the average nominal tariff rate on imported inputs is equal to the actual nominal tariff rate of the final product, then the effective rate of protection for the final product will be equal to the nominal rate of tariff.

There are two ways to examine the above proposition. One way is to go final commodity by final commodity. There will be one nominal rate of protection (say, 60 percent) for steel, another (say, 30 percent) for women's cotton dresses, yet another (say, 100
### Table 2.4. Effective protection rate for converting iron ore into steel

<table>
<thead>
<tr>
<th>Assumptions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on steel 60%;</td>
</tr>
<tr>
<td>Tariff on iron ore 30%;</td>
</tr>
<tr>
<td>Tariff on coal 10%;</td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Dollars</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by reduced steel imports</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>b. Dollars newly spent on ore</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>c. Dollars newly spent on coal</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>d. Net dollars saved (a - b - c)</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>e. Domestic value of steel with 60% tariff ($300 x 10 x 1.6)</td>
<td>4800</td>
<td></td>
</tr>
<tr>
<td>f. Peso cost of iron ore imports at 30% tariff ($120 x 10 x 1.3)</td>
<td>1560</td>
<td></td>
</tr>
<tr>
<td>g. Peso cost of coal imports with 10% tariff ($60 x 10 x 1.10)</td>
<td>660</td>
<td></td>
</tr>
<tr>
<td>h. Maximum profitable domestic resource cost of converting iron ore and coal into steel (e - f - g)</td>
<td>2580</td>
<td></td>
</tr>
<tr>
<td>i. Domestic resource cost per dollar of net import substitution (h/d)</td>
<td>21.5</td>
<td></td>
</tr>
<tr>
<td>j. Effective rate of protection $[(I/E_m) - 1] x 100^\ast$</td>
<td>115</td>
<td></td>
</tr>
</tbody>
</table>

a. The market exchange rate (E_m) at which the protection rate is calculated is assumed to be 10 pesos per dollar.
percent) for radios. Let us assume that imported inputs are used in the domestic production of each of these. The proposition that we have just set forth says that when the relevant weighted average tariff on inputs into steel averages 60 percent, then and only then, will there be a 60-percent rate of effective protection on the operation of transforming these inputs into finished steel. If the weighted average tariff is less than 60 percent, then the effective rate of protection on the steel-making operation will be higher than 60 percent, and vice versa. Similarly, only when the relevant weighted average tariff on inputs into women’s cotton dresses is equal to 30 percent will the effective rate of protection of this operation be equal to the nominal rate. Finally, so, too, for radios, where the weighted average tariff rate on inputs into the radio-making process would have to equal or exceed 100 percent to keep the rate of effective protection equal to or below the 100-percent level.

All of the above statements deal with a particular final product and its inputs. None says anything about the overall tariff structure. Thus, it would be possible to have an effective rate of protection on steel that was equal to the nominal rate of 60 percent, while at the same time, say, the rate of effective protection on women’s cotton dresses would also equal that particular nominal rate (in this case of 30 percent). To make this true, we would need the inputs into steelmaking to have a weighted average tariff of 60 percent, while those entering into the making of women’s cotton dresses would need to have a weighted-average tariff of 30 percent.

But if this type of equality (of effective and nominal rates) were to occur in a typical tariff structure with many different rates and many different classifications, it would surely be a matter of pure accident. It is not something that could be planned in advance and it is not something that could apply to more than a few categories at a time. A rise in the price of coal that is larger (percentagewise)
Table 2.5. Effective protection rate for converting iron ore and coal into steel

<table>
<thead>
<tr>
<th>Assumptions:</th>
<th>Dollars</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on steel 60%;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tariff on iron ore 60%;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tariff on coal 60%;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
<td></td>
<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>Option</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by reduced steel imports</td>
<td>300</td>
</tr>
<tr>
<td>b. Dollars newly spent on iron ore</td>
<td>120</td>
</tr>
<tr>
<td>c. Dollars newly spent on coal</td>
<td>60</td>
</tr>
<tr>
<td>d. Net dollars saved (a - b - c)</td>
<td>120</td>
</tr>
<tr>
<td>e. Domestic value of steel with 60% tariff</td>
<td>4800</td>
</tr>
<tr>
<td>($300 \times 10 \times 1.6)</td>
<td></td>
</tr>
<tr>
<td>f. Peso cost of iron ore imports at 60% tariff</td>
<td>1920</td>
</tr>
<tr>
<td>($120 \times 10 \times 1.6)</td>
<td></td>
</tr>
<tr>
<td>g. Peso cost of coal imports with 60% tariff</td>
<td>960</td>
</tr>
<tr>
<td>($60 \times 10 \times 1.6)</td>
<td></td>
</tr>
<tr>
<td>h. Maximum profitable domestic resource cost</td>
<td>1920</td>
</tr>
<tr>
<td>of converting iron ore and coal into steel</td>
<td></td>
</tr>
<tr>
<td>(e - f - g)</td>
<td></td>
</tr>
<tr>
<td>i. Domestic resource cost per dollar of net import substitution (h/d)</td>
<td>16</td>
</tr>
<tr>
<td>j. Effective rate of protection</td>
<td>60</td>
</tr>
</tbody>
</table>

\[
\left(\frac{i}{E_m} - 1\right) \times 100^a
\]

- The market exchange rate \(E_m\) at which the protection rate is calculated is assumed to be 10 pesos per dollar.
There will be no combination to exist, where increased distress and labor reduce with all the rest, and this will be true for every product. In our case, for each term

$$\frac{1-x}{1-x} = \frac{1-x}{1-x}$$

we make $x = 1$ for every final product and

impose an across-the-board unit rate of a uniform rate.

Any significant number of productive processes and then is so
expressed in the case of the labor of production as it applies to
wholesale production if ever, in practice, there is only one way to
and whose production is used for the other major outputs (or even crude simultaneously be true for the other major outputs)
product is used for the labor in exchange for exchange that this would
would change by just the same percentage as one of the principal
and its price, and many different products. If per price
coal, lead, copper, aluminum, wood, cocoa, and so forth—80
are needed to be sure that a great many key inputs—percolation, non-

of crude production on the labor to tax,

and which makes every of cocoa’s nature progress would cause the rise

would cause progress than is lower than the combination rise in
effective production or sacrifice below its present. A rise in
when the combination rise in the price of seed will reduce the

I love the imputed input, then we will have

Il using equation (2), we make $x = 1$ for every final product and
Reasons for adopting uniform tariff

The most profound and persuasive argument for a uniform tariff is the capriciousness of the alternative tariff structures that we observe in the real world. By capriciousness I mean two things:

a. The effective protection that emerges as a result of given tariff legislation is far from what was intended.

b. As relative prices change (which they must and always will in the complex world economy), rates of effective protection will also vary—sometimes quite dramatically.

These variations in effective protection rates are not intended by legislators and administrators, but they are additional to tariff legislation. For example, if we assume that the initial degree of effective protection was exactly what legislators wanted, then variations of relative world-market prices that end up changing the rate of effective protection obviously create a new situation that is different from what was intended.

Why effective protection turns out different from what was intended

The main reason why effective protection so often turns out to be different from what was intended is that legislators and government administrators do not really think in these terms. Perhaps, in ten or twenty years they will, in which case we will observe much more uniform world tariff structures than those we see today.

To get a feeling for the sort of motivation that lies behind tariff-setting decisions, consider the classic question of how to deal with imported inputs. The standard answer—directly embodied in legislation in some countries, and characterizing the actual tariff structure in many more—is that one should allow to enter duty-free all inputs of a type that cannot (or are unlikely to) be produced in the country in question.

The standard (but incorrect) answer to the classic question of how to deal with imported inputs is that we should allow duty-free the import of all inputs that cannot (or are unlikely to) be produced in the country. The typical result of such a rule is packaging and assembly operations.
What is the typical outcome of such a rule in most developing countries? Answer: packaging and assembly operations. The classic case of packaging is pharmaceuticals. When these are imported in the same packages or bottles that are finally sold to consumers, they are usually considered final products and are typically subject to a tariff. But when they are imported in bulk form (barrels, drums, cases, 20-liter cans, etcetera), they are typically considered inputs into productive process and are allowed to enter with a low or zero tariff.

Consider a situation in which the world-market price of aspirin packaged for consumers is one dollar per hundred tablets. Suppose the packaged aspirin carries a tariff of 20 percent, while the tariff on aspirin imported in bulk is zero. Suppose, too, that the final act of packaging accounts for 10 percent of the total world price of one dollar, so aspirin in bulk can be imported for 90 cents per hundred tablets. What is the rate of effective protection on the operation of putting bulk-imported aspirin into packages? In this case it is 200 percent. The imported input is bought for $.90, the packaged output can be sold for up to $1.20; thus, up to 30 cents worth of domestic resources can be used to save the ten cents that foreign packaging costs. In terms of formula (1) we have:

\[
t_{ij} = \frac{t_{ij} - a_{ij} t_{ui}}{1 - a_{ij}} = \frac{.20 - .90 (0)}{1 - .90} = .20 = 200\%
\]

If the tariff on pharmaceuticals were instead embedded in a system with a uniform 20-percent tariff, the formula would give us an effective rate of protection of just 20 percent:

\[
t_{ij} = \frac{t_{ij} - a_{ij} t_{ui}}{1 - a_{ij}} = \frac{.20 - .90 (.20)}{1 - .90} = .20 - .18 = 20\%
\]

The classic case of assembly operations is that of automobiles. In
a number of developing countries (such as Uruguay), attempts were made to produce automobiles or small trucks locally. High tariffs were placed on the final product, while the component parts were allowed to be imported at zero duty or at a very low rate. Extremely high rates of effective protection (300, 400, and even 500 percent) have been calculated for the auto industry in several developing countries.

Yet, most dramatic instances are those where infinite effective protection is involved. "Infinite protection" occurs when a country consumes domestic resources in an "import-substituting" process that doesn't save any foreign exchange. Typically, in these cases, the process actually is a net user (rather than saver) of foreign exchange. This occurs when the "kit" of unassembled pieces (that, when put together, will produce, say, a car) actually costs more than the import price of the final product (in this example, a car) that will be ultimately made from the kit of parts.

It is quite normal in the parts market that it will cost more to buy a full set of replacement parts, say, for an automobile, a refrigerator, or a television set than it would cost to buy the new, assembled product itself. And there are good economic reasons for this—the low turnover and consequent high inventory cost of storing parts, the handling costs of dealing with many different parts in small quantities, and so forth. It is thus practically certain that buying all the necessary parts for an automobile at the manufacturer's standard wholesale price for parts would cost a country more than to buy the same car, fully assembled, also at the manufacturer's standard wholesale price. Only by negotiating special prices for the parts or kits that will be used in repetitive assembly operations can a country even expect to get a price for the kit that is lower than the price for the assembled car itself.

The evidence suggests that in a number of cases, countries did not take the precaution of zealously pursuing such negotiations; these countries end up with "infinite" effective protection. Infinite protection occurs when a country consumes domestic resources in an "import-substituting" process that doesn't save any foreign exchange. Actually, the process becomes a net user of foreign exchange. In a number of cases,
Table 2.6. Effective protection rates on men’s sport shirts

<table>
<thead>
<tr>
<th>Assumptions:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on men’s sport shirts 30%;</td>
<td></td>
</tr>
<tr>
<td>Tariffs on wool, silk, cashmere cloth 0%;</td>
<td></td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of shirt</th>
<th>Cotton</th>
<th>Wool</th>
<th>Silk</th>
<th>Cashmere</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by reduced shirt imports</td>
<td>9</td>
<td>12</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>b. Dollars newly spent on cloth imports</td>
<td>—</td>
<td>9</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>c. Net dollars saved</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>d. Domestic value of shirt in pesos (a x 10 x 1.3)</td>
<td>117</td>
<td>156</td>
<td>232</td>
<td>312</td>
</tr>
<tr>
<td>e. Peso cost of cloth imports at 0% tariff (b x 10 x 1.0)</td>
<td>—</td>
<td>90</td>
<td>150</td>
<td>210</td>
</tr>
<tr>
<td>f. Maximum profitable domestic resource cost of converting imported material (if any) into shirts (d - e)</td>
<td>117</td>
<td>66</td>
<td>84</td>
<td>102</td>
</tr>
<tr>
<td>g. Domestic resource cost per dollar of net import substitution (f/c)</td>
<td>13</td>
<td>22</td>
<td>28</td>
<td>34</td>
</tr>
<tr>
<td>h. Effective rate of protection [\frac{(g/E_s) - 1}{100}]</td>
<td>30</td>
<td>120</td>
<td>180</td>
<td>240</td>
</tr>
</tbody>
</table>

a. The market exchange rate \(E_s\) at which the protection rate is calculated is assumed to be 10 pesos per dollar.
were the ones, I suspect, that ended up with infinite effective protection.

Yet another way in which a country can end up with rates of effective protection that are unintended is through the capriciousness of tariff nomenclature. Tariff systems actually exist with a thousand, two thousand and even more separate categories. We can all see the difficulty, perhaps even the folly, of trying to administer a system with a lot more categories than that. But it is hard to imagine that a system of one or two thousand categories will be able to devote more than one or two of them to men's shirts—say men's dress shirts and men's sport shirts. To divide these into shirts made of cotton, nylon, orlon, mixtures of these, plus wool, silk, cashmere, and others, would probably require a system with more than ten thousand categories—which would be an administrative nightmare.

But let us for a moment pursue the implications of having just two categories. Consider the category “men's sport shirts.” Let us assume that the country in question has a tariff of 30 percent on men's sport shirts, that it produces cotton locally, but that it is an importer (at zero tariff) of wool, silk, and cashmere cloth. Let the world price of a cotton shirt be $9, that of a wool shirt $12, that of a silk shirt $18, and that of a cashmere shirt $24. Let us also assume that the world price of the cloth for a wool shirt is $9, that of the cloth for a silk shirt is $15, and that of the cloth for a cashmere shirt is $21. These prices imply that at world-market prices, the cost of making any kind of shirt (that is, of transforming the cloth into the finished shirt) is $3.

Table 2.6 summarizes the calculation of effective rates of protection for the case just described. The innocent-looking tariff of 30 percent on men's sport shirts masks a protectionist chamber of horrors, with the 30-percent rate applying only to cotton shirts.
Table 2.7. Effective protection rates on men's sport shirts

- **Assumptions:**
  - Tariff on men's shirts 30%
  - Market exchange rate 10 pesos/dollar.

<table>
<thead>
<tr>
<th>Type of shirt</th>
<th>Cotton</th>
<th>Wool</th>
<th>Silk</th>
<th>Cashmere</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by reduced shirt imports</td>
<td>9</td>
<td>12</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>b. Dollars newly spent on cloth imports</td>
<td>—</td>
<td>9</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>c. Net dollars saved</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d. Domestic value of shirt in pesos</td>
<td>117</td>
<td>156</td>
<td>234</td>
<td>312</td>
</tr>
<tr>
<td>e. Peso cost of cloth imports at 30% tariff</td>
<td>—</td>
<td>117</td>
<td>195</td>
<td>273</td>
</tr>
<tr>
<td>f. Maximum profitable domestic resource cost of converting imported material (if any) into shirts (d - e)</td>
<td>117</td>
<td>39</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>g. Domestic resource cost per dollar of net import substitution (f/c)</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>h. Effective rate of protection ((g/E_M) \times 100^a)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

- a. The market exchange rate \((E_M)\) at which the protection rate is calculated is assumed to be 10 pesos per dollar.
(which use no imported inputs). For the rest, the rates of protection range from 120 percent to 240 percent. It is easy to construct similar examples with even wider ranges of variations among the effective rates of protection for different subgroups within the same tariff category. These horrors will always be present, I feel, when the number of tariff categories is plausibly manageable. And I do not feel that the solution to this type of problem is to create a tariff structure with, say, twenty thousand categories. That would only create more problems that it solved.

The obvious solution is to go in the other direction—to a uniform tariff (which can also be thought of as a tariff structure with only one category). Though we have already shown that a uniform structure will result in uniform rates of effective protection, Table 2.7 is added simply to show how dramatically the move to a uniform rate solves the problems posed in Table 2.6.

**How effective protection varies with world price changes**

Consider a situation in which a final product is produced with imported inputs accounting for half of its world-market price. In numerical terms, think of a world price of the product equal to 100, while the world-market cost of tradable inputs is 50. Suppose, too, that we have a tariff of 60 percent on the final product, with a zero tariff on the inputs. Thus, initially, the effective rate of protection is 120 percent.

Suppose now the cost of tradable inputs falls to 25, and that the final product's world price reflects this fall and drops to 75. Now the 60-percent tariff on the final product results in a rate of effective protection equal to 90 percent. Following equation (1) we have:

\[
\frac{t - a_{ij}}{1 - a_{ij}} = \frac{.6 - (1/3) (0)}{1 - (1/3)} = \frac{.6}{(2/3)} = 90\%
\]
And if the cost of tradable inputs increases from 50 to 75, with product price in this case rising to 125, we have an effective rate of protection equal to 150 percent \[\frac{.6 - (.6) (0)}{(1-.6)}\].

These examples are not exaggerated. Between 1971 and 1975 the annual average price of bauxite doubled, while the U.S. GNP deflator increased by 31 percent. From 1975 to 1980 it doubled again, with the U.S. deflator rising by 42 percent. The dollar price of lead, in contrast, was cut in half between 1979 and 1982. The dollar price of logs (per cubic meter) doubled between 1978 and 1980, then fell by about a third from 1980 to 1982. Zinc prices quadrupled (in dollar terms) between 1971 and 1974, then fell by more than half from 1974 to 1977. Wool more than tripled between 1971 and 1973, having fallen by a third from 1966 to 1968. The price of sugar, after averaging about 5-7 cents from 1968 to 1973, reached 50 cents in 1974 and again in 1980.

Trends as well as brusque movements can occur. The dollar price of iron ore was lower in 1979 than in 1953, yet the U.S. GNP deflator had almost tripled. Cotton did not fare quite so badly, but its dollar price only increased by 50 percent over the same period. The story of petroleum is perhaps too well known, but it is worth noting that petroleum prices rose less than the general price level between, say, 1953 and 1970, only to increase almost twentyfold in the subsequent decade. The commodities mentioned above are relatively homogeneous, so that price comparisons can be easily made across time. Yet, we are all aware of the tremendous fall in the relative prices (and the simultaneous massive rise in quality) of a host of products in the electronics and communications field.

Thus, the hypothetical example with which this section began is representative of many real-world situations. It is easy to find cases where changes in the world market caused the rate of effective protection to vary by much more than that example suggests.
cost per dollar produced or generated (by exports) than the domestic resource cost per dollar saved (by import substitution). But it is easy to see that if we pay 8 pesos to substitute for imports of one type, 12 pesos for another, and 16 pesos for a third, we can have the same total amount of import substitution more cheaply by doing less in the area where it costs 16 pesos to save a dollar and more in the area where it costs only 8 pesos. To do this, we should lower the tariff for the former, and raise it for the latter group of imports. The opportunity to make this type of trade-off will continue to exist, so long as there are differences in tariff rates among categories. Only when they have all been equalized will it be impossible to find cheaper ways to save a given amount of dollars via import substitution.

The argument just presented presumes that the country in question is not capable of influencing the world price of any of its imports or of any of its exports. Since this book is being written with developing countries in mind, I believe it is quite correct to rule out this type of market power for imports. Even a physically large country like Brazil is small relative to the size of the world market for the things it imports. However, we cannot say the same thing about export products. There are some cases (coffee in Brazil, copper in Chile, tin in Bolivia, and so forth) where even a small country can account for a large proportion of the world's supply of a good that it can influence the world price by altering its exports.

This situation gives rise to the classical "optimal export tax," which in effect is conceived of as that tax which exploits the "monopoly" position of a country on a given product. The thought of a tax can arise when the export-producing industry (best exemplified by coffee in Brazil) is composed of many individual producers (in contrast, say, to International Nickel in Canada). In such a case, the multitude of local producers will not be able to collude to take advantage of their combined monopoly
power, but an export tax imposed by the state could produce (for the nation as a whole) the same monopoly benefit.

The second argument deals with cases in which a country produces a differentiated product. (Spanish, Italian, and French grapes—as well as corresponding wines—are really different and vary in price relative to one another.) Here, even without accounting for a very important share of the world market, a country could find itself in a situation where changes in its commercial policy could alter the world price of its (differentiated) exports, even if they could not significantly affect the world-price level of a product group as a whole.

The third argument deals with cases in which a country exports products with high transport cost. Here, that country faces a situation in which demand increases when price is reduced, for the simple fact that a lower f.o.b. price in the country of exportation enables it better to compete with alternative sources of supply over a wider geographical radius.

These three arguments all create an “optimum export tax” situation. Following what economists call a “first best policy” (which in this context means that the individual exporting country will try to maximize its own interests), the country in question could gain by levying a variegated set of export taxes, each attuned to the degree of influence the country has over the price it receives for exports of each different type.

Economists would agree with the analysis leading to the above conclusion, but may not yet want to endorse a series of export taxes in different goods, each designed to exploit the market power that the country has in each of a whole set of specific export commodity markets. There are many reasons for this reluc-
tance. In the first place, economists are on the whole free-traders, in the sense that they are not pleased at subscribing to a set of policies by which one (exporting) country gains by artificial export restrictions that are aimed to exploit its monopoly power (a "quasi-monopoly power") in the markets for its various exports. Such restrictions will produce benefits for the country, but not for the world as a whole. In the second place, countries are not prone to place export taxes on the types of exports listed here. With rare exceptions, the mind-set of policymakers in most developing countries is more mercantilistic, leading them to want, if anything, to subsidize exports while taxing imports.

From the point of view of a developing country, so long as it has a modicum of monopoly or quasi-monopoly power on the export side, it would perhaps stand to gain most from a set of differentiated export taxes, each trying to exploit the degree of monopoly (or "quasi-monopoly") power that the country possesses in the given export market. This is an unlikely outcome, given the mercantilist mind-set of both politicians and the public in most countries. But it must be admitted that, up to a point, a (potentially but not necessarily) uniform tariff helps a country to exploit the monopoly and quasi-monopoly advantage referred to.

Under this line of reasoning, a moderate uniform tariff could be defended as enhancing the economic interest of the country that imposes it so long as its major trading partners did not take retaliatory actions. On the whole, industrial countries, which are the major trading partners of developing countries, have not tended to retaliate in such circumstances. Hence, the country's economic interest may be enhanced by a moderate uniform tariff. However, the policy cannot be favored from the point of view of the world economy as a whole, and it is not a first-best policy even from the point of view of the country in question. But given the mercantilist mind-set, and given the fact that the degrees of monopoly and

Developing countries generally are not prone to place taxes on exports. With rare exceptions, the mind-set of policymakers is more mercantilist, leading them to want, if anything, to subsidize exports while taxing imports.
quasi-monopoly power in different export markets are constantly changing, a moderate uniform tariff can be defended as being in the economic interest of a developing country that imposes it. Succinctly put, if the uniform tariff is low enough, we can be quite sure that benefits exceed costs (for the country in question) while, almost as surely, costs exceed benefits for the world as a whole.

2.07 Lessons for policymakers

Just because a convincing case has been made for a country to adopt an across-the-board uniform tariff on imports (if it is going to have any tariff at all), it would be naive to believe that administrators and legislators around the world will rush to implement such a policy. The pace of progress in policy matters is slow and tentative at best. I will, therefore, enumerate and explain what I believe are the important practical lessons to be drawn from this analysis.

1. The traditional way of thinking about tariffs must be changed. The strongest idée fixe that one finds in what the general public thinks about tariffs is the notion that no particular national interest is served (except for the revenue raised) by tariffs on products that cannot be or are unlikely to be produced at home. How, they ask, can tariffs on such items have anything to do with protection, when there's nothing here (or likely to be here in the future) to protect?

What we have shown is that there are very good reasons for imposing tariffs even on goods in this category. Taxing imported inputs at rates similar to the tariffs on the protected outputs is the only way of even being sure what is the effective rate that applies to the
protected domestic activity. Taxing all imported inputs and protected products equally is the only way of having, for any wide range of protected activities, the same knowledge of what is the effective rate of protection. Add to this the fact that there are very good economic arguments (presented in the preceding section) for having a single general rate, and you have the reasons why the traditional way of thinking about tariffs must be changed.

2. A country can gain from “squeezing” its tariff structure, even when it does not reduce tariff revenue.
   This does not deny that most countries would be better off with a general reduction in tariffs. It only says that even without a general reduction, countries can typically gain by moving toward equalization of tariff rates, raising the lowest rates while reducing the highest. This is definitely true when there are already tariffs (however small) on imported inputs. Moreover, in the process of “squeezing” a tariff structure, the biggest gains come from the first steps, the smallest from the last. Thus, even though countries are not prepared (for political or other reasons) to move to complete equalization, they should be encouraged to move toward it.

3. A country can gain from imposing tariffs on imported inputs, even when these have up to now entered free of duty.
   This is a very clear message—the only caveat is not to overdo it. It would be absurd to move an input from duty-free status into the 100-percent tariff category. But for a country with an average tariff rate of, say, 30 percent, it is virtually certain to be beneficial to move an input from zero percent to the 10-percent category. Once it is in the category of tariffed goods, the preceding lesson on “squeezing” applies.

4. The lessons mentioned above apply equally to imported capital goods.
   There has been a consistent bias in the tariff and tax legislation of
many developing countries in favor of imported capital goods over other types of imports. But truly, in the terms in which we have been speaking, the only difference between imported capital inputs and imported current inputs is that the imported capital goods render their productive services over a span of years, while the imported current inputs render their services relatively quickly.

Standard economic theory tells us that the price paid for a capital asset should reflect the present value of the services that it will render in the future—services that on the accounts of the firm are partly reflected in depreciation, partly in interest (if the asset was bought with borrowed money), and partly in profits (to the extent that the asset was bought with equity capital, and also, in addition, to the extent that the asset yielded more or less than the normal rate of return).

Thus, in effect, if we tax imports of capital equipment at the same rate as other imports, we will not be discriminating in any way against them, but rather fulfilling the objective of uniform effective protection for all domestic value added. Partial fulfillment of this objective—reflected in the idea of “squeezing”—thus includes imports of capital goods in a fashion equivalent to imports of raw materials, intermediate products, and other “current” inputs. There is no sound reason to exempt capital goods, or to treat them at a preferential rate, in a tariff structure built upon the analysis presented in this paper.

5. **High tariffs on luxury items can (and probably should) be replaced by high excise taxes on the same items.**

One of the policy “traps” into which many countries have fallen is that of precluding “luxury” imports via high tariff rates (or quotas, or indeed in some cases outright prohibitions). This type of policy was tried in many developing countries in the 1950s and 1960s. Tariffs (sometimes 100, 200, or even 400 percent) were thrown
up, which encouraged domestic production of, say, autos, refrigerators, or television sets at very high cost to the nation. These same goods could have been bought in the international market at a cheaper price.

Effective protection of such items has been in many cases extreme, and has led to a deplorable waste of domestic resources to produce inferior products at double (or more than double) the world price. This lesson has been recognized by some countries, notably China, which in 1982 began importing Toyotas from Japan as substitutes for its “own” car. The Chinese car was an expensive, fuel-inefficient, and fundamentally obsolete replica of a 1946 Pontiac from the United States. But the problem still remains in many countries.

What is the solution? We must first ask ourselves whether the motive for putting high tariffs on luxury items was to stimulate extremely high-cost domestic production of them. The answer is invariably “no.” The motive was “not to waste scarce foreign exchange” by spending it on such items. But the consequence was often the establishment of an extremely high-cost, inefficient “hot-house” industry producing the same general type of product at home.

The question to ask the people, the administrators, and the legislators in such a case is whether the outcome is something they anticipated and wanted. Certainly the mass of people would say that they would prefer to buy better cars, refrigerators, and television sets at half the price, rather than accept inferior substitutes at what it costs to produce them domestically. There is a direct way of producing these products—by using domestic resources—but also an indirect way. The indirect way is to produce wheat, beef, iron, cotton textiles, shoes, and other items and with the proceeds buy in the international marketplace Toyotas, Frigidaires, and Sonys. The choice is made particularly easy by the fact that when the inferior
domestic substitutes are produced at very high cost, they usually contain substantial amounts of imported components, so the amount of foreign exchange saved is much less than it might at first appear.

The answer is too simple for words. If we wish to deter the use of foreign exchange for the purchase of luxury items, and if we do not, as a consequence, want to stimulate their domestic production at high cost, one can simply place luxury taxes on those goods. Thus, automobiles with list prices of $7,000 might be taxed at 25 percent, those with list prices of $12,000 might be taxed at 50 percent, and those with prices of $20,000 and over might be taxed at 100 percent. The taxes in question would apply both to imported and to domestically produced items. Such a tax scheme would deter the use of imported cars, but it would also deter the domestic production of them. This solution avoids the tragedy that so many developing countries had to face in the era of extreme protectionism of this type—that of becoming ever more self-sufficient in the production of (usually inferior) luxury items while, at the same time, becoming ever more dependent on the rest of the world for imports of basic necessities and component parts.

Should there be exceptions?
To this question, an economist in principle would answer “no.” But there are some possibilities for exceptions. The basic case for a uniform tariff rests on the relationship between imported inputs and imported final products. A uniform tariff rate can be applied to the following:

a. All final products using significant amounts of imported inputs.
b. All products that serve as imported inputs into the above.
c. All imported goods that serve a dual purpose—both as final products and as inputs.
d. All products for which domestic production is feasible or conceivable within a reasonable time (say 10 to 15 years).
The above rules exclude two types of goods:

i. Final products (like coffee and tea) that in many countries cannot be produced at home and which do not serve as inputs in the production of import substitutes.

ii. Inputs that serve only to produce domestic final products (that is final products with no close imported substitutes.

In any country there would be a number of items fitting in category i. They would be, in a certain sense, eligible for differential treatment. The question is why? If they are luxuries, we can add a domestic tax to the uniform treatment. If they are “merit goods,” they can still be subject to the uniform tariff at the border, with their subsequent uses being subject to subsidies calibrated to their degree of “merit.” Frankly, I do not think of coffee and tea as merit goods, and I find no others that fall under category i, which I would so classify.

Following similar procedures to seek goods that fall under category ii, I fail to come up with even a single example. I first thought of imported electric generators in a small and poor country for which the production of such generators is inconceivable for decades. These generators are inputs into the production of electricity, which is one of the classic nontradable goods for most countries. But the problem is that electricity is an input into the production of many tradable items. Thus, ultimately, electric generators fall under category b: they are indirect inputs into nearly every process that produces tradable goods. So, too, are railroad locomotives and cars. What imported inputs serve only to produce nontradable outputs? Maybe machines that make expresso coffee—but even here we seem to run afoul of rule d, because the technology for producing such machines is relatively simple.

The answer to the initial question thus is: yes, there may be exceptions (like coffee and tea) on the final-product side, but they do not seem to present any compelling case for special treatment. It would
not hurt, in a country that could produce neither, to have a 50-
percent tariff on coffee and tea, in the presence of a general tariff of,
say 20 percent. But the same objective could be reached by subject-
ing coffee and tea to the general tariff of 20-percent, plus an addi-
tional excise tax (in principle applicable to domestic as well as
imported output) of 25 percent.

The final message is, then, that while we can make a case for a few
exceptions, they pale into insignificance in comparison with the
persuasiveness of the arguments for a uniform rate. We know in
advance that most countries will not end up with uniform tariffs.
We know, too, that the reasons for most of the deviations from
uniformity will have to do with political power and pressures, with
specific national traditions and goals, and so forth. We cannot deny
either the reality of the pressures or the validity of the traditions and
goals. But both of them end up trading off a potential economic
advantage for some other value. Economists, thus, would answer
that the economic goal should be a uniform tariff; that “squeezing”
the tariff structure combined with introducing new (small) tariffs on
previously nontaxed inputs is the operational guideline; and that
there is little if any gold at the end of the rainbow that we can trace
as we begin to think about exceptions.

Notes

1. Whether a subsidy is in fact justified depends on the particulars
   of the case. A generalized objective of increasing national produc-
tion, for example, does not lead to the selection of specific com-
modities for special subsidy treatment. A specific purpose, such as
the desire to promote the planting of forests to help control floods or
to prevent soil erosion, is more likely to generate a presumption that
a subsidy might be an appropriate policy instrument.

2. Since \( M_o^d = Q_o^d - Q_o^s \) and \( M_1^d = Q_1^d - Q_1^s \), we have \((M_o^d - M_1^d) = (Q_o^d - Q_o^s) - (Q_1^d - Q_1^s) = (Q_o^d - Q_1^d) + (Q_1^d - Q_o^s) = \) base of triangle
B plus base of triangle A.

3. All of this can be succinctly put by defining the metric of the vertical axis of Figure 2.3 as $P_t/P_d$, where $P_d$ is the internal price level, and $P_t$ is the general price level of importables (on the demand curve) or exportables (on the supply curve). In the case of exportables not subject to any trade restrictions, and defining units of quantity to be a dollar’s worth at world prices, $P_t$ equals $E_M$, the market exchange rate. This falls when $P_d$ is constant, but stays the same when $E_M$ is fixed.

(An acceptable definition of a country’s real exchange rate, based only on data from that country, is the ratio of the market-price level of nondistorted tradables to the general price index. Nondistorted tradables are, for example, exports that are neither taxed nor subsidized simply for the fact that they are exported. Similarly, imports that enter free of duty qualify as nondistorted tradables. This definition is arbitrary, but clear. Any restriction that reduces imports has the effect of lowering the real exchange rate—of reducing the incentives to export and to produce substitutes for nondistorted imports).

If there is a uniform 50-percent tariff, of course, the domestic price of importables will be $1.5 E_M$. With a nonuniform tariff of $t_j$ on product $j$, the relevant domestic price of a dollar’s worth of that product would be $E_M(1+t_j)$.

4. For a discussion of how a uniform tariff should be complemented by other policies in certain cases to guarantee uniform effective protection, see the Appendix on page 113.
Figure 2-4. Relative prices of exportables and importables

A

Domestic price per dollar's worth

Export supply

Import demand

Exports (X) and imports (M) (in dollars worth)

X₁ = M₁

X₀ = M₀

B

Domestic price per dollar's worth

Export supply

Import demand

Exports (X) and imports (M) (in dollars worth)

X₁ = M₁

X₀ = M₀
export good is subject to tax. If there is a tax on the domestic use of an export good, it should be treated in the calculation of effective protection in the same way as we would treat a tariff if the good in question were an import. The logic is clear; a tax on the domestic use of coal is part of the peso cost of coal which has to be deducted (as in row g) in the course of calculating the maximum profitable domestic resource cost of making steel. A higher tax on the use of coal as an input into steelmaking works in exactly the same way regardless of whether coal is an import good and the tax takes the form of a tariff or whether coal is an export good and the tax applies to its domestic use.

The preceding analysis has a corollary: in the presence of export goods used as inputs into the production of protected products, uniform effective protection of all activities is obtained by a uniform import tariff combined with domestic taxes of an equal percentage on the use of export goods as inputs into productive processes. Table 2.9 shows how the simple addition of such a tax can eliminate the disparity (revealed in Table 2.8) between the nominal and the effective rates of protection in making steel. Uniformity of effective protection can thus be ensured by parity of nominal rates, supplemented (where needed) by taxing the use of export goods as inputs into domestic productive processes.

You may wonder whether, by adding this footnote to our earlier analysis, we seriously weaken the case for uniform protection as a reasonable objective in the real world. The answer is “no.” First, there is no need for a general tax on the domestic use of all export goods; many export items are direct-consumption goods that do not enter as inputs into the production of import substitutes. Second, while other export goods may become inputs into production, they may not be so important that a failure to tax their domestic use would have a significant quantitative effect on the rate of effective
Table 2.9. Effective protection rate when an export good (coal) serves as an input to convert iron ore into steel.

<table>
<thead>
<tr>
<th>Assumptions:</th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff on steel 60%;</td>
<td></td>
</tr>
<tr>
<td>Tariff on iron ore 60%;</td>
<td></td>
</tr>
<tr>
<td>Tax on domestic use of coal 60%;</td>
<td></td>
</tr>
<tr>
<td>Market exchange rate 10 pesos/dollar</td>
<td></td>
</tr>
</tbody>
</table>

| a. Dollars saved by reduced steel imports         | 300     |
| b. Dollars newly spent on iron ore (an import good) | 120     |
| c. Dollar value of coal (an export good) used in process | 60     |
| d. Net dollars saved (a - b - c)                  | 120     |
| e. Domestic value of steel with 60% tariff        | 4800    |
| (300 x 10 x 1.6)                                   |         |
| f. Peso cost of iron ore imports with 60% tariff  | 1920    |
| (120 x 10 x 1.6)                                   |         |
| g. Peso cost of coal with 60% tax on domestic use | 960     |
| (60 x 10 x 1.6)                                    |         |
| h. Maximum profitable domestic resource cost      | 1920    |
| converting iron ore and coal into steel (e - f - g)|         |
| i. Domestic resource cost per dollar of foreign   | 16      |
| exchange savings (h/d)                            |         |
| j. Effective rate of protection                    | 60      |
| ([1/Eₚₐ] - 1) x 100%                              |         |

a. The market exchange rate (Eₚₐ) at which the protection rate is calculated is assumed to be 10 pesos per dollar. Effective protection is expressed in percentage.
protection of the import-substitution activities that use them. Third, cases that are not covered under the preceding two points would be rare, and in such cases the possibility is always present of introducing a domestic tax on the use of the export as an input into productive processes, if that seems critical to avoid a grossly distorted pattern of effective protection.

A review of the list of important export products for the major developing countries confirms the preceding judgments. Wheat, meat, hides, and wool are not important inputs into import-competing productive processes in Argentina; nor is tin in Bolivia; coffee and soybeans in Brazil; copper in Chile; coffee in Colombia and Central America; cacao in Ghana and Côte d'Ivoire; rubber, palm oil, and tin in Malaysia; rice and rubber in Thailand; and so forth. Petroleum is the main case of a major export good from the developing world that is widely used as an input; but petroleum enters into nearly every import-substituting activity without being a truly major input into any of them. Moreover, petroleum is frequently subject to special taxation; rarely could there be major obstacles in the way of its being taxed at the same (presumably moderate) rate as the uniform tariff to ensure parity among the rates of effective protection across product and sectors.

2. Exports with significant inputs of imported or import-substitute goods
The formula for effective protection holds not only for cases where a nominal tariff is present, protecting a given activity \( j \), but also when there is no such protection. There are at least two important cases here: the case of an imported good which carries no tariff or similar restriction of trade, and the case of a good produced for export. In both these instances, effective protection is negative so long as tariffs are levied on any of the inputs. The formula for the rate of effective protection is then:

\[
t_{ej} = \frac{-\sum a_{ij} t_i}{(1 - \sum a_{ij})}
\]
### Table 2.10. Effective protection rate for converting imported iron ore and exportable coal into steel for export

#### Assumptions:
- Tariff on iron ore 60%.
- Domestic excise or export tax on steel or coal 0%.
- Market exchange rate 10 pesos/dollar.

<table>
<thead>
<tr>
<th></th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dollars saved by increased steel imports</td>
<td>300</td>
</tr>
<tr>
<td>b. Dollars newly spent on iron ore (an import)</td>
<td>120</td>
</tr>
<tr>
<td>c. Dollar value of coal (an export good) used in process</td>
<td>60</td>
</tr>
<tr>
<td>d. Net dollars saved (a - b - c)</td>
<td>120</td>
</tr>
</tbody>
</table>

#### Tariff on iron ore rebated with export of steel?

<table>
<thead>
<tr>
<th></th>
<th>In pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. No</td>
<td>B. Yes</td>
</tr>
<tr>
<td>e. Domestic value of steel exported ($300 x 10)</td>
<td>3000</td>
</tr>
<tr>
<td>f. Peso cost of iron ore imports with 60% tariff ($120 x 10 x 1.6)</td>
<td>1920</td>
</tr>
<tr>
<td>f'. Rebate of tariff on iron ore</td>
<td>0</td>
</tr>
<tr>
<td>g. Peso cost of coal (an export good) used in process (60 x 10)</td>
<td>600</td>
</tr>
<tr>
<td>h. Maximum profitable domestic resource cost of converting iron ore and coal into steel (e - f + f' - g)</td>
<td>480</td>
</tr>
<tr>
<td>i. Domestic resource cost per dollar of foreign exchange generated (n) [h/d]</td>
<td>4</td>
</tr>
</tbody>
</table>
| j. Effective rate of protection 

\[
\frac{(1/E_n) - 1}{1} \times 100
\]  

-60 | 0 |

**a.** The market exchange rate \((E_n)\) at which the protection rate is calculated is
Table 2.10 explores this case for exports of steel, where the iron ore to make the steel is imported with a 60-percent tariff. Peso costs are calculated both under the alternative assumption A, that no rebate is given when the steel is exported, and B, that the contribution of the iron-ore tariff to the peso cost of the steel is rebated whenever the steel is exported. The expected results hold: when there is no rebate, the rate of effective protection is negative (in this case a negative 60 percent), which reflects the import duty on iron ore. When the duty on iron ore is rebated, the rate of effective protection becomes zero.

In Table 2.10, there is an entry for coal (an export commodity). No special treatment is assumed, but we can see that if there were a 60-percent domestic excise tax or a tax on coal, the peso cost in row g would be 960 rather than 600. This would cause the effective rate of protection in Column A to be negative 90 percent rather than the negative 60 percent shown. However, if the domestic excise tax on coal were rebated whenever steel (made by using the coal) was exported, there would be an entry in Column B (in a hypothetical row g', similar in concept to row f') to that effect, in the amount of 360 pesos. Effective protection would again be equal to zero percent in the case covered by Column B, which would now entail the rebating both of the tariff on iron ore and of the domestic excise tax on coal.

With appropriate use of border-tax adjustments, rebating both tariffs on inputs of importable goods and taxes on inputs subject to domestic excise taxes, a zero rate of effective protection of exports can be assured.

3. Effective protection and prohibitive tariffs

In studying problems of public finance, special issues arise when taxes, tariffs, or other types of restrictions cause a particular activity to cease entirely. A prohibitive tax on the production of a
commodity is one that results in the cessation of its production; a prohibitive import duty is one that reduces imports to zero.

A problem that emerges in such cases is that several different tax or tariff rates have equivalent effects. Thus, moving a particular tariff from zero to 120 percent might steadily reduce the level of imports of the good in question. Yet, if imports reach zero with a tariff of 120 percent, they remain at zero when the tariff is raised to 130 or 150 percent and beyond. The functional dependency of the level of imports on the rate of the tariff stops, so to speak, once the tariff reaches 120 percent. This fact creates problems for writers who would want to say something like “whenever a tariff is raised, the effect is to lower the level of imports of the affected good.”

To leave such statements intact, a convenient convention has evolved. This convention suggests that we should use the “just barely prohibitive tax rate” as a surrogate for any given prohibitive tax rate in interpreting statements about it. Thus, if faced with analyzing a rate of 130 or 150 percent in the case just cited, we could substitute 120 percent for the given rate, and use it instead. The effect would be the same, as all the rates in question are prohibitive.

Another aspect of prohibitive tariffs is that they can effectively eliminate certain processes in the measurement of effective protection. Suppose, for example, that a 40-percent duty would eliminate all imports of coal. If we assume that coal and iron ore both initially serve as imported inputs into making steel (as shown in Tables 2.4 and 2.5), we can state unambiguously that a uniform 30-percent tariff (with such associated domestic tax treatment of the domestic use of exportable inputs that may be required) would entail a 30-percent uniform protection. The same goes for a 35-percent and even, in the limit, a 40-percent uniform tariff. At the latter tariff rate (at which coal imports barely cease) we can deal with the case as if marginal coal imports still exist. (If it makes
things easier, we can assume a 39.9 percent uniform tariff rather than one of 40 percent.)

But what if we move to a 60-percent uniform tariff? Inputs of iron ore now bear a peso cost that is 60 percent above the world price. So, too, do any other imported inputs. But coal will not cost 60 percent more than the world market price. Without further information about the nature of costs and of competition in coal production, we cannot say any more than that. At tariff rates of 40 percent or above, coal is a domestic resource cost, not an imported input in making steel.

This gives us a clue which clarifies an otherwise puzzling situation. The fact is that just as a uniform 30-percent nominal tariff provides 30-percent effective protection to all relevant activities, and a 40-percent uniform rate gives 40-percent effective protection, so too a 50- or 60-percent uniform rate would provide 50- or 60-percent effective protection to all relevant activities. The general proposition that a uniform tariff provides uniform, effective protection remains intact. However, as we move the uniform tariff rate upward, we observe changes in the set of "relevant activities" for which effective protection is being calculated.

At tariff rates below 40 percent, in our example, imported coal is actually used as an input into making steel. For a marginal increase in domestic output of steel, all the coal will come from imports. (This follows because the price will not rise to stimulate additional domestic production.) The "domestic resource cost per dollar of net import substitution" will be measured by calculating in the numerator the domestic costs of the nonimported resources used, and in the denominator the net dollars saved (see Tables 2.4 and 2.5). Imports of coal will appear (along with iron ore) as negative items in the denominator of this ratio.

When we pass uniform tariff rates above 40 percent, coal ceases
to be an imported input in the making of steel. Instead, it becomes a domestic resource cost. It appears now in the numerator of the (domestic resource cost/net dollars saved) ratio. The protected operation, which previously was the conversion of imported coal and iron ore into steel (as in Tables 2.4 and 2.5), now becomes one of converting just imported iron ore into steel. On this operation, a uniform tariff of 50 or 60 percent represents an effective tariff of 50 or 60 percent.

All this is “as it should be.” When we raise a uniform tariff rate, we expect to get more and more domestic production and have less and less imports. Part of this process entails the passage of certain activities from the “import category” to the “domestic resource use” category. This is what happens to coal in the present case. At uniform rates of protection below 40 percent, coal is in fact an imported input and should be treated as such. At rates above 40 percent, it has become (as a result of the very protection we are analyzing) a domestic resource cost.

4. The concept of a “true tariff”

In its essence, effective protection is a microeconomic concept. The formula \( t_j = (t_i - \sum a_i t_i)/(1 - \sum a_i) \) refers to any particular protected item or activity \( j \), however tiny it may be. Likewise, the proposition that uniform protection renders the nominal rate equal to the effective rate is true item-by-item. If the various material inputs that go into the production of pencils are similarly tariffed at 20 percent, then the operation of converting those material inputs into pencils will have an effective rate of protection of 20 percent, regardless of what tariff rates apply to other things. Once we recognize the truth of the observation in the preceding statement, we can appreciate that the general theorem is also in a sense microeconomic in nature. The theorem states that a general uniform duty will give equal effective protection to all import-substituting activities. When we know that all actual and potential outputs of import-substituting operations will be subject to a given rate of tariff, and that all tradable inputs into those activities will be taxed at the same rate, the statement of the previous paragraph
export taxes, one particular combination which characterizes each case.

This is done by the concept of "true tariffs." Under this concept, the case of Graph A would be represented by a combination of a 35-percent general tariff plus a 10-percent across-the-board export tax. The case of Graph B would be reflected in the combination of a 5-percent uniform tariff plus a 30-percent general export tax. The rule is that a uniform tariff, or a uniform export tax, or any combination thereof, will be represented by its "true" equivalent, where the "true" equivalent is defined as a tariff \( t_m \) such that
\[
\frac{p_m}{p_d} = \frac{(1+t_m)}{(p^o_m/p^o_d)}
\]
and an export tax \( t_x \) such that
\[
\frac{p_x}{p_d} = \frac{(1-t_x)}{(p^o_x/p^o_d)}.
\]
Here \( (p^o_m/p^o_d) \) and \( (p^o_x/p^o_d) \) are the ratios that the import prices and export prices, respectively, would bear to the general price level in the absence of any trade restrictions.

The extreme cases under a 50-percent import duty are that with a completely elastic demand for imports (when the true tariff \( t_m \) would be zero and the true export tax \( t_x \) would be 33.33 percent), and that with a completely elastic supply curve of exports (when \( t_m \) would be 50 percent and \( t_x \) would be zero).

It is easy to see how the above concept generalizes to systems of tariffs and export taxes (as well as other trade distortions). We can simply define the "true tariff" on import good \( j \) to be \( t_m \), where
\[
\frac{p_m}{p_d} = \frac{(1+t_m)}{(p^o_m/p^o_d)}.
\]
Similarly, the "true export tax" on export good \( k \) is \( t_x \), where
\[
\frac{p_x}{p_d} = \frac{(1-t_x)}{(p^o_x/p^o_d)}.
\]
Thus a system "like" that of Graph A in Figure 2.4, but with non-uniform tariffs might actually have tariffs equal to 30 percent, 50 percent, and 70 percent. If this combination of tariffs drove the nominal exchange rate down by 10 percent, relative to \( P_d \), we would have \( t_x = 10 \) percent, \( t_m^1 = 17 \) percent, \( t_m^2 = 35 \) percent, and \( t_m^3 = 53 \) percent. (Note that 90 x 1.30 = 117; 90 x 1.50 = 135; 90 x 1.70 = 153.) If some import good \( m_4 \) were left free of duty,
its “true tariff” rate would be $t_{m4} = -10$ percent; this would be a rate equal to the negative of the “true export tax” of 10 percent (so long as there is no nominal tax or subsidy on exports).

A more complicated picture could emerge if, together with the above tariff rates, including $t_{m4} = 0$, we had a tax of 10 percent on $x_1$, and a subsidy of 10 percent on $x_3$, with $t_{x4} = 0$. This could result in $t_{x2} = 10$ percent (like $t$ in the previous case), with $t_{x1} = 19$ percent and $t_{x3} = 1$ percent. (Note that if the untaxed export has its price relative to $p_d$, reduced to 90, the export taxed at 10 percent will have its price reduced to 81, while the one subsidized by 10 percent will see its price fall only to 99.)

The concept of the true tariffs is of great interest, particularly because knowledge of the structure of “true tariffs” and “true export taxes” enables us to see readily how the entire system of trade restrictions has affected particular groups in their roles as producers and/or consumers of different products. Unfortunately, the concept is in its essence macroeconomic, dealing with the entire structure of trade restrictions as a whole. Each single tariff on imports of commodity $j$ will cause its internal price to rise relative to the domestic price level. At the same time, through its effect on the real exchange rate, it will produce a fall in the internal prices of all exports and in the internal prices of all imports. In a similar way, each single tax striking the exports of good $k$ will cause its internal price to fall, relative to $p_d$. But simultaneously it will cause a rise in the real exchange rate $E/p_d$, and through this will tend to accord positive protection to all other tradable goods (that is, exportables other than good $k$, plus all importables). Thus, any existing structure of true tariffs can be viewed as the end product of a series of moves in which all the existing tariffs and all the existing export taxes or subsidies (together with other existing trade distortions) are sequentially imposed. For each importable item subject to tariff, this total effect will consist of the tariff $t$, together with the movement of the real exchange rate $E/p_d$ caused by all tariffs, export taxes, restrictions, and similar trade distortions in the system.
Only when we know how the system of distortions has influenced the real exchange rate can we calculate the "true tariffs" $t_{mj}$ and the "true export taxes" $t_{ek}$ generated by a particular system. This is why "true tariffs" must be considered a macroeconomic concept. In the same vein, it is possible to know the rate of effective protection associated with any activity simply by knowing the rate of tariff on the final product of that activity, plus the tariff rates (or rates of domestic taxes) striking the various tradable inputs that enter into that particular activity. We need not know how the total structure of tariffs and other restrictions has influenced the real exchange rate $E/p_d$ on any other variables. This gives us the sense that effective protection is a microeconomic concept.

Notes

1. An ordinary excise tax meets the full qualifications of a tax on domestic use, as that term is meant here, so long as the country applies the standard tax adjustments approved under the General Agreement on Tariffs and Trade (GATT). Such adjustments would involve rebating the tax when the product is exported, causing (just as in the case of a tariff) the internal price of the good to exceed the world price by the amount of the tax.

2. Economists have long recognized the fact that the costs of tariffs are in part borne by the producers of exports and that consumers of export-type goods (as well as of nonprotected imports) actually benefit when tariffs are placed on imports of protected goods. Nonetheless, the formalization of the main relationships involved, and the empirical measurement of "true" export taxes awaited the work of Larry A. Sjaastad and his collaborators. See:


Elements of real-rate analysis

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- Concept of "dollar's worth" 145
- Domestic deflator 155
- Dollar-price or world-price deflator 157
- Reflections and conclusions 164
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3.01 Introduction

In this chapter we take the reader on a guided tour of exchange-rate analysis. Starting from the most elementary building blocks of international trade theory, we deal first with the determination of the nominal exchange rate under ideal circumstances—a flexible exchange-rate system supported by a monetary policy that keeps the general level of prices stable (Section 3.02). Then we pass on to examine a familiar set of problems—the international adjustment mechanism for a small country with a fixed exchange rate.

For each of these cases we examine the economic adjustments required by six different types of disturbances:

- a. the imposition of import restrictions;
- b. the imposition of export restrictions;
- c. an inflow of capital spent exclusively on tradable goods;
- d. an inflow of capital spent exclusively on nontradable goods;
- e. a rise in the world price of an export product; and
- f. a rise in the world price of an import product.

The equilibrium nominal exchange rate (the domestic-currency price of foreign money) falls as a result of a, rises as a consequence of b, remains unchanged under c, and falls under d and e. The adjustment to disturbances of type f is ambiguous; its direction depends critically on the elasticity of demand for imports of the affected product(s).

The concept of the real exchange rate is introduced in Section 3.03. When the nominal exchange rate is held constant, the same adjustments dealt with in Section 3.02 take place through movements in the general price level. Under a flexible exchange rate (with stable monetary policy), the disturbances a to f result in movements in the nominal exchange rate E. When a fixed exchange-rate policy is pursued, the same disturbances give rise to movements in the gen-
eral price level $p_e$. When the exchange-rate variable to be studied is defined as $E/p_e$, the identical analysis is capable of answering the problems posed in both Sections 3.02 and 3.03.

The concept of the “dollar’s worth” is used as a unit of measurement of the quantities of imports and exports (Section 3.04). This concept implies that the real exchange rate depends on imports and exports, and on the world prices of tradable goods. In particular, the real exchange rate depends on the world prices of a country’s export goods in one way, and on the world prices of that country’s import goods in another way.

This provides a powerful argument against thinking of the real exchange rate as the price index of tradable goods relative to that of nontradables. In the simple analysis of Sections 3.02 and 3.03, the nominal exchange rate is always the peso price of the dollar. The real exchange rate in these simple exercises is the peso price of the dollar relative to the general price index (or some other chosen numeraire).

The problem of following the real exchange rate of a country over time is addressed in Section 3.05. The problem is one of dealing with changes in the value of the dollar (or some other relative foreign-currency unit) over time. We know that for simple cases like those in Sections 3.02 and 3.03, we want to measure imports and exports in units of the “dollar’s worth”; we know that the number (or the quantity) of such units should change with alterations in the dollar prices of one or more import or export goods. But these conclusions were reached by doing exercises that were “timeless” in the sense that all comparative static theory is timeless.

When we postulate changes in the dollar prices of some imports
and/or exports, we implicitly hold other dollar prices constant. This
assumption is not met when we follow a real-world economy
through time. In addition to the movements of the dollar prices of
each country’s tradables, there is a general movement of world
prices, measured in dollars or any other foreign currency. We
would like to be able to correct for general world-price movements
when we work with data spanning extended periods of time, yet at
the same time we want to allow for changes in the relative prices of
some or all of a country’s imports, and/or some or all of its exports.

This objective is accomplished by the choice of some general dollar
(or world) price level $p^*$ as the yardstick for measuring over time
the “real dollar’s worth.” Thus, the nominal demand for foreign
exchange arising out of imports is $M_p^*$, where $M$ is the quantity
and $p^*_m$ is the dollar price of imports; the nominal supply of foreign
exchange arising out of exports is $X_p^*$, where $X$ is the quantity and
$p^*_e$ is the dollar price of exports. The real quantity of foreign ex-
change demanded (for imports) is then measured over time $t$ by

$$M_{p^*}/p^*_m,$$

the real quantity supplied (for exports) by $X_{p^*}/p^*_e$.

The corresponding real price of foreign exchange is $E_{p^*}/p^*_e$, where
$p^*_e$ is the general dollar-price index and $p^*_e$ is the general price index
of the country in question, all at time $t$. The product of real price
times real quantity would be $[(M_{p^*}/p^*_m)(E_{p^*}/p^*_e) = M_{p^*}E/p^*_m]$ for imports, and $[(X_{p^*}/p^*_e)(E_{p^*}/p^*_e) = X_{p^*}E/p^*_e]$ for exports.

That is, real price times real quantity of foreign exchange in either
category is equal to its nominal domestic-currency value at the
border divided by the general index of domestic prices.

This is the way it should be. The real value of the foreign exchange
demanded or supplied, as distinct from its real price, is independent
of the index chosen to correct for changes in world prices over time.
It depends only on the current nominal market values of the foreign
exchange transacted, and on the current value of the domestic-price
index used to convert nominal local-currency values into real values.
The issues surrounding the choice of an appropriate index to correct for foreign inflation are discussed in Section 3.06. Having previously established that the real exchange rate should fall when the dollar prices of exportables rise, and should also be influenced by changes in the dollar prices of importables, we rule out the use of these specific prices (that is, the dollar-price level of the country's tradables), either separately or in combination, as the relevant deflating index. Ruling out a country-specific deflating index automatically suggests that a single dollar-price index be used for determining the real volume of demand and supply for foreign currency, and for defining the basket of goods whose relative price in each country is that country's real exchange rate.

The questions that arise in this context are:

a. Should the index refer to dollar prices only, or to prices expressed in other currencies as well?; and
b. Should the index reflect mainly or wholly the prices of tradables (even though it is not separately calculated for each country's tradables), or should it attempt to achieve a broader coverage of goods and services?

The answers to these questions are recognized to be judgmental rather than deterministic, which suggests useful and convenient conventions rather than solutions that are dictated in some absolute sense by the underlying theory. The answer suggested for a is that so long as the relevant trade statistics are presented in U.S. dollars, the deflating index should be a deflator of dollar prices, but this does not prevent it from being an average of U.S. prices along with German prices converted at the dollar price of the mark, British prices converted at the dollar price of the pound, Japanese prices converted at the dollar price of the yen, etcetera.

For question b, the answer suggested is a basket of tradable goods somewhere on the high seas. The grounds for using wholesale
price indexes are that they are composed predominantly of tradables and that they are available on a monthly basis, in general, quite promptly. The simplest would be the use of the U.S. wholesale price index to deflate dollar values of imports and exports and to define over time the "real dollar" for which the real exchange rate of a country's currency is the relative price. More complicated, but probably preferable, would be a weighted average of the dollar prices of the wholesale price baskets of the major trading nations.

The notion that what is being priced is a bundle of tradables floating on the ocean rules out consumer price baskets and GDP (or GNP) baskets. But we could conceive of a weighted average of the tradable components of these baskets. To the extent that separable GDP price deflators are already calculated for the manufacturing and the agricultural sectors, it is possible to build national price indexes for tradables on the basis of these components.

3.02 Equilibrium exchange rate under flexible-rate system

The six types of disturbances listed in Section 3.01 are here analyzed under a flexible exchange-rate system. Under this system, it is assumed that monetary policy is managed in such a way as to keep constant the general price level $p_d$ of the country in question. Unless otherwise specified, prices in the rest of the world (which are expressed in relevant foreign currency units, such as dollars in this case) are also assumed to be constant. Thus, movements in the nominal exchange rate as derived in this section will also be movements in the real exchange rate as defined in Section 3.01.

The demand curves for imports and the supply curves for exports in Figure 3.1 are calibrated so that the quantity axis refers to units that cost one dollar at world market prices. Thus, if the world price of
Figure 3-1. Adjustment to disturbances under flexible rate system

A. Import tariff ($T_m$) is imposed

- Exchange rate (pesos per dollar)
- Demand for imports ($M$)
- Supply of exports ($X$)
- Demand price for foreign currency (net of $T_m$)

B. Export tax ($T_x$) is imposed

- Exchange rate (pesos per dollar)
- Supply price of foreign currency (gross of $T_x$)
- Demand for imports ($M$)

C. Capital inflow spent on imports

- Exchange rate (pesos per dollar)
- Initial demand for imports ($M_0$)
- Supply of exports ($X$)
- New demand for imports
- Capital inflow spent wholly on imports

D. Capital inflow spent on nontradables

- Exchange rate (pesos per dollar)
- Supply of exports ($X$)
- Capital inflow spent wholly on nontradables

E. World price of exports doubles

- Exchange rate (pesos per dollar)
- Demand for imports ($M$)
- Supply of exports when $P'_{x}=p_0_{x}$
- Supply of exports when $P'_{x}=2p_0_{x}$

F. World price of imports doubles

- Exchange rate (pesos per dollar)
- Demand for imports when $P'_{m}=2p_0_{m}$
- Supply of exports

Note: The general price level ($P_d$) is held constant by monetary policy. Imports ($M$) and exports ($X$) are measured in units of "dollars' worth" at world market prices.
coal is 50 dollars a ton (2,000 pounds), coal will be measured in units of 40 pounds (2,000/50). If the world price of aluminum is 80 cents a pound, it will be measured in units of 1.25 pounds. In this way, the demand curves for foreign currency arising out of many different import goods can be amalgamated into a single demand curve for foreign currency to pay for imports. Similarly, the supply curves of foreign currency arising out of many different export commodities can be aggregated into a single supply curve of foreign currency arising out of exports. The two aggregate curves thus constructed are the demand curve for imports and the supply curve for exports. These terms are commonly used in the literature of international economics (see Section 1.03).

When tariffs are imposed on imports, the demand for foreign currency arising out of any import good is derived by taking the demand price net of tariff for each successive dollar's worth of the import. This is done in Graph A in Figure 3.1. The tariff is assumed to be a fixed percentage of the local-currency price of the product; this generates a net-of-tariff curve. We can easily see how the equilibrium exchange rate is reduced by the imposition of a uniform import tariff. Both imports and exports fall as a consequence of the tariff. (Balanced trade is assumed unless specified otherwise.)

In Graph B, the case of a uniform export tax is examined. In this case, the equilibrium market exchange rate must be sufficient to pay both the fundamental supply price of exports (given by the height, at any quantity, of the solid supply curve of exports) and the tax on exports to the government. When there is no tax, equilibrium is reached at $M^e = X^e$, and the market exchange rate $E$, pays only the suppliers of exports; in the presence of the tax, the equilibrium shifts to $M^t = X^t$, where the market exchange rate produces enough to pay both what the suppliers of exports require to provide the quantity $X^t$ and what the government demands in the form of export taxes.
A comparison of Graphs A and B in Figure 3.1 confirms the familiar proposition: under conditions of balanced trade, the same equilibrium can be produced either by a uniform import tariff (Graph A) or a uniform export tax (Graph B). While such an equilibrium is identical in terms of the quantities of exports and imports (at \(M' = X'\)), and in terms of the gross price paid by the demanders of imports and the net price received by the suppliers of exports, it is not identical with respect to the exchange rate. In Figure 3.1, the nominal exchange rate falls as a result of an import tariff, and rises as a consequence of an (otherwise equivalent) export tax. More generally, we will find that the equilibrium real exchange rate, likewise, has opposite directions of movement in response to import tariffs on the one hand and export taxes on the other.

The consequences of capital inflows are traced in Graph C and Graph D. In Graph C, the proceeds of the borrowings are spent on imports. This means that the demand curve for imports shifts to the right by an amount equivalent to the borrowings. Because the balance-of-payments equilibrium will require imports to exceed exports by the amount of foreign borrowing, there is no cause for the exchange rate to change. The same would be true if the proceeds of the borrowings were spent fully on exportables (in which case the supply curve of exports would shift to the left by an amount equivalent to the borrowing, while the demand curve for imports would remain unchanged) or if these proceeds were divided, with one part spent on exportables and the remainder on importables.

In the latter case, we could modify Graph C to include both a shift to the left of the supply curve of exports by the amount of borrowings spent on exportables, together with a shift to the right of the demand curve for imports by the amount of the borrowings spent on importables. The combination of these two shifts would create (at the old exchange rate \(E_0\)), an excess of import demand over
export supply equal to exactly the amount of the borrowings. Hence when foreign borrowings are fully spent on tradables, they do not affect the equilibrium exchange rate.

The story is different when foreign borrowings are spent on non-tradables (Graph D). Here an economic adjustment must be made (the so-called “transfer problem” must be solved) to validate in real terms what would otherwise just be a transfer of monetary purchasing power. The receiving country effectively uses a net capital inflow only to the extent that it imports more than it exports. When the foreign capital is directly spent on tradables, the required excess of imports over exports is automatically created. But when the capital is spent on nontradable goods and services (for roads, housing construction, irrigation projects, and so forth), the money borrowed from abroad (dollars) must be sold to obtain the local currency (pesos) needed to pay wages and cover other local costs. In the process, the exchange rate will fall, as depicted in Graph D, so long as monetary stability is maintained.

Of course, any actual capital inflow from abroad is unlikely to be spent exclusively on either tradables or nontradables. It should be clear from Graph C and Graph D that in such a case there will still be a fall in the exchange rate, since the part of the capital flow spent on tradables has no effect while the part spent on nontradables exerts downward pressure on the exchange rate.

In Graph E, the familiar phenomenon of “Dutch disease” is depicted. A substantial increase in the world prices of exports—such as a rise in the price of an important export product (natural gas in the case of Holland)—generates a large increase in the amount of foreign currency available in the market, which in turn leads to a reduction in the exchange rate (the price of foreign currency). The rise in the world price of exports causes a shift in the supply curve of foreign currency, even though the supply curve of the export
good in terms of its own peso price remains constant.

A single point on the peso supply curve, showing 20 million pounds of sugar at 1 peso per pound, will be reflected in:

a. a supply of foreign currency of $2 million against an exchange rate of 10 pesos per dollar if the world price is 10 cents a pound;

b. a supply of foreign currency of $4 million against an exchange rate of 5 pesos per dollar if the world price is 20 cents a pound; and

c. a supply of foreign currency of $1 million against an exchange rate of 20 pesos per dollar if the world price is 5 cents a pound.

Thus, an unchanged supply curve of sugar in terms of its domestic relative price will be translated into different supply curves of foreign exchange, depending on the dollar price of sugar in the world market. Accordingly, a rise in the dollar price of exports will cause the market exchange rate in Graph E to fall (from $E_0$ to $E_1$) under a flexible-rate regime in conditions of monetary stability.

In Graph F, the demand curve for foreign exchange arising out of imports also undergoes a shift with a changing world-market price of the import goods in question. Though the nature of the shift is identical to that applying to the supply curve of exports, the shift in Graph F looks different from that in Graph E. This is only because the demand curve for imports is downward sloping while the supply curve of exports is upward sloping.

The nature of the economic adjustment to a rise in the world price of imports is clear. The initial response is simply a rise in the internal (peso) price of the good(s) in question. This will be reflected in unchanged peso expenditures if the elasticity of de-
mand for imports of the good is one, in increased peso expenditures if the elasticity is less than one, and in reduced peso outlays if the elasticity is greater than one. From this proposition we can deduce that there will be one range in which the demand for dollars (at a given exchange rate) will be reduced, and another range in which that demand will be increased as a consequence of a rise in the world price of imports. In Graph F, the initial equilibrium (at exchange rate $E_0$) was in the range where the demand for imports had an elasticity of greater than one; hence, the consequence of the price rise is a reduction in total peso outlays on dollars. Had the initial equilibrium been in a different range, peso outlays might have gone up rather than down; in this case the equilibrium exchange rate would have risen rather than fallen.²

3.03  

Economic adjustment under fixed rates

The money supply and the general price level $p_d$ play an active role in the fixed exchange-rate system. These are the key elements that distinguish the fixed-rate system from the flexible-rate one (described in Section 3.02). In Figure 3.2, Graph A, we consider the imposition of a 50-percent uniform import tariff. Because the world prices of importables and exportables are given, the tariff will cause the price of imports to rise and that of exports to stay constant. The price rise will result in a reduction in imports and cause a surplus in the balance of trade (where there was initially an equilibrium). This, in turn, will lead to an expansion of the money supply as the central bank buys the extra dollars. As the money supply expands, upward pressure is exerted on the general level of prices and costs, $p_d$. Because the demand for imports and the supply of exports are functions of the relative prices of imports and exports $[(p_m/p_d)$ and $(p_e/p_d)$, respectively], the upward pressure on $p_d$ causes these curves to shift upward.

The money supply and the general price level play an active role in the fixed exchange-rate system. These are the key elements that distinguish the fixed-rate system from the flexible-rate system.
Figure 3-2. Adjustment under fixed exchange rates: Uniform import tariffs and exports taxes

A. A 50% uniform tariff on imports causes monetary expansion; new equilibrium has $E_g = 15, E_n = 10$

B. A 50% uniform export tax causes monetary contraction; new equilibrium has $E_g = 10, E_n = 6.67$

Note: A fixed exchange rate of 10 pesos per dollar is assumed in this figure.
The new equilibrium is shown in Graph A at $M^1 = X^1$. The price paid by demanders of imports is 15 pesos per dollar's worth. Of this, 5 pesos goes to the government, and 10 pesos goes to buy the necessary foreign exchange at a fixed rate of 10 pesos per dollar. The amount of foreign exchange demanded is $M^1$; this is equal to $X^1$, the amount supplied. The supply of foreign exchange has been reduced in the adjustment process, as the pressure of increasing costs has shifted the supply curve upward from $S^*$ to $S^*_1$.

Graph B shows how the adjustment process works when we impose a uniform export tax of 50 percent of the net price received by exporters (which is equal to $33\frac{1}{3}$ percent of the gross price paid by the foreign buyers). In this case, the effect is to reduce the supply of exports relative to the demand for imports. A deficit in the balance of trade emerges, and consequently both international reserves and money supply get reduced. A downward pressure is exerted on the general level of prices and costs $p_d$. Equilibrium is reached in a situation like that represented by the dotted curves $D^*_1$ and $S^*_1$. The quantity of imports demanded (at a price equal to 10 pesos per dollar's worth) falls from $M^*$ to $M^1$, because $p_d$ has fallen, while import prices remain the same. The quantity of exports has fallen because, in the presence of the tax, exporters receive only 6.67 pesos per dollar's worth. Costs have fallen, and this fall has caused a shift of the supply curve of exports from $S^*$ to $S^*_1$, but the incentives are for a reduction in supply as compared with the initial equilibrium at $M^* = X^*$. This is because the prices received by exporters have fallen more than the general price level; this fall causes a movement along $S^*_1$ from $X^*$ to $X^1$.

This is the appropriate point to compare the results of Graphs A and B in Figure 3.2 with those of Graphs A and B in Figure 3.1. The new equilibrium in the latter two graphs can be replicated in Figure 3.2 by following the solid curves $D^*$ and $S^*$ to the new equilibrium. If the general price level remains constant while the
Figure 3-2. Adjustment under fixed exchange rates: capital inflows and capital price rise (contd.)

C. A capital inflow spent on nontradedables is absorbed via an import surplus. Surplus is brought about at E=10 via monetary expansion. Without monetary expansion E would have to fall to 7.

D. A rise in the world price of exports ($P'_x$) causes an increase in the dollar volume of both imports and exports. With fixed exchange rate at $E=10$, monetary expansion occurs to bring this about. Otherwise E would fall to 6.

Note: A fixed exchange rate of 10 pesos per dollar is assumed.
exchange rate falls, we would have equilibrium in Graph A, Figure 3.2 at an exchange rate of 8 pesos per dollar, buyers of imports would pay 12 pesos' worth, owing to the 50-percent import tariff.

The mechanism of adjustment under fixed exchange rates produces an equilibrium in which demanders pay 15 pesos per dollar's worth of imports, and suppliers get 10 pesos per dollar's worth of exports, when the exchange rate is 10 pesos per dollar and a 50-percent tariff is imposed on imports (see Graph A in Figure 3.2). With the same exchange rate a 50-percent export tax would generate an equilibrium in which demanders of imports would pay 10 pesos and suppliers of exports would get 6.67 pesos per dollar's worth (see Graph B in Figure 3.2). But in real terms, all of these equilibria are the same. In all of them, the price paid by demanders of a dollar's worth of imports ends up 50 percent higher than the price received by suppliers for a dollar's worth of exports.

The differences in the levels of import and export prices simply mirror what happens to the general price level in each of the three cases. First, in the flexible exchange-rate case (solid curves) the general price level remains constant. Second, in the fixed exchange-rate case with a 50-percent import tariff, the monetary expansion produced by the adjustment causes the general price level to move up from index 100 to index 125. Third, under a fixed exchange-rate case with a 50-percent export tax, the deflationary process entailed by the adjustment causes the general price level to fall from index 100 to index 83 1/3. Thus, in each of the final equilibria, the price of imports has risen 20 percent and the price of exports has fallen 20 percent, relative to the general price level.

Graph C in Figure 3.2 is comparable to Graph D in Figure 3.1. A capital inflow equal in amount to M' - X' dollars and spent wholly
on nontradables would, if the general price level $p_4$ were held stable by monetary policy, cause the nominal exchange rate $E$ to fall from 10 pesos to about 7 pesos per dollar. This is shown by the gap $M^t - X^t$ between the solid curves $D^e$ and $S^e$. Obviously, this cannot happen if the country is maintaining a fixed exchange rate. In such a case, the initial impact of the capital inflow will come through the sale of the borrowed foreign exchange (say, dollars) to the central bank to obtain the local currency (say, pesos) needed for buying nontradable goods and services in the local market. This causes an expansion of the peso money supply, which continues until the gap between imports and exports becomes equal to the size of the capital inflow. (It is assumed here that foreign capital would continue to flow for a long time, not be a one-shot injection.)

In the case depicted in Graph D, equilibrium is reached when the monetary expansion has caused a 40-percent upward shift in the demand curve for imports and the supply curve for exports. This is consonant with a 40-percent rise in the general price level. Comparability between the fixed- and flexible-rate cases is maintained. In the fixed-rate case, the general price level rises from index 100 to 140, while the exchange rate stays constant at 10 pesos per dollar. In the flexible-rate case, the general price level remains constant, while the equilibrium exchange rate falls to approximately 7.3

Graph D shows the economy’s response to a rise in the world price of exports under fixed exchange rates. The rise in price would shift the supply curve of foreign currency to the right. Under a flexible exchange rate and a stable general price level, this would cause the nominal exchange rate to fall from 10 to 6 pesos per dollar (see Figure 3.1, Graph E). Instead, with a fixed exchange rate of 10 pesos, monetary expansion occurs as a consequence of the inflow of foreign exchange, driving up the general level of prices $p_d$. The new equilibrium level is $166\frac{2}{3}$, rather than 100, so the new equilibrium real exchange rate $E/p_d$ is the same under a fixed exchange rate system as it would be under a flexible one.
It is hardly a new idea that when dealing with problems of international trade for a small country we should treat world prices as given and should use the composite commodities based on the given world prices when working with aggregates, such as the demand for tradables, the supply of tradables, the demand for imports, and the supply of exports. Far from being new, the idea has become commonplace to the point where a shorthand notation has been developed for it. For example, a writer may usually begin by saying something like “the following analysis will be based on the small-country hypothesis,” and then proceed to his or her task.

We have probably become too complacent, too easy, or too cavalier in working with the small-country hypothesis. Under its convenient shorthand, we have buried at least two important problems. First, by correctly assuming that a small country can do nothing that will change the world prices it faces, we have fallen into the trap of neglecting changes in world prices of individual commodities as an important class of disturbances to be analyzed. Second, (in part as a consequence of the first), we have not been critical enough in accepting as a definition of the real exchange rate the ratio of the “price of tradables” to the “price of nontradables.”

On the first point, let us recognize that the small-country hypothesis is used in building the demand curve for imports, the supply curve for exports, and their counterparts for importables, exportables, and tradables. Each of these is typically a composite good; in constructing the demand or supply curve of that composite, the individual prices of its separate component items are assumed to move up and down together (that is in the same proportion). Many of the problems dealt with in this context can be handled by using composite goods, which are defined on the next page.
Let the relative price of each member of the composite good be defined as:

$$p^*_j E(1+t_j)/p_d$$

where $p^*_j$ is the world price;

$E$ is the nominal exchange rate translating the world price from dollars to pesos;

$t_j$ is the distortion (tariff in the case of imports, export subsidy in the case of exports) causing the internal price to be above the world price converted at the market exchange rate; and

$p_d$ is the general price level.

The relative price of all tradables, thus defined, will move up and down if the exchange rate moves up and down, as would naturally happen (other things being equal), with a change in the rate of capital inflow under a flexible exchange-rate system. The relative price of all tradables would react similarly to capital flows under a fixed exchange-rate system, but in this case the common fluctuations in each relative price derive from changes in $p_d$ rather than in $E$.

For dealing with uniform tariffs—standard fare for textbook treatments of this type of material—we must distinguish between importables and exportables. Once that distinction is made we can see how, under the small-country hypothesis, a uniform tariff will cause the relative prices of all importables to move up by an equal amount, and those of all exportables to move down by a given amount. An export tax has a similar effect. A uniform export subsidy works on the relative prices of all exportables in the same
way as a uniform import tariff works on the relative prices of all importables.

From the above discussion we can derive two results. One is the equivalence (under balanced trade) of uniform export taxes on the one hand and uniform import duties on the other. The other is (again under balanced trade) that a uniform import tariff combined with a uniform export subsidy at the same rate has no ultimate real effect at all; it produces instead a countervailing movement, from one equilibrium to another, in $E/p_e$.

The same framework has also been widely used in the discussion of purchasing power parity. For example, when $p^*$ (for imports and exports alike) changes by a given percentage, equilibrium can be restored under a fixed exchange rate by an equal-percentage movement in $p_e$. Generally, the necessary adjustment can be achieved through an offsetting movement in $E/p_e$. When the predominant forces at work are monetary ones, and they cause $p^*$ to move by a certain percentage while $p_e$ moves by a different percentage, the relative price of each tradable $[p^*E(1+t)/p_e]$ can nonetheless be kept constant by an offsetting movement in $E$. Such a move is simulated when a country sets a new nominal exchange-rate level by applying a purchasing-power-parity formula.

The above examples show how much can be done while still maintaining the assumption that prices of all tradables (or exportables or importables or exports or imports) move together. But obviously there are many problems that cannot be dealt with under that assumption. On the whole, such problems have been dealt with through the use of a more partial-equilibrium framework. Examples include the analysis of the effects of a tariff or an export tax on a single commodity; the calculation of rates of effective protec-
tion; and the finding of second-best optima, such as the Ramsey problem of choosing tariff rates on a subset of commodities to minimize the efficiency costs of raising a given amount of revenue from them.

In at least one case—the problem of "Dutch disease" arising from a dramatic rise in the world price of a country's principal export good—the nature of the problem demanded a macroeconomic framework and precluded the assumption of a composite export commodity. Here, the analysis has on the whole been correct and to the point, but the relationship of this case to the other general-equilibrium problems discussed above was not made clear.

We should try wherever possible to embed our "partial" analysis in a general-equilibrium setting. This means we should couch our analysis of a tariff on a single commodity in such a way that when imports are viewed as being subjected one after another to a given tariff rate, until finally all are covered, we get the correct answer for a uniform tariff. The same should hold for export taxes and subsidies and for the various combinations of uniform taxes and subsidies on exports and imports.

This means that we should recognize that each import tariff on each single good produces a downward shift in the demand curve for foreign exchange, and a corresponding downward effect on the real exchange rate. Likewise, each export tax on a single good causes a leftward shift in the supply curve for foreign exchange and a corresponding upward effect on the real exchange rate.

The above statement causes no difficulties until it is realized that
p*_j and (1+t) enter in a similar way in the expression for the relative price \([p*_j (1+t)/p_j]\) of imports of j. Just as we do not want to confine ourselves to analyze just uniform tariffs or export taxes, so too, we do not want to confine ourselves to cases where all of the \(p*_j\) for all tradables move together. We should strive for an analysis that can deal with changes in the price of individual export and/or import goods, and can do so in such a way that the sum total of the individual effects on all such goods is equal to the already well-recognized general-equilibrium result.

Figure 3.3 illustrates how the demand and supply curves of foreign exchange (arising out of imports or exports of particular commodities) are altered when the world price of the relevant good is changed. In Graph A, the effect of a doubling of the price of imports of good j is explored; in Graph B, a doubling of the price of exports of good k is assumed. In each case we show how the changing world price affects the demand curve for (or supply curve of) foreign exchange, arising out of the market for the good in question.

Consider the case of a commodity (say, wheat) selling in the world market for $4 a bushel. Its ordinary demand curve will have bushels measured on the horizontal axis and the relative price of the bushel \([p*_w (1+t)/p_w]\) on the vertical axis. To express this demand curve in units of dollar's worth, stretch the quantity axis by multiplying by \(p*_w \) ($4 in this case); the quantity units are now in dollar's worth. Since the price of a dollar's worth is \(1/p*_w\) times the price of a bushel, the new price axis is measured in units of \(E(1+t)/p_e\). This expresses what demanders actually pay per dollar's worth, and includes the tariff or other tax received by the government. To produce a demand curve in which the demand price represents the actual price for foreign currency, we must shift the ordinate of each point downward by dividing by \(1+t\). The re-
Figure 3-3. Demand and supply curves for foreign exchange

A.

Real exchange rate \( (E/P_d) \)

- Initial demand curve (before \( P^*_i \) doubles)
- New demand curve (after \( P^*_i \) doubles)
- Intermediate step \( B \)
- Imports of \( j \)
  (in dollar's worth)

B.

Real exchange rate \( (E/P_d) \)

- Initial supply curve (before \( P^*_k \) doubles)
- Intermediate step
  (Cut initial supply prices in half)
- New supply curve (after \( P^*_k \) doubles)
- Exports of \( k \)
  (in dollar's worth)

C.

Real exchange rate \( (E/P_d) \)

- Initial demand curve (before \( P^*_m \) doubles)
- Intermediate step
  (Cut initial demand prices in half)
- New demand curve
  (same as initial curve)
  (Double quantities on dotted curve)
- Imports of \( m \)
  (in dollar's worth)
sulting demand curve has dollar’s worth on one axis and a relative price of the dollar’s worth $E/p_4$ on the other.

When the world price of wheat $p^*$ changes, this same transformation must be reperformed. Each ordinate of the curve must be multiplied by the old $p^*$ ($\$4$) and divided by the new one (say $\$8$). Similarly, the quantity of foreign exchange demanded at each price must be divided by the old $p^*$ and multiplied by the new one. This is done in Figure 3.3, for a postulated doubling of the world price of the good in question. Graph A deals with a linear demand curve. In effect, it shifts from measuring demand in units of $1/4$ bushel to measuring it in units of $1/8$ bushels. Here, as an initial step, the vertical intercept is cut in half; this operation produces the dotted curve. Then the abscissa of each point must be doubled (to reflect the doubled quantity of dollars that each physical quantity unit, such as a bushel, now produces). This second step produces the new demand curve for foreign currency arising out of imports of j.

Graph B does the same thing for an export supply curve. To obtain the dotted curve (an intermediate step), the height of each point on the old supply curve is cut in half. To obtain the new supply curve of foreign currency arising out of exports of good k, the abscissa of each point on the dotted curve is then doubled.

Graph C shows how these transformations map a unit elastic demand curve into itself. Starting at point A we cut the height in half to get point B; then we double the quantity to get point $A'$—a different point on the same unit-elastic demand curve with which we began.
From Graph C it is also easy to visualize how, starting from a demand curve of constant elasticity of less than one, a rise in the world price of the commodity will result in a new demand curve (for foreign currency) that lies everywhere to the right of the original one. Likewise, if we start from a demand curve of constant elasticity greater than one, a rise in world price will map that curve into a new demand curve for foreign currency that lies everywhere to the left of the original one.

Thus the phenomenon we call the “Dutch disease” is not in any way limited to changes in the world price of the principal exports of a country. Even the tiniest export items give rise to the same type of disease—just in very small doses. All import items (except those with a fortuitously unit-elastic demand curve) have effects on the real exchange rate when the world prices of these items change. For cases where there is local production of the imported good or of close substitutes, the demand is likely to be of greater than unit elasticity, and a rise in world prices will cause a decline in demand for foreign currency and a fall in the real exchange rate. For imports of essential items with no local production (most particularly raw materials and other imports not produced at home), the demand is likely to be inelastic, with a rise in world price producing an increase in the real exchange rate.4

A complex set of connections exist between the world prices of tradable goods on the one hand and the real exchange rate on the other. If we try to explain variations in the real rate as resulting from changes in the world prices of tradables, we would want to at least distinguish three variables—the world-price level of a country’s exports, the world-price level of its competitive imports, and the world-price level of its noncompetitive imports.

All of this suggests a complex set of connections between the world prices of tradable goods on the one hand and the real exchange rate on the other. If we were trying to explain variations in the real exchange rate as resulting from changes in the world price of tradables, we would probably want to at least distinguish three separate explanatory variables—the world-price level of a country’s exports, the world-price level of its competitive imports, and the world-price level of its noncompetitive imports. But even here the strength of the causal connection would differ from commodity to commodity within each category, depending on its indi-
individual elasticity of import demand and export supply. Hence, we have no particular reason to expect to find a particularly good (or "tight") empirical relationship between variations in the real exchange rate and changes in the separate price levels of exports and of the two classes of imports. We would expect to find even less a good "fit" for equations trying to explain movements in the real exchange rate on the basis of changes in the terms of trade (the ratio of the world-price level of exports to the world-price level of all imports) or in the world-price level of a country's tradable goods (typically a weighted average of the price levels of its exports and all of its imports).

This leads to the second main point of this section—how tricky or precarious it might be to think of the real exchange rate as the ratio of the price level of tradables to that of nontradables. This definition works without any problem when the disturbance in question is a capital inflow spent on nontradables. In this case it follows from the nature of the disturbance that prices of all tradables will move together (or remain constant while $p_d$ undergoes changes stemming from movements in the prices of nontradables).

But in just about every other interesting case, differential movements in the prices of tradables or different forces influencing production separate one or more tradables from the rest. Examples include a world oil boom, looked at either from the standpoint of an oil-exporting or an oil-importing country; a reduction in the real costs of producing a particular tradable good, either locally (as a backward country adopts a technology already known but new to it), or worldwide (as in the "Green Revolution," or the arrival of the computer age); and the introduction or relaxation of trade restrictions, either selectively or across the board. In none of these cases is the price ratio of tradables to nontradables particularly helpful as a key to critical insights or as an analytical concept or tool. For example, knowing precisely what happens to this ratio does not tell...
us how the various disturbances will influence the nominal exchange rate $E$, in the event that the general level of prices $p_4$ is held constant; or what will happen to $p_4$ in the event $E$ is held fixed.

More broadly, we should realize that just as we must use the unit of the dollar's worth to measure the demand for imports and the supply of exports in determining the real exchange rate ($E/p_4$) as defined here, so too must we use that unit when talking about the demand and supply of importables and exportables. After all, the demand for imports (under the small-country hypothesis) is nothing more nor less than the excess-demand curve obtained from juxtaposing the demand and supply curves for importables. Similarly, the supply of exports is nothing more than the excess-supply curve obtained when doing the same thing for exportables. Consequently, the dollar's worth has to be the unit for measuring the supply and demand for tradables—at least if we want to maintain the magnificently useful identity between the balance of trade and the excess supply of tradables.

Thus, if this line of argument is correct, we should not put $p_t/p_n$ (price of tradables over price of nontradables) on the vertical axis when we expound demand and supply in the market for tradable goods. Rather, the vertical axis (in a timeless, comparative static analysis) should be labeled $E/p_4$, just as it is when we directly analyze adjustment in the market for foreign exchange.

We should also remember that the demand and supply curves of tradables undergo shifts when world prices of particular import and export goods change, as well as when tariffs, domestic excise taxes, export taxes and subsidies, and other types of distortions and restrictions are imposed. I come away from this entire exercise with a new respect for the old way of thinking about exchange-rate
determination as taking place in the market for foreign exchange. This way of thinking is not just a guide to the day-to-day setting of the nominal exchange rate; it is also a sound guide to the forces determining the equilibrium real exchange rate $E/p_r$.

3.05 **Domestic deflator**

The matters treated in this section and the next are more practical than conceptual; they have more to do with the actual indexes used in empirical work than with the underlying theory of the subject. At the theoretical level, we know that the real side of economics deals with real (as against nominal) quantities and with relative prices. At some point, therefore, we have to choose a *numeraire* commodity—one in terms of whose price the remaining prices are expressed. The analysis to date has taken us part of the way down the road. We have specifically singled out world prices and internal prices of export(able) and import(able) goods. We have recognized the possibility that, because of taxes and subsidies, the internal demand and supply prices might differ due to excise taxes or subsidies. The problem then is, relative to which price or price level, do we wish to express these various supply and demand prices of the different tradable goods?

While we could, in theory, pick any arbitrary good to serve as a numeraire, this would miss the point; the numeraire would then have no particular economic content or meaning. Our concern, however, is to give specific content and meaning to what we have already identified as $p_r$. There are only two reasonable candidates:

a. A general price index ($p_d$) covering, in principle, all goods and services, including tradables.

b. A general index ($p_n$) of nontradable goods.

At some point we have to choose a numeraire commodity—against whose prices the remaining prices can be expressed. There are two reasonable candidates:

a. A general price index covering all goods and services, including tradables.

b. A general index of nontradable goods.
If I were to make the choice at the theoretical level, I would opt for b, on the ground that it is cleaner work with \( \frac{p_w}{p_d} \) and \( \frac{p_s}{p_d} \) than with \( \left[ \frac{p_w}{(a_1p_w + a_2p_s + a_3p_e)} \right] \) and \( \left[ \frac{p_s}{(a_1p_w + a_2p_s + a_3p_e)} \right] \), even though any given values of the former pair will imply specified values for the latter pair. Clearly, in the above expressions, the denominator \( (a_1p_w + a_2p_s + a_3p_e) \) represents the general price level, \( p_d \).

However, if we were to look at the actual use of data—even of estimated (or guesstimated) elasticities of demand and supply, the balance would tilt strongly toward option a. In the first place, we don’t have well established indices of nontradable goods—ones that are reliable and readily (and speedily) available. In the second place, nearly all our estimation of elasticities use relative prices expressed as ratios of individual goods’ prices to a general index like the consumer price index or the GDP deflator. Not only are the numerical estimates derived in this way, but our intuitive sense on the likely orders of magnitude is based, in the final analysis, on such estimates. In the third place, when we work through the theory of international adjustment mechanisms under flexible exchange rates, it is more reasonable to assume a monetary policy that tries to stabilize (or otherwise take as its target) the general price index than to assume that it is some nontradable price index that is being stabilized (or targeted).

Similarly, it is much more natural to think of the adjustment mechanism under fixed exchange rates as taking place through movements of the money supply and the general price level than through movements of money and the price level of nontradables alone. It is the general price level that presumably governs people’s behavior on their holdings of money and other things. This is true even in cases where, in the theoretical exercise, only movements in the prices of nontradables cause the general price level to change. These are the pure textbook cases; there are other textbook cases in which prices of tradables would change (either exogenously or as a result of policy changes). And, of course, in the real world the
prices of some tradables or others are always changing. Under these circumstances, the general index of prices \( P_d \) is the deflating index that we can most rely on for dealing with both theoretical and empirical problems.

Having opted for a general index, rather than an index covering nontradables only, I will deal only briefly with the question of which index to use for \( p_e \). To my mind, wholesale price indexes everywhere are heavily weighted with tradables—the mere fact that they typically deal with tangible and transportable goods practically guarantees that. Even though the deflating index is not a pure nontradables index, it should at least give nontradables their due weight. Two widely used indexes that do this are the consumer price index (CPI) and the GDP (or GNP) deflator. The latter is the more comprehensive, but the CPI (so long as it is formulated along accepted professional standards) is conceptually sound, acceptably general, and above all readily available (in nearly all countries), on a monthly as well as a quarterly and an annual basis. Thus, for most purposes, I would choose the CPI as a deflator, probably reserving the GDP deflator mainly for historical time series work where yearly data are needed.

3.06 Dollar-price or world-price deflator

We do not need a dollar-price or world-price deflator for most analytical purposes. The nominal price of an import good at the border is \( p^{*}_e E \); its relative price at the border is \( p^{*}_e E/p_d \); the relative price of a dollar’s worth of it at the border is simply \( E/p_d \). This is true of each and every import good, at all moments of time. The same can be said for export goods—their relative price at the border is \( p^{*}_e E/p_d \); the relative price of a dollar’s worth is \( E/p_d \). With this definition of the real exchange rate, we can analyze in the real world, the general index of prices \( P_d \) is the deflating index that we can most rely on for dealing with theoretical and empirical problems. The most widely used index for \( p_e \) is the consumer price index followed by the GDP deflator.
tariffs, quantitative import restrictions, export taxes and subsidies, domestic taxes, domestic production subsidies, agricultural price-support programs, and changes in the world prices $p^*_m$ or $p^*_s$ of particular imports or exports, or of groups of them, or of all of them. Of course, we need to recognize that some of these introduce distortions in which the relative prices paid for a dollar's worth by domestic demanders, or received by domestic suppliers (or both), are different from the corresponding relative prices at the border.

But when we argue the power of $E/p_d$ as a measure of the real exchange rate, we should recognize that we are talking in the world of theory. Our analyses of tariffs and excise taxes are carried out in the timeless world of comparative statics. We analyze policies or other disturbances one at a time (or in packages of our own choosing), with other potentially complicating factors held constant. Through it all, we measure our quantities of tradable goods in units of the dollar's worth.

But what if the value of the dollar changes over time? This question can be answered in three ways.

First, there are many problems for which the fact that the dollar changes value through time is of no particular importance. Thus, if a 50-percent uniform tariff causes $E/p_d$ to be 20 percent lower than it otherwise would be, this disincentive to export activity will presumably be present when the dollar-price level is 100, and when it rises to 200 and 500. The presence of inflation does not by itself alter or modify the disincentive.

Second, our purpose may be to analyze the effects of an inflationary process in the world (dollar) economy. This can be done (analyti-
(ally) by assuming that all dollar prices of goods and services move up together. Obviously, once this assumption is made, any dollar-price numeraire can be used to convert the “dollar’s worth” of different time periods into units of constant purchasing power. All will give the same answer. It does not matter whether we use an index \( (\beta_1 p^* + \beta_2 p^*) \) of the dollar prices \( p^* \) and \( p^* \) of the specific imports and exports of the country in question, or whether alternatively we use a more general dollar-price index \( p^* \); nor does it matter, if we use \( p^* \), what its composition is.

Third, we may be concerned with the empirical analysis of real-world data characterized by ample fluctuations in the relative prices of individual goods (and groups of goods) as well as irregular movements in the general dollar-price level (however defined). Here we want to find a deflating index that defines a “meaningful” concept of the real dollar’s worth. At this stage, I would suggest ruling out goods in the nontradable category. For example, technological advance in the tradables category in the United States and other industrial countries can cause a rise in the dollar prices of nontradables, while the general dollar-price level of tradables may stay relatively constant. We would not expect such a change to cause an adjustment of the real exchange rate (properly defined) of a developing country. A simple way to accomplish this is to keep nontradable goods and services out of the index used to convert nominal dollar’s worth into real dollar’s worth.

At this point we have limited our search for the relevant deflator to the subset of goods that we call tradable. I believe the most interesting question here is:

a. Should we use one index (based on the country’s own exports and imports) of the value of the dollar when we are talking of the real exchange rate of Spain, another when we are dealing with the real exchange rate of India, a third for...
Colombia, and so forth?; or

b. Should we seek a common measure of the value of the dollar to be used in all cases?

The choice between a and b is not clearcut or obvious, but my own inclination is strongly toward b.

First, a country can alter the composition of its tradables. It can drive goods out of the import category by prohibitions or very high tariffs, and it can drive goods out of the export category through a policy of generally heavy protectionism (leading to such an appreciation of the real exchange rate that many exports are rendered unprofitable). On the whole, it does not seem appropriate for such policy-induced changes in the mix of a country's traded goods to dictate changes in the index used to convert inflated dollars into dollars whose purchasing power is constant through time.

Second, we definitely want to be able to distinguish situations in which the disturbance is a change in the relative dollar price of one or more key commodities from one in which a general world inflation prevails. An extreme example would be a country whose sole export was natural gas and whose principal imports were petroleum products. A boom in energy prices could cause the dollar prices of its exports \(p^*_e\) and its imports \(p^*_r\) to rise by the same percentage. Even though this might have the same effect on the country as a general world inflation, that similarity would be picked up by working with the relative prices \(p^*_e/p^*\) and \(p^*_r/p^*\) and by using \(p^*\) as the general dollar-price deflator. This seems to me better than ignoring \(p^*\) and using a country-specific \(\beta_1p^*_e + \beta_2p^*_r\) as the general dollar deflator.

Third, a fair amount of empirical work in international economics
deals with cross-sections of countries. Here, a definition of the real dollar’s worth that remains invariant as one moves from country to country (at any given point in time) has obvious appeal.

Fourth, occasions arise when we have the impact of a commodity price rise on the economies of countries producing and/or using it. It would seem reasonable in such circumstances to deal with a rise in the relative dollar price of, say, oil that is the same for all countries. This, of course, would not be the case if the general deflating index differed across countries, weighting the different commodity prices by their relative importance in each country’s own trade. For a commodity like oil, which is almost the sole export in some producing countries and has a more moderate weight in others, differing weights (for oil) in an index of the form \(\beta_1 p^*_E + \beta_2 p^*_o\) might cause a doubling of oil prices to be reflected as changes of very different percentages in the relative world-market price of oil in different countries. I do not find this sensible.

The price of oil, translated into local currency, and expressed in relation to the domestic general price level \(p_d\), will more likely differ from country to country, and in ways that reflect how the relative importance of oil in total output, exports, consumption, etcetera differs among countries. But here we are not talking of the relative price of oil \([p^*_E E(1+t)/p_d]\) within Indonesia, Nigeria, or Venezuela. We are talking about its relative price \((p^*_E/p^*_o)\) in the world market. In reality, the former relative price does differ among countries; our analysis must capture and explain this. I see no reason, however, why the relative price of oil in the world or dollar economy should differ from country to country.

We thus suggest that the index \(p^*_E\) for converting nominal dollar’s worth into real dollar’s worth be an index of the dollar prices of tradable goods can be used as the world-price deflator for converting a nominal dollar’s worth into a real dollar’s worth. However, the weights used for the different goods in this index should not vary from one developing country to another.
tradable goods, and that the weights used for the different goods in this index should not vary as we move from one developing country to another. We allow for the possibility that in a particular developing country the relative prices of both its importables and exportables could rise (or fall) during a given period. Our analysis would capture the total effect of such a change as being similar, for the country concerned, to that of a general world inflation.

The single index $p^*$ can be thought of as an index of the prices of tradable goods "somewhere on the high seas." The analogy is apt because it connotes that there is no principle which dictates that it should be an index of U.S. prices, or German prices, or U.K. prices.

Throughout this paper we have talked of the dollar's worth as the unit of measurement of tradables. This is the result of the dominance of the U.S. dollar as the key currency during the past few decades and of its likely continued importance for a few decades more. Consequently, many international trade statistics are measured in dollars; this creates a pragmatic necessity for a deflator to convert these nominal dollar data into real terms.

The most natural, readily available index for doing this job is the U.S. wholesale price index. But it is not difficult to convert the German, British, or Japanese wholesale price indexes into dollar terms by multiplying by the dollar price of the mark, the pound, or the yen. On this basis we could then create a dollar wholesale price index based, say, on the relative weights of the different major currencies in the special drawing rights (SDR). It would not be a U.S. price index; but it would be a dollar price index that could be appropriately used to deflate trade statistics expressed in dollars, and to trace through time real exchange rates reflecting the

The "dollar's worth" is used as a unit of measurement of tradables because of the dominance of the U.S. dollar in international trade statistics. This creates a necessity for a deflator to convert the nominal dollar data into real terms. The most readily available index for doing this job is the U.S. wholesale price index.
price of the dollar in different countries’ local currencies.

An alternative to the use of wholesale price indexes is to work with those components of GDP deflators that are most readily identifiable as relating to tradables: these are manufacturing, agricultural (including forestry and livestock production) and mining sectors. Using these components, it would be easy to construct for any country a national index of tradables prices.

Once again we could use the United States “tradables GDP deflator” as the relevant index, or alternatively a weighted average of several countries’ “tradables GDP deflators.” Each of these could be converted into dollar terms by the relevant dollar exchange rate of the respective country’s currency. The appeal of this index lies in its conceptual clarity—both in the definition of tradable goods (here manufactures, agricultural and mineral products) plus the weights with which their prices are combined in each country (that is, the relative weights they have in the corresponding GDP). The disadvantages are that this index is never available on a monthly basis (not always on a quarterly basis), and that it often appears with a long lag in relatively obscure sources.

My vote for work to be done in the near future would be on the use of the U.S. wholesale price index as the deflator for dollar values of trade. If consensus regarding the conceptual framework is achieved, we can hope that the IMF might begin to publish (in *International Financial Statistics*) monthly indexes of the wholesale prices in a number of major countries (say those whose currencies compose the SDR), converted to dollars by the relevant exchange rate, and hopefully averaged together (presumably with SDR weights). Once such an index is regularly calculated and readily available, I believe it could claim superiority over the U.S. wholesale price index for the purpose at hand (see Chapter 4).
It is my belief that indexes based on components of the GDP deflator, either of the United States alone, or of a combination of countries, will be useful in the future, but for more restricted purposes than those based on wholesale price series. Nonetheless, the time is ripe for imaginative use by researchers of price indexes of baskets of tradables that are built up from the corresponding components of GDP deflators.

Reflections and conclusions

It has been more difficult to write this chapter than I had anticipated. The process has been sobering, too; among other things I have come to appreciate how a concept of the real exchange rate that is simple and obvious in one context can lead you seriously astray in others.

Among the contending concepts are:

a. The price level of a country’s tradables deflated by that of its nontradables.

b. The nominal exchange rate deflated by a general price index.

c. The nominal exchange rate (for example, the peso price of the dollar) deflated by a peso price index and a dollar price index of similar concept.

d. The nominal exchange rate deflated by an index of nominal wages and salaries.

Of these, concept a fits very naturally when dealing with problems of international capital movements, and with the transfer problem
generally. Concept b is appropriate for dealing with internal inflation and other policies (such as tariffs, taxes, and subsidies). Concept c is appropriate for dealing with dissimilar monetary movements, such as between a country and the rest of the world. Concept d brings home the fact that much of the time a required devaluation of the real exchange rate necessarily entails a fall in real wages and salaries.

Being a firm believer that language (and communication in general) must always be understood in the context in which it is embedded, I am not too uncomfortable with the thought that these and other competing notions of the real exchange rate will probably swirl through economic discourse for years to come. But I am a bit more uncomfortable with that idea than I was before writing this chapter. The trouble is that unlike simple cases (such as whether demand elasticities are defined as positive or negative, or whether an exchange rate is taken to be the dollar price of the peso or the peso price of the dollar), the issues surrounding the different usages of the real exchange rate are complex. Moreover, the problems involved are not widely appreciated, so people who think in terms of one concept may find unintelligible or downright stupid the things said by others who have a different concept in mind. So complex and intertwined are the issues that I am supremely confident of only one thing: despite the best efforts of myself and others, much confusion will surround the concept of the real exchange rate for a long time to come.

I have been chastened by the fact that I too have used these concepts interchangeably. At times, I have described concepts a, c, and d as three “guises” in which the real exchange rate appears. How fateful that I now should come as a defender of concept b, and as an advocate of yet another concept—concept e! But so it is. (Concept e is double deflation using an index of the world prices of tradables as the foreign deflator, and a general index like the
I would test the concept of the real exchange rate by requiring that it correctly replicate simple textbook cases of exchange-rate determination. This is done admirably by \( E/p_d \), so long as we take the general price level in the rest of the world as given.

In Figure 3.1 we dealt with six disturbances under conditions of a flexible exchange rate and a monetary policy that held the general internal price level \( p_d \) constant. (These six disturbances are also listed in Section 3.01.) These cases gave the familiar and expected answers, but in the process it was underlined that (for the flexible-rate case at least) the exchange rate is a price that is set \textit{in the market for foreign exchange}. The units that are demanded and supplied are dollars of foreign exchange. To link this fact to the demand for imports and the supply of exports, we must measure the quantity of each individual import and export good in units that have a given value (say one dollar) in the world market. Based on this assumption we can construct demand and supply curves for foreign exchange, and determine the equilibrium exchange rate. One key result that can be drawn from Figure 3.1 is that the demand and supply curves for foreign exchange shift when the world prices of import and export commodities change, causing changes in the nominal exchange rate for a given \( p_d \).

Figure 3.2 presented our first explicit introduction to the real exchange rate. We explored the process of adjustment to disturbances like those in Figure 3.1—only the assumption was changed from a flexible exchange-rate system to a fixed-rate system. The adjustment process under the latter system works through monetary expansion and contraction; identical results to those of Figure 3.1 are obtained, however, when the price of foreign currency is
expressed as \( E/p_d \). In Figure 3.1 the adjustment is in the numerator of this expression; in Figure 3.2 it is in the denominator.

The concept \( E/p_d \) is exceedingly robust. Through its use we can handle essentially all types of disturbances originating in the domestic economy, and basically any relevant disturbance originating abroad. (The only links through which foreign disturbances would enter the picture are movements of capital and changes in the world prices of tradable goods and services.) The only flaw in using \( E/p_d \) as the general and definitive concept of the real exchange rate is the fact that its equilibrium value falls (signifying an appreciation of the peso or other local currency) when there is a general world (or dollar) inflation. Where world (or dollar) inflation is not an intrinsic part of the picture (for example, in any and all theoretical analyses of the consequences of domestic policies and other domestic disturbances), \( E/p_d \) is the correct concept to use.

Where world inflation is the problem (or an integral part of the problem), the concept of the real exchange rate can be made more symmetrical by introducing a world-price deflator \( p^* \) along with the domestic-price deflator \( p_d \). The expression for the real exchange-rate concept then becomes \( p^*E/p_d \). This is a natural extension of the original concept. Where the real value of the dollar is not changing, we can treat the basic demand and supply as being for the dollar’s worth of foreign exchange. Where the real value of the dollar is changing, the basic demand and supply will be for the real dollar’s worth of foreign exchange.

But note that if we fail to introduce \( p^* \) into the expression for the real exchange rate, the consequences are not cataclysmic. We simply get an expression that could be denominated “the real peso price of the dollar, uncorrected for dollar inflation.” This type of

The concept \( E/p_d \) is exceedingly robust for use as a real exchange rate. It can handle essentially all types of disturbances originating in the domestic economy or abroad. The only flaw in using \( E/p_d \) is that its equilibrium value falls when there is a general world or dollar inflation.
index has, in fact, been widely and successfully used in countries experiencing very rapid inflation.

Of the alternative concepts of the real exchange rate mentioned at the beginning of this section, I consider \( p/p_a \) (the ratio of the price levels of tradables to that of nontradables) to be the most vulnerable. Taken at face value, this index gives the wrong answer much of the time. The right answers to questions concerning the real exchange rate are those represented in Figure 3.1 (page 124). Of the six disturbances presented in the graph, the concept \( p/p_a \) does well in only two cases. The first is a capital inflow spent on tradables (Graph C). In this case, the supply of tradables would shift to the right by the amount of the capital inflow and the demand would shift likewise, which would leave \( p/p_a \) unchanged. The second is a capital inflow spent on nontradables (Graph D). In this case, adjustment would require that an excess demand for tradables be generated, which would cause a fall in the equilibrium level of \( p/p_a \).

An import tariff and an export tax would each have an ambiguous effect on the price level of tradables—one component of it (the price level of importables) would rise under either of the two disturbances, while the other component (the price level of exportables) would fall. Whichever of these two dominated, the effect on \( p/p_a \) would be the same under either a general import tariff or a general export tax that introduced the same gap between the price levels of importables and exportables, respectively. However, as the analyses of Figures 3.1 and 3.2 show, the real exchange rate must unequivocally fall in the case of a general tariff, and rise in the case of a general export tax. The concept \( p/p_a \) thus cannot provide the right answer in these cases.
It is similar for changes in the world prices of specific tradable goods. A rise in the world price of exports (alone) must cause a fall in the equilibrium real exchange rate. Yet, because exportables are an important component of tradables—they could exceed half or be less than a half even with balanced trade because of domestic consumption of exportables and domestic production of importables—a rise in export prices could cause the index $p/p_a$ to rise, or fall, or remain the same. Here, too, $p/p_a$ does not lead us to the correct answer.

We have seen that the effect of a rise in import prices on the demand for foreign currency (and hence on the real exchange rate) will depend on the price elasticity of import demand. The effect is nil with unit elasticity, negative under elastic demand, and positive under inelastic demand. The elasticity of import demand does not even come into play when one considers the ratio $p/p_a$; this ratio must rise if world prices of imports rise while those of exports remain the same. Thus $p/p_a$ once again gives us the wrong answer.

In my view, two correct answers out of six is not good enough. Even worse, an extension of the analysis to cover other types of domestically imposed distortions—quotas, price supports, domestic taxes, subsidies, etcetera—would reveal still further the failure of $p/p_a$ to reliably predict what would happen to the nominal exchange rate under conditions of a stable, general (or for that matter a stable, nontradable) price level.

The use of $p/p_a$ has another defect: it diverts attention from the necessity of measuring both demand and supply of tradables in dollar’s worth. (Actually, if this is done, and if $p$ is explicitly defined as the internal price at the border—that is without tariffs,
taxes, or subsidies—of a dollar’s worth of tradable goods, the \( p/p_a \) ratio can be rehabilitated.) The \( p/p_a \) concept focuses attention on tradables and nontradables as two bundles of goods and services competing for the interest of demanders and for the application of resources by suppliers. Our instinct is to treat them symmetrically, when an asymmetric treatment is called for. We are also inclined to treat tradables as a single bundle when familiar disturbances require the separation of importables from exportables, and often the breaking down of these categories into individual commodities or groups.

In general, we can amend the \( p/p_a \) to produce the right answers. Exportables and importables must first be expressed in units of “dollar’s worth.” When this is done, the excess-demand curve for importables becomes the demand curve for imports, and the excess-supply curve of exportables becomes the supply curve for exports; we are back in a framework of the supply and demand for foreign exchange. But we must “properly define” the demand and supply curves of importables and exportables. In general, necessary corrections must be made beforehand so that the price of tradables reflected on the curve is the border price of a dollar’s worth of tradables. Thus for a tariff, the demand and supply for exportables would remain untampered with, but the height of the supply and demand curves for importables would be reduced by the amount of the tariff. There would be an outward shift of the supply of importables, and an inward shift of demand, with the result that the supply curve of tradables (both importables and exportables) would shift outward; the demand curve would shift inward, which would produce a fall in the equilibrium real exchange rate (\( p/p_a \) in this modified framework).

To analyze any disturbance, it is possible to find the necessary shifts in the supply of, and in the demand for, exportables and/or importables that will result in the correct final result. The underlying principle is that the equilibrium \( p \) in the \( p/p_a \) ratio must always be
the border price, net of import tariff, gross of export tax, gross of import subsidy, net of export subsidy, etcetera. It must always be what an importer pays for a dollar's worth of a (hypothetical, if necessary) nondistorted import good, or what an exporter gets for a dollar's worth of a nondistorted export good. Once this is done, the \( p/p_a \) framework is rehabilitated. However, I doubt the result is worth the effort when other means exist for reaching the same conclusions more directly and simply.

The other concepts of the real exchange rate can be dealt with more easily. Using the nominal exchange rate divided by an index of wages and salaries is just like using \( E/p_a \) with the general internal price level being represented by the wages and salary level. (Actually the corrected \( p/p_a \) ratio substitutes \( p_a \) for \( p_d \) in the same way.) None of the concepts mentioned above are corrected for foreign inflation—which is not necessary for solving many analytical problems, and only sometimes necessary for dealing with practical ones.

If we need to correct for foreign inflation, I do not feel that deep theoretical considerations enter seriously into the choice of the index to be used. Foreign CPI indexes and foreign GDP deflators have been widely used, particularly in tandem with domestic price deflators \( p_d \) based on the same concept. Because the nontradables of the rest of the world have little connection to a given developing country's economy, I prefer to use a foreign-price deflator \( p^* \) that is explicitly concentrated on tradable goods. I prefer a general dollar-price index to one which is based on a country's own tradable weights. For practical reasons, I prefer a dollar-price index that is quickly and readily available. The U.S. wholesale price index meets this criterion, as does a weighted average of the wholesale price indexes of major trading nations, converted to a dollar basis by using the exchange rates of their respective currencies against the dollar.

Another way to calculate the real exchange rate is to divide the nominal rate by an index of wages and salaries. It is similar to using \( E/p_p \) with the general internal price level being represented by the wage and salary level.
An alternative would be to use $p^*$, the tradable component of the United States GDP deflator, or a weighted average of the corresponding components of the GDP deflators of the major trading nations (once again converted to a dollar basis by using prevailing exchange rates). Probably indexes based on GDP (or GNP) deflators have greater conceptual clarity, but they are not available monthly. Of the options available for defining precisely the composition of $p^*/p_e$, I would at the one extreme opt for the U.S. wholesale price index as representing $p^*$ and the country’s own consumer price index as representing $p_e$. These indexes are available on a monthly basis and we can work with them quickly.

At the other extreme, I would consider using an index built up from the agricultural, mining, and manufacturing components of the United States GNP deflator for $p^*$ and the individual country’s own total GDP deflator for $p_e$. This could be done mainly for working with time series data using annual statistics. We should be clear that these are preferences, not choices determined by profound analytical dictates. On the choice of indexes, there is much room for fruitful debate and experimentation.

A final note concerns the design of empirical work aimed at explaining movements in the real exchange rate over time. This chapter contains a partial list of explanatory variables that might be useful; it also carries warnings that certain variables might not be useful at all, and others might be only fitfully so. An ideal list of explanatory variables would include:

i. Net capital inflow spent on tradable goods.

ii. Net capital inflow spent on nontradable goods.

iii. World-price level of a country’s exports.
iv. World-price level of a country’s competitive imports.

v. World-price level of a country’s noncompetitive imports.

vi. Average strength of tariffs and other restrictions inhibiting import demand.

vii. Average strength of export taxes (subsidies) and other restrictions inhibiting (or policies promoting) export supply.

The list in the preceding paragraph is only partial, as I have limited it to items explicitly discussed in this chapter. Yet, it shows how difficult it is to explain empirically movements in the real exchange rate. We rarely have breakdowns of the figures on the types of goods on which a country’s foreign borrowings are spent, yet we know that only the part spent on nontradedables should influence the real exchange rate. For small countries, we usually have world prices for a few principal exports: import prices are difficult to come by, especially if we want them classified into competitive or non-competitive imports (or other categories that distinguish groups with different import demand elasticities). We usually have average receipts from import tariffs, but little clue on the strength (and the variation over time) of nontariff barriers. The story is similar with incentives (particularly the disguised ones) that countries often give to certain export activities.

It is sobering to learn how rough will be (in many cases) the approximation of the actual variables we have to use to the desired ones. But the woes of empirical workers are familiar, particularly those related to the failure of actual data series to measure what we want. Let me therefore end on a more positive note. The list intentionally excludes the terms of trade (the ratio of export to import prices); it is separated into components instead. The lesson is we should avoid working with this variable to explain real exchange-rate changes.

Explaining empirical movements in the real exchange rate is difficult. We rarely have a breakdown of figures on the types of goods on which a country’s foreign borrowings are spent. Yet, we know that only the part spent on nontradedables should influence the real exchange rate.
The list explicitly includes export taxes as variables, which cause the real exchange rate to rise; these have been extremely important (and varying over time) in a number of countries (among them Argentina and Uruguay), but they have not been used in real exchange-rate regressions. The concept of net foreign borrowing is also useful as a separate argument in the demand functions for different categories of goods; the fraction of foreign borrowing spent on tradables is important in determining its ultimate effect on the real exchange rate. These observations, which come from analyzing the underlying concept and measurement of the real exchange rate, may ultimately be of use in empirical investigations that attempt to explain variations in the real exchange rate.

Notes

1. This point is treated in more detail in Section 3.04.

2. Once again, for further elaboration of the relevant analysis, see Section 3.04.

3. This works out to $10 \times (1/1.4) = 7.14$, shown in Graph C as approximating $7$.

4. There are some interesting technical relationships among elasticities of demand for imports and for tradables in general. These are briefly explored in the Appendix to this paper.

5. This is what is done in mathematical treatments of most general-equilibrium problems. The other general-equilibrium tradition has its roots in international trade theory; it deals with a relatively small number of identifiable commodity groups, one of which per force ends up being chosen as the numeraire. This choice is what we are concerned with here.
Applications of real-rate analysis

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Introduction

In this chapter we provide a simple manual for use in analyzing movements in the real exchange rates of different countries. The principal source of data is *International Financial Statistics* (IFS) published by the International Monetary Fund. The IFS presents data on a great many economic variables for each of the countries covered. These data appear on a monthly basis going back to about eight or nine months, on a quarterly basis going back to a dozen or more quarters, and on an annual basis going back to six or seven years. Once a year, a yearbook is published, which is devoted only to annual data and which goes back in time to two decades and more. Most of the information used in the examples here is taken from the 1985 *IFS Yearbook*.

Calculation of real exchange rates

Practical applications of real exchange-rate analysis are generally based on data for a country’s nominal exchange rate $E$, deflated by its general price index $P_d$. Where movements of the world-price level, $P^*$ (or that of a particular partner country for which the real exchange rate is being calculated) are quantitatively significant, a time-series data of the real exchange rate should also embody a correction for these movements.

The general expression for the real exchange rate is $Ep^*/P_d$ (for details, see Chapter 3). Particular measures will differ depending on how each of the component variables is defined. To some degree, these differences are matters of judgment, convenience of use, availability of data, and the like; but it is also possible to make genuine mistakes while putting together the basic data. I will draw attention to such mistakes, and indicate how to avoid them.
The basic data on exchange rates are given at the beginning of the IFS presentation for each country. The first series shows the exchange rate with the special drawing rights (SDR); this is followed by an exchange rate against the United States dollar. Because the composition of the SDR has changed through time, and because the data on world imports and exports are expressed in U.S. dollars, we shall concentrate on exchange rates with the dollar.

For most countries, two series on exchange rates with the dollar are presented in IFS. One, labeled ae, refers to the local-currency price of the dollar at the end of the period considered. For most purposes, ae is less desirable than the second series, labeled rf. The latter gives the average price of the dollar in local currency over the period of reference (month, quarter, or year). This series is more appropriate, not only because most of the questions we want to answer concern the periods about which we speak, rather than just their terminal dates, but also because the price data of IFS invariably refer to average prices over the period covered. Hence, rf is the series of choice as the variable to represent the nominal exchange rate.

A few countries (such as the United Kingdom) typically refer to the exchange rate as the foreign price of local currency (in the U.K.'s case, the U.S. dollar price of the pound), rather than the local-currency price of foreign money. In the few instances in which IFS follows this practice in presenting exchange-rate data, the end-of-period rate is labeled ag; the average-over-the-period rate is rh. It is important that we be aware of this difference; for these cases, the exchange rate E used in this chapter is $1/rh$.

Regarding the internal general price level (p_d) used to deflate the
nominal exchange rate, economic theory requires that the deflating index include nontradable as well as tradable goods. The best deflating indexes are the consumer price index (CPI) and the GDP or (GNP) deflator. Between these two, the GDP deflator wins from the standpoint of coverage; the CPI wins on the timeliness of publication and the availability of data on a monthly and quarterly basis. The exercises presented in this chapter use the CPI.

Recent advances in our understanding of the conceptual basis of real exchange-rate analysis have led us away from the symmetrical treatment of the domestic price level \( p_d \), and the foreign price level \( p^* \).

There is a growing consensus among economists that the foreign price level \( p^* \) should be an index made up of principally prices of tradable goods, while the deflating domestic price level \( p_d \) should be an index comprising prices of nontradable goods as well. This consensus is reflected in the increasing practice of using foreign wholesale price indexes in the construction of \( p^* \), and of using consumer price indexes or GDP deflators for \( p_d \). 

**Elementary concepts**

**Calculation of real exchange rate using U.S. WPI**

Table 4.01 presents a calculation of the real exchange rate of Kenya for the period 1975-84. For the sake of simplicity, the calculation is done against the U.S. dollar, using the U.S. wholesale price index (WPI) in the role of \( p^* \) to express the dollar in real terms. The nominal exchange rate \( E \) is, thus, the nominal price of the nominal dollar. Multiplying \( E \) by \( p^* \) we get \( Ep^* \), the nominal price of the real dollar (defined in this case as the United States
Table 4.1. Calculation of the real exchange rate of the Kenya shilling against the U.S. dollar, 1975-84
(Deflating indexes: Kenya consumer price index and U.S. world price index)

<table>
<thead>
<tr>
<th>Year</th>
<th>[IFS, rf]</th>
<th>(1 \times \frac{100}{7.42})</th>
<th>[IFS, Line 63]</th>
<th>[IFS, Line 64]</th>
<th>(2 \times \frac{3}{4})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>7.343</td>
<td>98.96</td>
<td>65.04</td>
<td>54.4</td>
<td>118.3</td>
</tr>
<tr>
<td>1976</td>
<td>8.367</td>
<td>112.76</td>
<td>68.07</td>
<td>60.6</td>
<td>126.7</td>
</tr>
<tr>
<td>1977</td>
<td>8.277</td>
<td>111.55</td>
<td>72.24</td>
<td>69.6</td>
<td>115.8</td>
</tr>
<tr>
<td>1978</td>
<td>7.729</td>
<td>104.16</td>
<td>77.86</td>
<td>81.4</td>
<td>99.6</td>
</tr>
<tr>
<td>1979</td>
<td>7.475</td>
<td>100.74</td>
<td>87.62</td>
<td>87.9</td>
<td>100.4</td>
</tr>
<tr>
<td>1980</td>
<td>7.420</td>
<td>100.00</td>
<td>100.00</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1981</td>
<td>9.048</td>
<td>121.94</td>
<td>109.13</td>
<td>111.8</td>
<td>119.0</td>
</tr>
<tr>
<td>1982</td>
<td>10.922</td>
<td>147.20</td>
<td>111.33</td>
<td>134.7</td>
<td>121.7</td>
</tr>
<tr>
<td>1983</td>
<td>13.312</td>
<td>179.41</td>
<td>112.73</td>
<td>150.2</td>
<td>134.7</td>
</tr>
<tr>
<td>1984</td>
<td>14.414</td>
<td>194.26</td>
<td>115.41</td>
<td>165.4</td>
<td>135.5</td>
</tr>
</tbody>
</table>

Note: All data are from the International Monetary Fund, International Financial Statistics Yearbook 1985. Columns 1 and 4 are from Kenya pages; Column 3 is from the United States pages.
Dividing $E_p^*$ by the Kenyan CPI, we get $E_p^*/p_4$, Kenya's real exchange rate for U.S. wholesale price index baskets.

In Table 4.01, Column 1 gives us the nominal exchange rate directly; Column 2 converts this into index form using 1980 = 100. The U.S. wholesale price index is presented in Column 3 and the Kenyan CPI in Column 4. Finally, we calculate $E_p^*/p_4$ to obtain the Kenya real exchange rate index in Column 5.

**Concept of SDR-WPI**

For the period 1955-70, the U.S. wholesale price index (WPI) is perfectly adequate for use in real exchange-rate calculations. During these years, most of the major currencies maintained fixed exchange rates against the dollar, and price fluctuations were relatively moderate.

After 1970, the major countries moved in a series of steps toward a flexible exchange-rate system. The flexible system was fully in operation by 1973. Inflation rates, which had been very moderate up to at least the mid-1960s, began to grow and to become more disparate among countries. Moreover, the oil shocks of the 1970s added a new type of pressure on the world’s monetary system.

As a result of these and other influences, the U.S. WPI became a less appropriate surrogate for the “world price level of tradable goods” than it had been earlier. In fact, situations arose where no one country’s WPI could be taken as representative.

The problem became particularly acute in the late 1970s and early
1980s. During the last half of the 1970s, the U.S. dollar depreciated significantly against other major currencies; then from 1981 until early 1985, it experienced a major appreciation. Subsequently, a second major depreciation set in. These events raise questions regarding the interpretation of movements of a country’s real exchange rate, when only the U.S. WPI is used for \( p^* \) in the calculation. To what extent are the movements in question to be interpreted as originating in the economic situation of, say, Kenya? Or, alternatively, to what extent do the measured movements of Kenya’s real exchange rate simply reflect the story of the U.S. dollar?

An element of doubt, similar to that implicit in these questions, is inevitable whenever we have to deal with an economic concept for which data come from different places. Nonetheless, it is possible to have cases where the issue is acute, and others where it hardly matters. In developing the concept of the special drawing rights-wholesale price index (SDR-WPI), a conscious effort has been made to moderate the influence that any particular country has on the general price-level variable \( p^* \) used to define the “real dollar.”

The SDR-WPI reflects a conscious effort made to moderate the influence any one country has on the wholesale price level used to define the “real dollar.” The index applies the weights used in calculating the value of special drawing rights. The SDR-WPI is still a dollar-price index, but it does not draw all its data from the United States. The SDR-WPI is still a dollar-price index, but it does not draw all its data from the United States. An easy way to look at the SDR-WPI is to conceive of each country’s wholesale price index as being the price of its “wholesale price basket of goods and services” in local currency (francs, marks, pounds, yen, etcetera). We can then imagine going year by year through the country’s experience, and calculating how much its “wholesale price basket” would cost in U.S. dollars. To do this entails multiplying, say, the franc price of the French basket by the number of dollars per franc, the mark price of the German basket by the number of dollars per mark, etcetera. Having derived indexes of the dollar prices of the various countries’ “wholesale price baskets,” we can take an average of them all. This is what is done in calculating the SDR-WPI.
The index is called the SDR-WPI because it applies the weights that have been used since January 1981 in calculating the value of the special drawing rights at the International Monetary Fund. These weights are 42 percent for the U.S. dollar, 19 percent for the German mark, and 13 percent each for the French franc, the British pound, and the Japanese yen. These weights are used for all years in the construction of the SDR-WPI index, even though prior to 1981 different currencies entered into the computation of the value of the SDR, and with different weights. The objective of the SDR-WPI is not to change the definition of special drawing rights, but rather to settle upon one simple, plausible, definitive weighting pattern by which different countries' WPI baskets can be combined into a global index of a dollar-price level relevant for world trade.

Table 4.2 presents a representative calculation of the SDR-WPI for five industrial countries for 1970, 1974, and 1984. In Row a of each panel, the country's own WPI is given and in Row b its nominal exchange rate against the U.S. dollar is given. Because the initial data are indexes and the objective is to end up with an index, the nominal exchange rates are converted to indexes in Row c. This is done by dividing each country's nominal exchange rate for the particular year by the corresponding figure for 1980, and then multiplying by 100. Thus, Germany's nominal exchange rate for 1970 is 3.660 marks; that for 1980 is 1.818 marks. The nominal exchange rate index for 1970 is therefore (100)(3.660)/1.818, or 201.3, and the index of the U.S. dollar price of the German WPI basket is (100)(60.79)/201.3, or 30.20. This figure, along with those calculated for the other currencies, enters into the weighted average that constitutes the SDR-WPI.

We should bear in mind that the SDR-WPI is an index of U.S. dollar prices. The reason for designing it this way is that most of the statistics on international trade (exports, imports, capital flows, balances of trade and payments, and so forth) are denominated in
Table 4.2. Calculation of the SDR-wholesale price index, 1970-84

<table>
<thead>
<tr>
<th></th>
<th>Germany</th>
<th>U.K.</th>
<th>France</th>
<th>Japan</th>
<th>U.S.A</th>
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<tbody>
<tr>
<td><strong>1970</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Country's own WPI (1980=100)(1)</td>
<td>60.79</td>
<td>28.02</td>
<td>45.95</td>
<td>48.4</td>
<td>41.05</td>
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<tr>
<td>b. Nominal exchange rate (rf)(2)</td>
<td>3.660</td>
<td>0.4167</td>
<td>5.554</td>
<td>360.0</td>
<td>0</td>
</tr>
<tr>
<td>c. Nominal exchange rate index (1980=100)</td>
<td>201.3</td>
<td>96.9</td>
<td>131.4</td>
<td>158.8</td>
<td>0</td>
</tr>
<tr>
<td>d. WPI in U.S. dollars (100 x a/c)</td>
<td>30.2</td>
<td>28.92</td>
<td>34.97</td>
<td>30.48</td>
<td>41.05</td>
</tr>
<tr>
<td>e. SDR-WPI(3)=35.25=(.19)(30.20)+(.13)(28.92)+(.13)(34.97)+(.13)(30.48)+(.42)(41.05)</td>
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<table>
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<th>France</th>
<th>Japan</th>
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<td><strong>1974</strong></td>
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<tr>
<td>a. Country's own WPI (1980=100)(1)</td>
<td>78.67</td>
<td>42.60</td>
<td>72.71</td>
<td>73.7</td>
<td>59.54</td>
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<tr>
<td>b. Nominal exchange rate (rf)(2)</td>
<td>2.588</td>
<td>0.4275</td>
<td>4.814</td>
<td>292.1</td>
<td>0</td>
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<td>c. Nominal exchange rate index (1980=100)</td>
<td>142.4</td>
<td>99.4</td>
<td>113.92</td>
<td>128.8</td>
<td>0</td>
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<tr>
<td>d. WPI in U.S. dollars (100 x a/c)</td>
<td>55.25</td>
<td>42.86</td>
<td>63.83</td>
<td>57.22</td>
<td>59.54</td>
</tr>
<tr>
<td>e. SDR-WPI(3)=56.81=(.19)(55.25)+(.13)(42.86)+(.13)(63.83)+(.13)(57.22)+(.42)(59.54)</td>
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<table>
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<th>France</th>
<th>Japan</th>
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<td><strong>1984</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Country's own WPI (1980=100)(1)</td>
<td>119.17</td>
<td>132.08</td>
<td>155.07</td>
<td>100.7</td>
<td>115.41</td>
</tr>
<tr>
<td>b. Nominal exchange rate (rf)(2)</td>
<td>2.846</td>
<td>0.7483</td>
<td>8.739</td>
<td>237.5</td>
<td>0</td>
</tr>
<tr>
<td>c. Nominal exchange rate index (1980=100)</td>
<td>156.5</td>
<td>174.09</td>
<td>206.8</td>
<td>104.8</td>
<td>0</td>
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<tr>
<td>d. WPI in U.S. dollars (100 x a/c)</td>
<td>76.15</td>
<td>75.87</td>
<td>74.99</td>
<td>96.09</td>
<td>115.41</td>
</tr>
<tr>
<td>e. SDR-WPI(3)=95.04=(.19)(76.15)+(.13)(75.87)+(.13)(74.99)+(.13)(96.09)+(.42)(115.41)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

(1) From IFS, country pages, line 63 for the particular country.

(2) From IFS, country pages, line rf for the particular country.

(3) A weighted average of the corresponding figures from Row (d). The weights are .19, .13, .13, .13, .42 for the five countries in the order listed.
U.S. dollars. The index of dollar prices is needed to express such figures in real terms. In addition, in most countries the exchange rate most widely used and cited is that with the U.S. dollar; therefore, an index of U.S. dollar prices is needed to convert that exchange rate to real terms.

Comparing SDR-WPI with U.S. WPI

A comparison of the SDR-WPI with the U.S. WPI shows a closeness of the two indexes to each other in the 1950s and 1960s (see Table 4.3). In fact, between 1955 and 1969, the ratio of the two indexes stayed between 0.837 and 0.878—a total range of variation of less than 5 percent over a 15-year period. In contrast, the ratio of the two indexes varied between 1.0 and 0.823 from 1980 to 1984—a range of variation in which the maximum exceeded the minimum by more than 20 percent.

Variations in real rates after 1960s

Although the real exchange rate has always been a significant economic concept, its importance has increased in the wake of high inflation, oil crises, massive capital movements, and the debt crises of the 1970s and early 1980s. Table 4.4 summarizes the real exchange-rate experience of several countries during two periods: 1960-69 and 1970-83. The data measure how much the real exchange rate of the country in question has varied; specifically, they present the ratio of the highest annual average real exchange rate to the lowest one observed during the period covered.

The data indicate how substantially the world economy has changed since the 1960s. During 1960-69, a majority of the countries had ranges of exchange-rate variation between 1.0 and 1.35. During
Table 4.3. Comparison of US-WPI and SDR-WPI, 1955-85

### A. Annual data

<table>
<thead>
<tr>
<th>Year</th>
<th>Wholesale price index</th>
<th>Year</th>
<th>Wholesale price index</th>
</tr>
</thead>
<tbody>
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Table 4.3. Comparison of US-WPI and SDR-WPI (continued)
1970-83, the ranges increased to between 1.35 and 1.75.

In addition to showing a large increase in real exchange-rate variability, Table 4.4 highlights differences across regions and calls attention to countries with unusually high or low variability. In summary, it is probably fair to say that in the 1960s the outlier observations represented situations specific to each country, with little true regional tendency. In the subsequent period, data show a more general tendency for the variability of real exchange rates to differ among regions, being significantly higher in Latin America than in the other areas considered.

4.04 Forces affecting real exchange rate

The concept of the real exchange rate is widely used in countries facing severe inflation. In these countries, the business and financial communities follow the movements of the nominal exchange rate against the general price level (usually the consumer price index). When the exchange-rate movement lags behind the general price level, the real exchange rate is said to have fallen; when the exchange rate (E) increases faster than the CPI ($p_0$) or some other domestic price index, the real exchange rate is viewed as rising.

The simple concept of the real exchange rate as a deflated nominal exchange rate ($E/p_0$) is useful in highly inflationary circumstances. In some countries, local prices increase so much faster than prices in the rest of the world that we can sometimes ignore the world inflation. This index, in fact, measures the real price of the dollar (or other foreign currency unit), but it does not adjust for the fact that the dollar itself changes in value (or purchasing power) over time.
A more refined index \((E_{p^*}/p_d)\) of the real exchange rate corrects for changes in the purchasing power of the dollar through multiplication by a general index \((p^*)\) of dollar prices in the world market. In Table 4.2, this index is built up from the wholesale price indexes of France, Germany, Japan, the United States and the United Kingdom by using the weights employed in the calculation of the SDR. Thus, the real exchange rate of a country measures the price in its own currency, of an international basket made up of the wholesale price baskets of the five major industrial economies. This price is then deflated by the country’s own CPI. In short, the real exchange rate is the real price (real in the sense of being deflated by the country’s own general price index) of the real dollar (real in the sense that its international purchasing power is held constant over time).

A second way of looking at the real exchange rate is to recognize that in most cases where an adjustment of the real exchange rate is called for, the required adjustment entails changes in the prices of tradable goods relative to nontradables. Under flexible exchange rates, such adjustment takes place (ideally) by movements of the nominal rate \(E\), which affects equally the prices of all tradable goods. Under fixed exchange rates, with prices of tradables considered as given in the world market, adjustment takes place through movements of the internal price level \(p_d\). In both cases, adjustment comes about through changes in the price ratio of tradables to nontradables.

A third way of looking at the real exchange rate is to examine the forces that work on the prices of tradables and nontradables, respectively. In this view, changes in the internal prices of tradables are brought about (for given levels of their world prices) through the nominal exchange rate, while the level of wages \((W)\) is the major force which can cause the internal prices of nontradables to move relative to those of tradables. Major appreciations (in real terms) of a country’s currency are thus likely to entail large gains in the real

**Forces affecting real rates:**
1. Changes in the purchasing power of the dollar.
2. Changes in the prices of tradables relative to nontradables.
3. Changes in the internal prices of tradables (through the nominal exchange rate) and in the internal prices of nontradables (through wage levels).
Table 4.4. Range of variation in real exchange rates, 1960-83  
(Maximum rate in period/Minimum rate in period)

A. Range of variation during 1960-69

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<td></td>
<td>Colombia 1.45</td>
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<tr>
<td></td>
<td>Belgium</td>
<td>1.44</td>
<td></td>
<td></td>
<td>Mexico 1.47</td>
</tr>
<tr>
<td>1.50 to 1.75</td>
<td>Japan</td>
<td>1.65</td>
<td>Syria 1.56</td>
<td>Burma 1.70</td>
<td>Cote d'Ivoire 1.55</td>
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<tr>
<td></td>
<td>Switzerland</td>
<td>1.67</td>
<td>Yugoslavia 1.59</td>
<td>Indonesia 1.71</td>
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<td></td>
<td></td>
<td>Turkey 1.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.75 to 2.00</td>
<td>Iran</td>
<td>1.95</td>
<td></td>
<td>Tanzania 1.95</td>
<td>Paraguay 1.81</td>
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<td></td>
<td>Egypt</td>
<td>1.98</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2.00 to 2.50</td>
<td>Pakistan</td>
<td>2.11</td>
<td></td>
<td>Nigeria 2.35</td>
<td>Boliva 2.00</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Costa Rica 2.42</td>
<td></td>
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<td>Over 2.50</td>
<td>Zaire</td>
<td>2.90</td>
<td></td>
<td>Argentina 2.68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uganda</td>
<td>4.62</td>
<td></td>
<td>Chile 5.90</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ghana</td>
<td>12.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The real exchange rate is the nominal average price of the U.S. dollar during the period, divided by the local consumer price index and multiplied by a weighted average of the wholesale price indexes of the U.S. (.42), Germany (.19), France (.13), Japan (.13), and the U.K. (.13). The basic data used for this table are annual average exchange rates against the U.S. dollar. Each constituent WPI is thus multiplied by an index of the U.S. dollar price of the respective currency before the weighted average index is formed. The weights used to form the weighted-average WPI are those used since January 1981 to define the SDR.
wages of workers, while important depreciations involve substantial reductions of real wages (at least when these are measured in terms of tradable goods). The view of $E/W$ as a proxy for the real exchange rate, even though it is inexact in the literal sense, contributes greatly to our understanding of the euphoria that sometimes follows in the wake of a significant real appreciation of a country's currency, and of the pain and suffering that accompany major real devaluations.

All three ways of viewing the real exchange rate contribute to our understanding of the sources of its movements. It is easiest, perhaps, to consider the reasons why the nominal rate might change in a country pursuing a flexible exchange-rate policy in an otherwise stable environment (the general level of prices at home and abroad, say, remaining roughly constant). The reasons are the following:

1. **Forces Affecting the Supply of Foreign Currency**
   a. Improved efficiency in the production of export goods.
   b. Development of new export goods, or the opening of new supplies of old ones.
   c. Increases in the world price of export goods.
   d. Changes in the rate of inflow of capital from abroad.

2. **Forces Affecting the Demand for Foreign Currency**
   a. Reduction (or increase) in the intensity of import restrictions.
   b. Increases in income (part of which is spent on tradable goods).
   c. Changes in the rate of capital inflow from abroad (part of
which is usually spent on tradable goods).

d. Changes in the level of debt-service payments.

e. Changes in the world prices of particular import goods. (A rise in the world price can affect demand for foreign currency in either direction depending on whether a country’s demand for imports of a particular good is elastic or inelastic.)

f. Improved efficiency in the production of import substitutes.

These and other forces act together—and with an intensity that varies over time—on a country’s real exchange rate, which makes quantitative analysis difficult. The graphs in Figure 4.1 represent real cases in which one particular force seems to predominate. This makes them ideal for expository purposes; but it must be emphasized that most cases in the real world are much more complicated.

4.05

Case studies

Six case studies, illustrated in Figure 4.1, have been chosen to show the operation of the principal forces affecting the real exchange rate listed in Section 4.04. The examples are important because they demonstrate the relevance of the concepts in the real world; they are convenient because of their simplicity. The six countries are Japan, Ecuador, Iraq, Turkey, Uruguay, and Jamaica.

Japan has enjoyed a tremendous economic boom, much of it propelled by increasing efficiency in the production of manufactured goods. Because Japan’s efficiency in producing nontradables did not increase as fast, the price level of nontradables had to rise relative to that of tradables—that is, the real exchange rate had to fall. Increases in efficiency caused wages to rise relative to prices of
Figure 4-1. Real exchange rate in selected countries

Real exchange rate

Real per capita income

Real exports (1971 = 100)


Real exports (in millions of 1980 dollars)
tradables. While Japan's export growth increased incomes and the supply of foreign currency, only part of such increases was directly reflected in increased demand for foreign exchange. To bring about an equilibrium in the demand and supply of foreign currency, the real price of foreign currency had to fall.

Ecuador too recorded a big boom in real exports, but, unlike Japan's, Ecuador's boom was a result of the development of oil reserves and increases in oil prices during 1973-74 and 1979-80. These events added to the supply of foreign exchange and to the nation's income. The money was spent on tradables and non-tradables for both consumption and investment. Only part of the extra foreign exchange proceeds was directly spent on imports; since supply of foreign exchange increased more than demand, a fall in the real exchange rate ensued. Another way to view Ecuador's case is to note that the extra income generated by the oil boom was spent partly on nontradables. Because there was no autonomous increase (similar to the oil boom) in the supply of nontradables, their price had to rise relative to that of tradables. Such a rise, of course, corresponds to a fall in the real exchange rate.

Iraq illustrates the complexity of real exchange-rate analysis. Iraq shared with Ecuador the oil boom of the 1970s, but it did not experience the same decline in its real exchange rate. First, Iraq pursued a policy of quantitative controls (licenses, quotas, prohibitions, and so forth) on imports at the time of the oil-price boom. When more foreign exchange resources became available, imports were expanded by relaxing controls. This increased the demand for foreign exchange at the old real exchange rate; no fall in the real exchange rate was required to bring about an equilibrium of supply and demand. Second, Iraq had a vast accumulation of foreign assets in the wake of the oil boom. Imports, which had averaged about 60 percent of exports in the late 1960s, fell to under 50 percent from 1973 onward. The result was a great surge in foreign assets of the
Figure 4-1. Real exchange rate in selected countries (contd.)

Iraq


Turkey

Exports, imports (in billion 1980 dollars)

Net foreign assets (in million 1975 dinars)
country, much of which were held by banks. Because the proceeds of the export boom were held abroad, they did not exercise any downward pressure on the foreign exchange rate.

Turkey exhibits a different behavior. Turkey's export boom was "induced"; it wasn't "autonomous" as it occurred in Ecuador, Iraq, and Japan. The moving force was a massive liberalization of import restrictions from the first quarter of 1980. The liberalization increased the demand for imports, which in turn caused the real exchange rate to rise, and stimulated an increase in the supply of exports. In Turkey's case, the view that the "real exchange rate is the price level of tradable goods relative to that of nontradables" falters. The internal relative prices of goods freed from restrictions, fell; this fall was accompanied (through the effect of liberalization in increasing the real exchange rate) by a rise in relative prices of the remaining tradable goods (such as exports depicted in the graph).

Uruguay illustrates a case of increased supply of foreign exchange coming from a different source: an inflow of foreign capital. Such a flow might have no effect on the real exchange rate (if, for instance, the newly borrowed funds are earmarked for incremental purchases of imported capital goods or other tradables), but typically only a part of the borrowing is directly spent on tradables. The rest is sold in the foreign exchange market to finance purchases of nontradable goods (construction work, locally produced materials, local services, etcetera). These purchases exert a downward pressure on the real exchange rate. The downward pressure works directly under a flexible exchange-rate system and indirectly under a fixed-rate system. (In the latter case it works by inducing monetary expansion which increases the level of internal prices relative to that of tradables.)

Jamaica's experience contrasts in a subtle way with that of Uruguay. In both cases, there was an increased flow of capital to the country.
Figure 4-1. Real exchange rate in selected countries (contd.)

Real exchange rate (1980 = 100)

Trade deficit

Real exchange rate

Net foreign assets

Net foreign assets

Real GDP

Real GDP


Trade deficit

Real GDP

Real exchange rate

Net foreign assets

Real GDP

1980 pesos

1980 pesos

1980 J. dollars

1980 J. dollars
In both cases, the real exchange rate fell. However, in Uruguay the capital inflow was basically a voluntary flow, while in Jamaica it represented largely official “emergency financing” to cover a growing trade deficit. In Uruguay, real GDP sustained a healthy growth and the net foreign assets of the banking system also grew (see graph). In Jamaica, the GDP stagnated (it actually declined in per-capita terms). The economy was supported partly by foreign loans and (toward the end of 1978-83) by a dramatic drawing down of the net foreign assets of the banking system. Characteristically, Jamaica’s fiscal deficits were huge (between 15 and 20 percent of GDP), while Uruguay’s were small (less than 2 percent of GDP).

The Jamaican experience is shared by some other countries: Chile (1969-72), Ghana (1979-82), Uganda (1973-78), and Zaire (1974-78). In all of these cases, a massive fiscal deficit set in motion the machinery of monetary expansion. This produced pressure on the country’s international reserves. Rather than allowing the nominal exchange rate to rise sufficiently to stem the incipient drain of reserves, these countries imposed a series of import restrictions. These restrictions, in turn, permitted the internal price level to rise dramatically, relative to the exchange rate. The exchange-rate appreciation carried with it an increasing distortion in the structure of internal prices and subjected the economy to more serious strains. The dam finally broke in each country with a massive devaluation that reversed the downward trend of the real exchange rate.

Chile’s money supply grew by some 800 percent between 1969 and 1972. Advances from the banking system to the government accounted for the full increase in the money supply. In the same interval, the general price index (GDP deflator) quadrupled, while the nominal exchange rate against the dollar barely doubled. The second quarter of 1972 marked the beginning of the process of “correcting” the greatly appreciated real exchange rate. By the fourth quarter of 1973, this real rate was more than three times its
1972 low, and it was still rising.

In Ghana, the money supply \( (M_2) \) increased by a factor of 2.5 between the end of 1979 and the end of 1982. Again, the increase in the money supply was fully accounted for by increased advances by the banking system to the public sector. Consumer prices quadrupled between 1979 and 1982, while the nominal exchange rate of the dollar remained fixed. A massive devaluation in the fourth quarter of 1983 finally reversed the cumulative real appreciation; in that quarter, the cedi price of the dollar increased more than tenfold.

In Uganda, the shilling was pegged to the SDR; the nominal exchange rate remained unchanged from 1975 through 1980. In the interim, the money supply \( (M_2) \) increased by a factor of four and the GDP deflator by a factor of six. Corrective devaluation in 1981 caused the shilling value of the SDR to increase by a factor of ten.

In Zaire, the minimum value of the real exchange rate occurred during the process of successive devaluations that followed a long period (1968-75) when the exchange rate was fixed at 0.5 zaires per dollar. When the real exchange rate reached its low point in 1978, the zaire price of the dollar had already risen to 0.836; but consumer prices had risen nearly sixfold since 1974, the money supply had quadrupled, and increases in bank loans to the government had accounted for nearly all of the growth in \( M_7 \). Inflation worsened with time, and the exchange rate against the dollar increased fivefold between 1978 and 1981, and eightfold during 1981-84.

In all of these cases, the drastic decline of the real exchange rate was in some sense a byproduct of a fiscal deficit that was out of control, and of the monetary expansion which that deficit engen-
dered. The real exchange-rate movement was not a conscious policy objective, nor was it the natural result of an inflationary fiscal deficit. The deterioration of the real exchange rate could have been prevented by a policy of moving the nominal exchange rate upward to reflect (approximately) the full extent of the inflationary forces being generated internally. When governments failed to take this route, they virtually made inevitable the piling of import restrictions and the consequent gross distortion of relative prices.

In a sense, Japan’s real exchange-rate appreciation was a natural consequence of the process of technological advancement that the country was experiencing; Ecuador’s was a natural outgrowth of the development of oil exports and the oil-price boom; and Uruguay’s was the natural concomitant of an increased inflow of foreign capital. Similarly, Turkey’s real exchange-rate depreciation was the natural result of a massive liberalization of import restrictions of 1979.

In contrast, the constancy of Iraq’s real exchange rate was anomalous in the face of the oil-price boom. Iraq was able to prevent the natural result (an appreciation) and maintain a relatively constant real exchange rate because it already had heavy controls on imports, which it proceeded to relax while it also accumulated abroad some of the dollar proceeds of the oil bonanza.

Also in contrast are the cases of Chile, Ghana, Uganda, and Zaire. In these countries the appreciation of the real exchange rate came not as a natural consequence of ongoing inflation, but as a byproduct of the particular way in which those countries handled their inflationary episodes. Of all the cases cited, these four countries are the ones in which the volatility of the real exchange rate can most readily be attributed to errors and misjudgments in policy.
Figure 4-2. Trade balance and real exchange rate in selected countries

Argentina

Real exchange rate

Trade balance

Chile

Trade balance

Real exchange rate
Figure 4-2. Trade balance and real exchange rate in selected countries (contd.)
Figure 4-3. Effects of changes in capital inflows on real GDP and real imports.

The graphs show the effects on real GDP and real imports for Argentina, Chile, Mexico, and the Philippines in 1980, 1981, and 1983.
Movements in the real exchange rate play a central role in the debt crisis. A typical debt crisis usually begins with an unusually large inflow of capital. This inflow adds to the total spending in the receiving country and propels its gross domestic product to high (possibly unsustainably high) levels. During this period of inordinately high capital inflow, the balance of trade moves into the negative side, and the real exchange rate falls.

The onset of the crisis is marked by a sharp reduction in the inflow of capital. This requires a corresponding improvement in the balance of trade, which is brought about in part through a reduction in spending, and in part through a rise in the real price of the dollar.

Figure 4.2 shows how the real exchange rate fell in four countries during the period of capital inflow (declining trade balance) and then rose as the trade balance improved in response to the onset of the debt crisis. In the same countries, real GDP rose to a peak during the period of large capital inflows, then fell sharply as they adjusted to the reduction in these flows (see figure 4.3). Some of the movement in GDP can be attributed to the direct effect of the reduced capital inflow, but part of the fall in GDP comes from belt-tightening monetary and fiscal policies that are adopted to contain public sector deficits and to improve the balance of trade.

The triple pressures—from reduced spending of capital funds flowing in, from tighter macroeconomic policies, and from a rising real exchange rate—produced an extremely sharp fall in real imports in all four countries (see Figure 4.3). Imports bear the brunt of the adjustment of the trade balance in the short run because the supply of exports tends to respond to economic stimuli only with a lag.
Table 4.5. Real devaluation and inflation in countries facing debt crisis, 1980-84

<table>
<thead>
<tr>
<th>Country</th>
<th>Time periods being compared</th>
<th>Ratio of real exchange rate peak/ trough</th>
<th>Ratio of CPI (Peak period/ trough period)</th>
<th>Inflation relative to real devaluation (4/3)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Pre-crisis trough</td>
<td>Post-crisis peak</td>
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<td>2</td>
</tr>
<tr>
<td>Argentina</td>
<td>1980 IV</td>
<td>1984 I</td>
<td>2.57</td>
<td>53.34</td>
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<tr>
<td>Bolivia</td>
<td>1982 III</td>
<td>1984 II</td>
<td>1.59</td>
<td>18.83</td>
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<tr>
<td>Brazil</td>
<td>1982 III</td>
<td>1984 III</td>
<td>1.48</td>
<td>7.23</td>
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<tr>
<td>Chile</td>
<td>1982 I</td>
<td>1984 III</td>
<td>1.45</td>
<td>1.61</td>
</tr>
<tr>
<td>Mexico</td>
<td>1981 IV</td>
<td>1983 III</td>
<td>1.50</td>
<td>3.13</td>
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<td>Peru</td>
<td>1982 I</td>
<td>1984 III</td>
<td>1.11</td>
<td>5.86</td>
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<td>Philippines</td>
<td>1982 III</td>
<td>1983 IV</td>
<td>1.36</td>
<td>1.19</td>
</tr>
<tr>
<td>Portugal</td>
<td>1979 III</td>
<td>1983 III</td>
<td>1.48</td>
<td>2.15</td>
</tr>
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<td>Turkey</td>
<td>1979 IV</td>
<td>1984 II</td>
<td>1.92</td>
<td>5.65</td>
</tr>
<tr>
<td>Uruguay</td>
<td>1982 III</td>
<td>1984 II</td>
<td>2.00</td>
<td>2.09</td>
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<tr>
<td>Venezuela</td>
<td>1983 III</td>
<td>1984 II</td>
<td>1.74</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Source: International Monetary Fund, *International Financial Statistics*
Exports in different countries responded somewhat differently in the wake of the debt crisis. (Other developments, such as agricultural weather cycles and world-price movements of the countries’ principal export products complicated the picture.) Argentina’s real exports, for example, rose by 10 percent in the first year of adjustment (1981), then fell back to their 1980 levels in the following two years. Chile’s real exports stayed constant, in spite of a substantial real devaluation, mainly because of declining world copper prices. The exports of Mexico and the Philippines grew, but only moderately, in the years following their debt crises (1982 and 1983, respectively).

One area in which major differences exist among countries ridden by debt crisis is the way in which inflation impinges on their adaptation to the crisis. Table 4.5 summarizes the experience of 11 countries in this regard. Column 3 presents the ratio of the post-crisis real exchange rate to its pre-crisis level. The ratio indicates the maximum percentage of real devaluation that was achieved. Column 4 presents an index of the rise in consumer prices for the same period. Column 5 expresses a ratio of the index of the rise in CPI (Column 4) to the amount of real devaluation (Column 3).

Because a devaluation of the nominal exchange rate carries with it a corresponding rise in the internal prices of tradable goods, it is inevitable that a major real devaluation be accompanied by some rise in the internal price index of a country. (Otherwise, a major fall in the price level of nontradable goods would be required.) The challenge to policymakers is to limit this price rise. The figures in Column 5 can be taken as an index of the relative success of different countries in meeting this challenge. Chile, the Philippines, Uruguay, and Venezuela were the most successful in this regard, while Argentina, Bolivia, Brazil, and Peru suffered most from the surges of inflation. In the latter countries, the surges in inflation...
greatly exceeded what might be considered a necessary consequence of their respective real devaluations or of their international debt crises.

4.07 Real exchange-rate analysis in interpreting history

It would be wrong to think that any single variable provides the key to interpreting the evolution of economic events. Nonetheless, I believe that real exchange-rate analysis greatly enriches our capacity to understand the forces behind the changing course of a country’s economic history. Major events and policies are often reflected in the movement of real exchange rate.

In previous sections, we have looked at individual episodes of country experience to highlight the various mechanisms affecting the real exchange rate. In this section, we trace the history of two countries for a period long enough to reflect different causal connections. I believe the stories of Uruguay and Mexico speak for themselves in highlighting the usefulness of understanding real exchange-rate analysis for interpretation of events.

Uruguay, 1970-82

Uruguay’s trade policy was historically restrictive, but a change of direction beginning around 1974 gave a significant stimulus to trade. Trade liberalization took partly the form of relaxing import restrictions, and partly that of eliminating taxes on the country’s principal export products. Because the elimination of import restrictions tends to push up the real exchange rate while reduction of export taxes tends to drive it down, a combination of these policies should lead to a large expansion of trade; but only a relatively modest change in the real exchange rate. This, in fact, occurred in Uruguay. Exports, which averaged 12 percent of GDP
in 1970-72, grew to 19 percent in 1976-78; while imports rose from 13 to 20 percent of GDP. The real exchange rate (measured by the SDR-WPI), meanwhile, moved up from an average of 121 in 1970-72 to an average of 141 in 1976-77. International prices appear to have played no important role in this period. While an average of the U.S. dollar unit values of Uruguay’s exports of wool and meat (IFS Yearbook 1985, lines 72h, 72k) rose from an index of 31.3 in 1970-72 to an average of 57.6 in 1976-78, the SDR-WPI in the same period rose by almost the same percentage: from 37.45 to 69.36.

The picture changed significantly in the subsequent period. Between 1976-78 and 1980-82, the ratio of exports to GDP fell from 19 to 14.6 percent, while the ratio of imports was maintained at about 19 percent of GDP. The incentives were, in all likelihood, working in opposite directions. The real exchange rate index fell from 141 in 1976-78 to 94 in 1980-82. This reflects a substantial reduction in the incentive to produce for exports, and an attractive increase in the incentive to import.

The reduction in the proportion of GDP devoted to exports is a direct reflection of this changed incentive. However, you might think it anomalous that the proportion of GDP devoted to imports should go down even slightly in the face of so sharp a drop in the real exchange rate. But you must recall that the demand curve for imports is downward sloping, and that the proportion of GDP spent on imports reflects price times quantity, not quantity alone.

While we do not possess a good quantity index of Uruguay’s imports, we can measure the real purchasing power of Uruguay’s actual expenditures on imports, simply by dividing each year’s dollar volume of imports (IFS Yearbook 1985, line 77abd) by the
SDR-WPI for that year (see Table 4.3, Part A). When this is done, we find that real imports of Uruguay rose from $524 million (in 1980 dollars) per year during 1970-72 to $928 million per year during 1976-78; this was the "liberalization phase," when the increase in imports was essentially matched by an increase in exports. Between 1976-78 and 1980-82, real imports rose to $1,472 million per year (in 1980 dollars). This period was the "capital imports" phase of Uruguay. Imports, while remaining roughly constant as a share of GDP, actually grew substantially during this period, in part because GDP itself was growing, but also because imports were cheaper due to the highly appreciated real exchange rate.

The final phase of Uruguay's story has been reviewed (along with others) in Section 4.06. Here we need only place the data for the "debt crisis" phase in the context of the present story. As the reality of the debt crisis became clear, drastic adjustments were called for. The real exchange rate was one of the principal instruments of this adjustment, leaping from 93 in 1982 (and an average of 94 for all of 1980-82) to 153 in 1983 (and an average of 159 in 1983-85). The function of this rise in the real exchange rate was, of course, to help close the payments gap created by the sharp reduction of capital flows. In this it succeeded quite well. Exports rose to an average of over 24 percent of GDP (again with no significant help from world price changes), while imports moved only to 21 percent of GDP. (Once again we must take care to recognize that the rising share of imports reflects price times quantity, not quantity alone.) Actually, in terms of the purchasing power over SDR-WPI baskets, merchandise imports fell from $1,472 million (in 1980 dollars) in 1980-82 to around $770 million in 1983-84.

Mexico, 1955-86

In 1955, Mexico had just emerged from a spate of monetary instability with a significant economic policy reform. As part of this reform, the exchange rate had been fixed (in 1954) at 12.5 pesos to
the dollar, a rate that was to hold for more than two decades. The new policy ushered in an era of prosperity and economic growth without major crises or dramatic incidents.

Over the 18-year period 1955-73, the country’s GDP grew at a compound annual rate of 6.8 percent. Thus, in spite of population surging ahead at 3.5 percent per year, product per head grew at 3.3 percent—a major feat for so large and populous a country to maintain for so long. Inflation was kept well under control in this period. Because of its outstanding economic performance—even while successfully maintaining a fixed exchange rate—Mexico “absorbed” the world inflation of the period, and little more. The country’s consumer price index rose over the 18-year period at an annual rate of 4.4 percent. Fiscal and monetary restraint lay behind this result.

Money plus quasi-money together grew at an average annual rate of 12.4 percent over these years, just enough to cover the economy’s 6.8 percent growth and its 4.4-percent inflation, with a tiny margin of less than 1 percent per year to cover the extra demands for cash balances brought about by rapid modernization and growth. Of course, in the final analysis, the money supply is an endogenous (dependent) variable in a fixed exchange-rate system; such systems fail when a country’s authorities do not abide by the discipline that the system imposes. During 1955-73, Mexico’s authorities did well in successfully holding to the “rules of the game” under a fixed exchange rate.

This era of prosperity saw exports and imports growing rapidly, whether measured in nominal or deflated dollars; they did not grow, however, as a proportion of GDP. As is characteristic in cases of rapid growth of large and diversifying economies, the
share of trade in GDP declined moderately. Exports were about 14 percent of GDP in the latter half of the 1950s, about 10 percent in the early 1960s, about 9 percent in 1967-70, and about 8 percent in 1971-73. In each of these periods, imports were about one percentage point higher, beginning at 15 percent of GDP in 1955-59 and ending at 9 percent in 1971-73. The natural forces of economic growth were supplemented by conscious policies of import-substituting industrialization, which of course accelerated the trend toward declining shares of exports and imports in the GDP. Note, too, that with imports averaging one percentage point higher than exports, the country was accepting a steady, though modest, rate of capital inflow from abroad.

Thus, there were three forces at work to drive down Mexico's real exchange rate in this period:

a. **Rapid increase in per capita income.** The wage growth was considerably in excess of growth in the prices of tradables, which reflected high productivity growth concentrated in the production of tradables.

b. **Increased import restrictions.** These restrictions, which reflected the policy of import-substituting industrialization, worked, as expected, to reduce the real demand for foreign currency and hence its real price.

c. **Small but steady inflow of capital.** The inflow financed a modest excess of import demand over export supply and caused the real exchange rate to be somewhat lower than it would have been in the absence of capital flows.

As a result of these three forces, we observe a steady fall in the real exchange rate during Mexico's most prosperous period. Her real exchange rate index (with 1980=100) started at slightly over 125 in 1955, fell slightly below 120 by 1957, and was 103 by 1959. Dur-
ing the 1960s, it fell gradually from 98 in 1961 to a little over 88 in 1968. The latter level was then maintained for four years.

Mexico's 18-year economic idyll began to falter in the early 1970s. The rate of monetary expansion (money plus quasi-money) was below its 18-year average of 12.4 percent during 1970 and 1971, but then jumped to 23 percent in 1973, 26 percent in 1974, and finally 47 percent in 1976, the year in which the 12.5-peso rate of exchange was finally abandoned. Lying behind the monetary expansion was a rapid expansion in the size, spending, and borrowing of the public sector.

The government deficits of 1973 through 1976 totaled about 180 billion pesos (about $15 billion of that era), compared with less than 25 billion pesos ($2 billion) from 1967 through 1971. In spite of the fact that most of the deficits of the early 1970s were financed from outside the banking system, the amount of money the government borrowed from the banking system was, nonetheless, sufficient to stretch and strain it. From its base of 25 billion pesos in 1970, total bank credit made available to the government increased sixfold by 1976, more than tenfold by 1977, and about twentyfold by 1979. The share of government (as a borrower) in total bank credit rose from less than a third in the late 1960s to nearly two thirds in 1974-76.

The inflationary forces that were set loose in the economy produced a new appreciation of the real exchange rate during 1973-75. The country was now heading toward a classic devaluation crisis (like in Chile, Ghana, Uganda, and Zaire, recounted in Section 4.05, though on a much smaller scale). The devaluation came in the latter half of 1976. From its pre-devaluation level of about 80 in the second quarter of 1976, the real exchange-rate index reached a peak of 124 in the fourth quarter of that year and maintained an average level of 117 during 1977.
Mexico’s oil boom was the main reason why the real exchange rate did not rise more sharply with the devaluation crisis, and why it drifted downward over the subsequent five years. Oil exports represented only 1 percent of total exports in 1973, and about 15 percent in 1976. But they ran up to over 20 percent of total exports in 1977, over 30 percent in 1978, over 40 percent in 1979, nearly 60 percent in 1980, and over 70 percent in 1981 and later. And while oil revenues were rising as a proportion of exports, exports were rising as a proportion of GDP—from an average of 8 percent in 1974-76 to over 10 percent in 1977-78, 11 percent in 1979, and about 12 percent in 1980 and 1981.

The oil boom unleashed for Mexico pressures that were similar to those recounted for Ecuador in Figure 4.1. Mexico’s case of “Dutch disease” was relatively mild because the oil boom in part simply offset the “budget-deficit/ inflation/devaluation-crisis” syndrome that had been building for several years and which had already, in a sense, “exploded” prior to the country’s oil boom. The oil boom greatly muted the effects of the “explosion.”

As far as the real exchange rate was concerned, there was mutual offsetting between two sets of forces:

a. the events leading up to the 1976-devaluation crisis; and

b. the oil boom that started in the mid-1970s and which intensified with the increases in the world-market price of oil in 1979.

What might have been a big real devaluation following the 1976 crisis turned out to be a relatively moderate one. Likewise, what might have been a big appreciation of the real exchange rate due to the oil boom was also reduced in intensity because of the “devaluation crisis” syndrome.
The rest of Mexico’s story is well known. The export proceeds earned from the oil boom were spent for imports; in addition, the country borrowed against future revenues. When international creditors resisted further expansions of debt, Mexico was forced into a new real devaluation in 1982 (see Figure 4.2 on page 193). A new sequence of external shocks (the 1985 earthquake, followed by the breakdown of the oil producers’ cartel) forced further adjustments in Mexico’s economy; these were reflected in new rounds of nominal and real devaluation. The devaluation brought Mexico’s real exchange-rate index to over 150 by April of 1986, with further real devaluation still in prospect.

Notes

1. The countries for which IFS presents the exchange rate as defined by \( r_h \) (rather than \( r_f \)) are: Australia, Bahrain, Botswana, Cyprus, Fiji, The Gambia, Ghana, Iraq, Ireland, Jordan, Kuwait, Lesotho, Malta, New Zealand, Nigeria, Papua New Guinea, Qatar, Sierra Leone, South Africa, Sudan, Switzerland, Western Samoa, and the United Kingdom.

2. The older literature on purchasing power parity used similar indexes in the two countries. This may not be a serious problem when we are concerned with purely monetary disturbances. Modern real exchange-rate analysis, however, deals with many different types of real disturbances. For these, we must be careful not to miss the essential nature of the adjustment process. This is what would happen if a similar index of tradable goods were used in the two countries. For each imported commodity \( X_i \), the domestic price \( P_d \) is connected to the world price \( p^* \) by the nominal exchange rate \( E \) plus any tariffs (or tariff-equivalent restrictions) \( t_i \).

Thus, for this type of commodity, \( p_d = p^* (1 + t_i) E \). For export commodities \( X_p \), the relation is similar: \( p^*_d = p_p (1 + t_j)/E \), the tariff here being that of the foreign country that imports the good.

(Transport costs, where they are significant, play a role similar to tariffs.)
Because tariffs are changed at relatively rare intervals, an index of domestic prices of tradables $p_d$ and $p_d$ would tend to equal the same index (that is, an index constructed using the same weights) of the foreign prices $p^*_i$ and $p^*_j$ of the same tradables. A general index of the real exchange rate $E^*_d/p_d$ would, thus, tend to be equal to unity, except where tariffs (or transport costs, which also intervene between domestic and foreign prices and which in the preceding description can be thought of as part of $t_i$ and $t_j$) have changed through time. This makes clear the reason why the deflating index $p_d$ should cover, in principle, nontradable as well as tradable goods.

3. Examples of recent literature in which this schema is followed are:


4. Indeed, prior to November 1971, the SDR was defined as exactly one U.S. dollar. Up to 1974, it was still defined exclusively in terms of the dollar, though at differing parities.

5. “Dutch disease” is a name given to the phenomenon of a major export boom producing such a flood of foreign exchange that the real exchange rate appreciates very significantly, which creates problems for other activities producing tradables. The term was coined as a consequence of the experience in The Netherlands following the discovery of North Sea oil and gas.
Policy analysis for trade liberalization

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- Imposing new tariff on one final good, with existing tariff on another 222
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- Special case of imported input 235
  - Steel, molybdenum, and aluminum 238
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- Concept of supersubstitutes 244
- Regular and super substitutability 246
- Exports: Case of supercomplementarity 249
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This chapter provides a simple, didactic exposition of the economic analysis of two types of trade liberalization:

a. liberalization by reducing existing barriers to trade;

b. liberalization, if it may be called that, by introducing tariffs on previously unprotected items, when the result is to bring the whole pattern of restrictions closer to uniformity.

To lend an element of realism, we shall assume that there is an existing tariff of 60 percent on manufactures. Initially, two classes of products enter duty free: food grains which compete with local production, but which have been left on the free list because they are cost-of-living items, and components (intermediate inputs and possibly raw materials) which enter into domestic production processes. For simplicity, we shall assume that exports consist of other classes of agricultural products (such as ground nuts, coffee, and cacao), plus possibly minerals. We shall also assume that these goods are not important in the domestic demand pattern.

Figure 5.1 presents a familiar case. An initial tariff $T^*_{\text{F}}$ on finished goods is reduced to $T_{\text{F}}$. The result is improved efficiency from two sources. First, the excess production cost occasioned by the tariff is reduced, which leads to a gain measured by the shaded area under the supply curve. Second, the excess consumer cost occasioned by the tariff is also reduced at the same time; this results in a gain equal to the shaded area under the demand curve.

In the absence of other distortions in the economy, these two areas are the only efficiency effects. Quantities and prices may change in other markets; indeed, with balanced trade—a condition of equilibrium for the present analysis—exports must rise and other imports...
Figure 5-2. Introduction of a tariff on grains

A

New producer cost

New consumer cost

$P_G + T_G$

$P_G^*$

$S_G$

$D_G$

Grains (G)

B

Induced gain (Reduce supply with MSC>MSB)

Induced gain (Increase demand with MSB>MSC)

$P_F^* + T_F^*$

$P_F^*$

$S_F$

$D_F$

Finished goods (F)

Note: Figures 5.2 and 5.3 are not drawn to the same scale.
must fall. But so long as these changes occur in undistorted markets, they do not give rise to additional welfare gains (or losses) above and beyond the two shaded areas of Figure 5.1.

**Imposing new tariff on one final good, with existing tariff on another**

In Figure 5.2, a tariff is introduced on grains when a tariff already exists on finished manufactures. The tariff on grains gives rise to the familiar two triangles of consumer cost and producer cost in Graph A. But now there are other effects to be taken into account, owing to the presence of a preexisting distortion (the tariff $T^o_F$ on imports of finished manufactures). Since we have both domestic production and domestic demand for finished manufactures, we can expect to find two additional effects. Normally, both of these will be positive—that is, they will both entail net social benefits. As their price rises, the demand for grains will fall; this fall will be compensated by an increase in the demand for other goods, among them finished manufactures (except in the very unlikely case where finished manufactures are somehow complements in demand for food grains).

The rectangle of induced gain from increased demand for finished goods $F$ is indeed a benefit—because we are expanding an activity (demand for $F$) in which marginal social benefit (MSB), as measured by the demand price ($P^*_F + T^o_F$), exceeds marginal social cost (MSC) as measured by supply price ($P^*_F$). $P^*_F$ is the world price of $F$, but indirectly it reflects the resource costs of the exports that are needed to permit the importation of $(D_F' - D^o_F)$ of additional manufactured goods.

On the supply side, the expansion of production of food grains will draw resources from other sectors of the economy. Some of these will presumably come from the manufacturing sector. Resources at
so released will have a value measured by the supply price \((P_F^* + T_F^r)\) of manufactured goods. This is the measure of the benefit produced by their release. Releasing the resources also has a cost, because now additional imports equal to \((S_F^o - S_F^r)\) will be required. The cost of these additional imports is \(P_F^*\). [Once again, this can be thought of as the cost of the additional resources that will be needed in export activities to generate added foreign exchange in the amount \(P_F^* (S_F^o - S_F^r)\).]

In Figure 5.2, the two rectangles of gain in Graph B have each a greater height, though a smaller base, than the corresponding triangles of cost in Graph A. So, the question of whether the overall gain exceeds the overall cost of introducing the tariff on grains is rendered ambiguous. This ambiguity is quite appropriate, because under the general assumptions we have been working with there is always a tariff on grains sufficiently low that its introduction will necessarily (within the framework of the analysis) produce a net gain. Correspondingly, there will normally exist a tariff level on grains sufficiently high so that its introduction would necessarily (that is, even in the presence of the existing tariff \(T_F^o\) on finished manufactures) produce a net loss. (The exception to this rule occurs when the demand for imports of grains is highly elastic, and the tariff on grains reduces their imports to zero before it becomes high enough for the triangle of loss on grains to outweigh the rectangle of gain on manufactures.)

Figure 5.3 presents the same story in a more compact way. For the construction of this figure, we use the fact that the demand function for the import of any good is simply the excess demand function obtained by subtracting the supply curve for its production within the country from the demand curve for its purchase by consumers (or other demanders) in that country. The quantities measured on the curve \(D_{MG}^o\) in Graph A, Figure 5.3 are thus, at every price, equal to the corresponding \((D_G^o - S_G)\) in Graph A, Figure 5.2. Similarly, the quantities represented on the curve \(D_{MF}^o\)
Figure 5-3. Introduction of a tariff on grains

**A**

- New consumer cost
- New producer cost

\[ (D^*_G - D^0_G) \]

\[ (S^*_G - S^0_G) \]

\[ (S^*_G - S^0_G) \]

\[ (D^*_G - S^*_G) \]

\[ (D^*_F - D^0_F) \]

\[ (S^*_F - S^0_F) \]

\[ (D^*_F - S^*_F) \]

**B**

- Induced gain from reduced supply
- Induced gain from increased demand

\[ (D^*_F - D^0_F) \]

\[ (S^*_F - S^0_F) \]

\[ (S^*_F - S^0_F) \]

\[ (D^*_F - S^*_F) \]

\[ (D^*_F - S^*_F) \]

Note: Figures 5.2 and 5.3 are not drawn to the same scale.
Figure 5-4. The "second-best optimum" tariff on grains

A

\[ \text{Imports of grains (} M_G \text{)} \]

B

\[ \text{Imports of finished goods (} M_F \text{)} \]
in Graph B, Figure 5.3 are equal to \((D_F - S_F)\) in Graph B, Figure 5.2. The areas shaded in Figure 5.3 correspond to the areas shaded in Figure 5.2. The triangle labeled "new consumer cost" in Figure 5.3 is in every way identical to the corresponding triangle in Figure 5.2; that labeled "new producer cost" has the same base and height as the corresponding triangle in Figure 5.2; hence it has the same area, even though its shape is different.

Likewise, Graph B of Figure 5.3 replicates the story of Graph B of Figure 5.2. The solid demand curve for imports of \(F\) is the difference between the solid \(D_F\) and \(S_F\) curves of Figure 5.2. Similarly, the dashed demand curve \(D_{MF}\) in Figure 5.3 is the difference between the dashed \(D_F\) and \(S_F\) curves of Figure 5.2. The shaded area "between" these two curves, whose height is \(T_F\) and whose base is \((M_F' - M_F)\), thus corresponds exactly to the sum of the two rectangles of induced gain that are shown in Graph B of Figure 5.2.

From the derivation of Figure 5.3, it is easy to see in Figure 5.4 how the "second-best optimum" tariff on grains is determined. It is a "second-best optimum" because it takes as given the preexisting distortion \(T^a_F\) the tariff on finished goods.

In Figure 5.4, we analyze a small increase in \(T_G\), the tariff on grains. This will obviously cause a reduction in imports of \(G\), which we shall denominate by \(R_{GG} \Delta T_G\). \((R_{GG}\) is, therefore, defined as the coefficient [note the negative sign] giving the reaction of the quantity of imports of \(G\) to a change in the tariff on \(G\).)

Simultaneously, the change in \(T_G\) produces a reaction in the quantity of imports of finished goods. This is represented by the rightward shift in \(D_{MF}\) from the solid to the dashed curve (see Graph B). This shift is equal to \(R_{FG} \Delta T_G\) \((R_{FG}\) is defined as the coefficient [note the positive sign] giving the reaction of the equilibrium
This gives us the necessary information to explain the determination of the second-best optimum tariff on grains. The shaded area of added costs is negative in sign, and for small changes can be measured as $T_G R_{GG} \Delta T_G$. When $T_G$ is very small, the gain occurring in the market for F will outweigh the cost incurred in the market for G. When $T_G$ is large enough, the cost will outweigh the gain. The second-best optimum, $T^*_G$, is reached when the two terms are equal and have opposite signs. Thus:

$$T^*_G = -(R_{FG} / R_{GG}) T^*_F.$$  

This formula has an easy interpretation. The raising of $T_G$ obviously leads to a reduction in the amount of foreign exchange spent on grains. This reduction in foreign exchange use will have its counterpart (under balanced trade) in additional expenditures on other imports and/or in the reduction of one or more sources of exports. Typically, the pattern will be broadly spread, and will reflect the ways in which the different components respond to a greater availability of foreign exchange (that is, an appreciation of the real exchange rate) as well as any particular substitutability or complementarity that may exist between food grains and the various other import and export products.1

Figure 5.5 illustrates further the central principle determining the second-best optimum tariff on one import (grains) in the presence of a preexisting tariff on other imports (finished goods). We can explore the second-best optimum by raising the tariff on grains by a given amount, starting from three different initial positions $T^*_G$, $T^*_G$, and $T^*_G$; the rise in the tariff $\Delta T_G$ is the same in all three cases. With linear demand functions, this means that $\Delta M^*_G$ (the base of each trapezoid in Graph A) is the same in all three cases, as is the induced change $\Delta M^*_F (= R_{FG} \Delta T_G)$. Since the tariff $T^*_F$ on finished goods market.
Figure 5-5. Why there is a “second-best optimum” tariff

A small increase of $T^b_G$ produces neither a net gain nor a net loss because the trapezoid of loss in the grain market is offset by rectangle of gain in the finished goods market.

With large loss trapezoid, there is a net loss from increasing $T^b_G$.

With small loss trapezoid, there is a net gain from increasing $T^b_G$.
goods is taken as given throughout the exercise, the rectangle depicted in Graph B of Figure 5.5 is of the same size, regardless of whether $T^a_G$, $T^b_G$, or $T^c_G$ was the starting point from which the increment $\Delta T_G$ was imposed.

The difference between the three cases lies in the trapezoids in the market for imports of grains. When the preexisting tariff on grains is $T^a_G$, the trapezoid is smaller than the rectangle of gain in the market for finished goods. When the preexisting tariff is $T^b_G$, the rectangle and the trapezoid are of equal size, hence $T^b_G = T^c_G$, the "second-best optimum" tariff. But if $T^b_G$ is raised above $T^b_G$, there is a net loss at each step, as the trapezoid of loss (shown for $T^c_G$ in Figure 5.5) outweighs the rectangle of gain.

Lessons

From this exercise, we can draw two lessons:

1. In the presence of a preexisting tariff $T^o_F$, taken as given and for the purposes at hand immutable, it always pays (abstracting from administrative and compliance costs) to introduce at least a tiny tariff $T^c_G$ on imports of grains $M_G$.

2. By limiting and modifying the above statement we find that, so long as normal substitution prevails among imports, it never pays to raise the new tariff $T^c_G$ to a level higher than that of the preexisting tariff $T^o_F$. This follows from the fact that $R_{FG}$ must be less than (or at the most equal to) $R_{GG}$ in absolute magnitude. In simple language, imports of finished goods are not the only substitutes to which people turn to as a consequence of the rise in the tariff on grains.

1. In the presence of a preexisting tariff $T^o_F$, it pays to introduce at least a tiny tariff $T^c_G$ on imports of grains.

2. So long as normal substitution prevails among imports, it never pays to raise the new tariff $T^c_G$ to a level higher than that of the preexisting $T^o_F$. 

1
Figure 5-6. Reducing the tariff on finished goods

A

Gain from reduction in $T_F$

Imports of finished goods ($M_F$)

Trapezoid of gain must exceed the rectangle of loss because $T_F > T_G$ and $\Delta M_F > (-\Delta M_G)$.

B

Imports of grains ($M_G$)

$D_{MG}$ shifts due to $\Delta T_F$.
Reducing existing tariff on finished goods

There are symmetrical lessons to be learned from reducing a "high" tariff. We consider here the case of reducing the tariff on finished goods, which was taken as given and immutable in the preceding section.

Without any question, reducing $T_F$ in the absence of any other tariff will produce a gain in welfare. This is a very familiar proposition, and is quite general so long as other distortions are absent.\(^2\)

The case becomes more interesting when another tariff (say, on imports of grains) already exists. Where this preexisting tariff is higher than $T_F$, the problem gets reduced to the one considered in Figures 5.4 and 5.5. So the case to be examined here is one in which the preexisting tariff $T_G$ is lower than the initial level of $T_F$. This case is dealt with in Figure 5.6.

The critical result in this case is that there is always a gain in welfare from reducing the highest tariff\(^3\). The reason is that the rectangle of loss (stemming from the market for imports of grains) is smaller, both in its height and in its base, than the trapezoid of gain from reducing $T_F$. About the height there is no doubt, for by assumption the initial level $T_F^0$ is greater than $T_G^0$, and our argument loses no generality if we assume that reduction takes place in small enough steps, so that after the step in question the finished goods tariff $T_F^0 - \Delta T_F$ is still greater than $T_G^0$.

For the base of the rectangle to be smaller than the base of the trapezoid we need only establish that, as people use more foreign exchange to import $\Delta M_F$ of extra finished goods, not all of that increment of foreign exchange is diverted from imports of grains. If there are other categories of imports, some of the incremental...
foreign exchange will almost surely come from them. Typically, too, there will be a real exchange-rate effect stemming from the liberalization of the finished goods, and this will entail part of the incremental foreign exchange coming from newly stimulated exports.4

Note that if there are only two relevant import goods—finished manufactures on the one hand and grains on the other—a reduction in the tariff on finished manufactures always produces a welfare gain, so long as the tariff on grains is zero.

This calls attention to the asymmetry of the two cases:

a. raising the tariff on grains in the presence of a preexisting tariff on finished manufactures; and

b. lowering the tariff on finished manufactures in the presence of a preexisting situation of free trade in grains.

Under "normal" circumstances of generalized substitutability among the goods in question, the answer to b is yes at every step, until the tariff on finished manufactures has been reduced to zero. In contrast, the answer to a is affirmative at the beginning (that is, starting from a zero tariff on grains), but turns negative once $T_G$ exceeds the "second-best optimum" tariff on grains $T^*_G$.

From what has just been said, you might wonder whether an optimum "package" of tariffs $T^*_F$ and $T^*_G$ exists. Under conditions of substitution, there is a positive second-best optimum tariff on grains, if we start with a preexisting positive tariff on manufactures. However, there is no positive second-best tariff on manufactures, if we start with a pre-existing zero tariff on grains. The juxtaposition of these two answers opens up a third possibility: whether there is any positive package of tariffs $T^*_F$ and $T^*_G$ such that each is the second-best optimum tariff, given the other.
Let us start with $T^\circ_F$. Following the procedures outlined earlier, we obtain:

$$T^*_G = -(R_{FG}/R_{GG}) T^\circ_F$$

Please note that so long as there are other substitutes for $G$ besides $F$, the fraction $-(R_{FG}/R_{GG})$ will be less than one; hence $T^*_G$ will be less than $T^\circ_F$.

The same line of analysis will tell us that if we take as given any $T^*_G$ and calculate the second-best optimum tariff $T^*_F$, we will find:

$$T^*_F = -(R_{GF}/R_{FF}) T^\circ_G$$

Again, it is overwhelmingly likely that $R_{GF}$ will be less in absolute magnitude than $R_{FF}$; this only requires that—if people reduce by $\Delta F$ the number of dollars (foreign currency units) spent on imports of $F$ when its tariff rises—they will not (also as a direct consequence of the rise in the tariff on $F$) expand their spending on $G$ by an amount greater than $\Delta F$.

Let us take a numerical example. Suppose the initial tariff on $F$ is 60 percent, while the initial tariff on $G$ is zero. If by taking $T^*_G = 0$ as given, we ask: what is the best tariff in $F$?, the answer is directly, $T^*_F = 0$. But if by taking $T^\circ_F = 60$ percent, we ask: what is the best tariff on $G$?, we might get $T^* G = 40$ percent.

We can now start a sequence. Taking $T^*_G = 40$ percent we might get $T^*_F = 30$ percent; then taking $T^*_F = 30$ percent we might get $T^*_G = 20$ percent. In the end, however, this process will also culminate with both $T^*_F$ and $T^*_G = 0$. 
Figure 5-7. The "second-best optimum" tariff on steel

A

Positions of equilibrium traced as $T_F$ is raised

Production cost of $T_F$

Consumption cost of $T_F$

Domestic demand for $F$

$P_F^* + T_F^0$

$P_F^*$

$P_S^* = a_s P_F^*$

$S_F$

$D_F$

Initial supply $Q_F^0$

Initial level of steel imports $M_s^0$

Demand $D_F$ with $T_F^0$ (does not depend on $T_S$)

Finished goods

Detail of efficiency cost measurement as $T_S$ is increased with given $T_F^0$.

B

Rectangle measures efficiency gain in market for finished goods

Marginal cost of $F$ minus $c_F$

$Q_F^*$ Finished goods output

C

Triangle measures efficiency in cost in market for steel imports

Demand price of steel minus $P_F^*$

$T_S$

$M_s^1$ Imports of steel

$M_s^0$

"Optimum is reached when $T_S = T_F^0$. This "annuls" production cost of $T_F$."

Rectangle measures efficiency gain in market for finished goods

Marginal cost of $F$ minus $c_F$

$Q_F^*$ Finished goods output
The voluminous literature on effective protection already gives us a clue that special circumstances may be created by the presence of imported inputs. Conclusions that seem straightforward and obvious when dealing with imports of final products may need to be drastically modified when the focus is shifted to imported inputs. Most particularly, the proposition no longer holds true that the second-best optimum tariff on a second import ($T_G$ in the above instance) lies always below the initial tariff ($T^o_F$) on the first import. In fact, if the second good is an input that enters in fixed proportions into the domestic production of the first and has no “other uses” its second-best optimum tariff will necessarily be higher (normally very much higher) than $T^o_F$. This is illustrated in Figure 5.7.

For convenience, and to reflect the assumption of fixed proportions between imports of steel and the production of finished goods, these two commodities are measured in equal units. That is, if the unit of finished goods is that amount which sells for a dollar on world markets, then the unit of steel is that amount of steel which is embodied in a dollar’s worth of finished goods. The world price of steel ($P^s$) will accordingly be equal to a fraction $a_s$ of the world price of finished goods ($P^F$), where $a_s$ is the fraction of the cost of finished goods that is accounted for by inputs of steel.

The choice of a common unit of measurement of quantities for the two goods enables us to depict on a single graph what happens when a tariff is imposed on steel and then successively raised.

We assume other inputs into the production of finished goods give rise to an upward-sloping supply function. As the tariff on steel is raised, this supply function undergoes upward shifts to reflect the
Figure 5-8. How tariff on steel "annuls" the production cost of tariff on finished goods

A

B

Finished goods (F)
(also imports of steel $M_S$)

Situation with just $T_F^o$

Situation with $T_F^o + T_F^a$

Situation with $T_F^o + T_S^b$
rising price of steel. Because the market price of finished goods remains the same \((P^*_F + T^0_F)\), the consequence of successive rises in \(T^*_s\) is a set of successive reductions in the equilibrium quantity of finished goods. At each step in this process, the quantity of finished goods produced \((Q^*_F)\) remains equal to the quantity of imports of steel \((M)\). Similarly, at each step the vertical distance between \((P^*_F + T^0_F)\) and the basic supply curve of finished goods \(S_D\) is precisely equal to the tariff on steel \(T^*_s\).

In Graph C of Figure 5.7, the welfare consequences of a rising level of \(T^*_s\) are illustrated. As \(T^*_s\) rises, a triangle of efficiency cost is generated, measured in the market for imports of steel. This is similar to the welfare triangle associated with any tax.

At the same time, the equilibrium quantity \((Q^*_F)\) of the finished goods output is reduced as \(T^*_s\) increases. This produces a welfare gain, because at each point the marginal production cost exceeds the world price by the amount \(T^0_F\). As production is successively reduced, the efficiency gain remains \(T^0_F\) on each unit fall in the quantity of \(F\) produced.

In the case illustrated in Figure 5.7, where \(T^*_s\) is set at its second-best optimum level (which under the assumptions of this example is equal to \(T^0_F\)), the net result is a triangle of gain. This triangle of gain is precisely equal in size to the preexisting triangle of production cost of the tariff on finished goods \(T^0_F\) in Graph A.

Figure 5.8 shows in more detail how this result comes about. Graph A shows the results of imposing a relatively small tariff \(T^*_s\) on steel. This generates a triangle of cost \((C)\) in the market for imports of steel, and a rectangle of benefit \((C + H)\) in the market for finished goods. The net benefit is the trapezoid \(H\).
In Graph B, the tariff on steel is assumed to be raised to $T'_b$. The triangle in the market for steel imports grows; the incremental cost is measured by the trapezoid $C$. The rectangle of gain in the market for finished goods also grows, by the amount of the shaded area $C' + H'$. The net gain at this second step is $H'$.

At the point where $T$ has been made equal to $T_F$, the production of finished goods is driven back to $Q_F$—the same location it would have reached, with neither a tariff on finished goods nor a tariff on steel.

The tariff on steel that succeeds in doing this is equal in dollars-per-unit-of-finished-goods to $T_F$. As a percentage of the world price of finished goods, it is the same as $T_F$; but as a percentage of the world price of steel, it is $1/a$ times $T_F$. Thus, if steel accounts for 20 percent of the world price of finished goods, the tariff that annuls the production cost of $T_F$ is equal to 5 times $T_F$, or 300 percent, since we have assumed that $T_F = 60$ percent.

5.05

Steel, molybdenum, and aluminum

The result of the preceding section seems almost too good to be true. But, if the tariff on steel can be used as an instrument to annul the production cost of the tariff on finished goods $T_F$, cannot the same objective be accomplished by using tariffs on other imported inputs as instruments?

Unfortunately, the answer is yes. Let us suppose there are two imported inputs—steel and molybdenum—that enter in the production of finished goods. Let us suppose, too, that steel accounts for 20 percent, and molybdenum for 10 percent, of the cost of finished
goods, measured at world prices. Then, from the line of reasoning just given, we can annul the production cost of a 60-percent tariff on finished goods *either* by imposing a 300-percent tariff on imports of steel \((T_s)\), or *by* levying a 600-percent tariff \((T_y)\) on imports of molybdenum. Obviously, we cannot get this same beneficent effect by introducing both \(T_s = 300\) percent and \(T_y = 600\) percent. That would carry finished goods production far below its "efficient" level \(Q^o\).

There is a nice compromise, however. If we choose to impose a single tariff \(T_{sy}\) to cover imports both of steel and molybdenum, then its optimal level would be \(T_{sy} = \frac{T_F}{(a_s + a_y)}\). In this case, with \(T_F\) at 60 percent, \(T_{sy}\) would be equal to 200 percent.

Let us enter now yet another imported material, aluminum \((L)\), with an input coefficient of 30 percent in the production of finished goods. If it alone were to offset the production cost of a 60-percent tariff on \(F\), the appropriate level of its tariff, \(T_L\), would be 200 percent.

Thus, looking at one imported input at a time, we could offset the production cost of \(T_F = 60\) percent by *either* \(T_L = 200\) percent, or \(T_s = 300\) percent, or \(T_y = 600\) percent. But there is no need to choose among the three. The task might be far better accomplished by treating all three of them together as an instrument. Using this instrument to fully offset the production cost of \(T_F = 60\) percent would now call for a general imported-input tariff of:

\[
T_F/(a_s + a_y + a_L) = (60\%)/(.20 + .10 + .30) = 100\%.
\]

It is easy to see what is happening as we bring additional imported inputs into consideration. Our production-cost-offsetting tariff is always \(T_F/(\Sigma_j a_j)\), where \(a_j\) is the coefficient indicating (at world

Where there are two or more imported inputs, many combinations of different tariffs exist on each of them, all of which would succeed in annulling the production cost of \(T_F^o\).

Probably the most prudent combination to choose is that of a uniform tariff applying to all these inputs.
prices) what fraction of the cost of product $F$ is accounted for by factor $j$. The larger the fraction of imported inputs, the closer to $T_F$ is the production-cost-offsetting tariff on all the inputs taken together.

Lessons

From this exercise, we can draw four lessons.

1. While with grains (imports that are not inputs into production of tradables) we found that the second-best tariff would always be lower than the preexisting tariff $T^o_F$ on finished goods, in the case of imports that are inputs into finished goods production we found the opposite: economic criteria alone would suggest a tariff that is, if anything, higher than the preexisting $T^o_F$.

2. Serious possibilities of incompatibility emerge when we think of setting tariffs on inputs one at a time. The lesson here is to think of a single tariff on all goods that are actually inputs, or which might assume that role in the future.

3. If there is a uniform tariff on finished products, then the strictly technical presumption—aimed at annulling or at least offsetting in large measure the production cost of that tariff—would be that the uniform tariff on imported inputs should be, if anything, higher than the uniform tariff on finished products.

4. This presumption (in lesson 3) is modified in favor of a uniform tariff for a whole host of reasons when other complications or considerations are taken into account. One important consideration is the desire to protect import-competing activities. As is well known, a uniform tariff (on all inputs as well as all finished products) ensures uniform effective protection to all import-substituting activities, independent of their stage in the production process.
In this section we explore further the imposition of a tariff on steel. The objective is to place the analysis of a tariff on steel on the same footing as the discussion based on Figures 5.2 through 5.5. This entails measuring both finished goods and steel in units of the "dollar's worth"—that is, in units of equal value in the world marketplace.

Two steps are depicted in Figure 5.9. At step 1, a tariff of 60 percent is imposed on finished goods. The analysis of this step is straightforward: the standard triangles of consumer cost and producer cost are generated in the finished goods market. At the same time, the demand for imports of steel shifts to the right. Using an input coefficient of 0.2, it would have taken $160 million of imports of steel for the country to produce the initial equilibrium value of $800 million worth of finished goods. When $T^o_F$ is imposed, the production of finished goods rises to $1,000 million worth (at world prices) and entails an increase in the use of steel from $160 to $200 million. No element of efficiency cost or gain arises in the market for imports of steel at step 1, because at that step it is still an undistorted market.

At step 2 we introduce a tariff $T^a$ on steel. This is intentionally set at a level different from the tariff that would fully annul the production cost of $T^o_F$—in fact, it is set at precisely half that level.

The introduction of $T^a$ generates a triangle of loss in the market for imports of steel. But it shifts the supply curve of finished goods upward (vertically) by an amount which reflects the increased cost of steel. Steel used to account for 20 cents of the cost of a dollar's worth of finished goods; now that has become 50 cents and includes the tariff on steel. At 900 million units of F, the original supply curve $S_F$ reflects a supply price exactly half way
Figure 5-9. How tariff on steel produces gain in finished goods market

A

Triangle of producer cost of $T_F$ (step 1)

$P_F^* = 1.0$

$S_F$ shifts to reflect imposition of $T_F^*$ at step 2.

$1 + T_s^a = 2.5$

$P_s^* = 1.0$

Shift from $D_s^0$ to $D_s^1$ is due to imposition--step 1--of $T_F^0 = 60$. As a consequence, steel imports rise from 160 to 200.

B

Loss from imposition of $T_s^a$ at step 2

Imports of steel (millions of dollars' worth)

(millions of dollars' worth)
between its value of 1.00 at 800 million units and its value of 1.60 at 1,000 million units. The supply price on the original curve is thus 1.30; when this is shifted upward by 30 cents to reflect the tariff $T^a$, the new supply price at 900 million units is 1.60. That is to say, the new equilibrium of production of finished goods in the country is 900 million units.

The shift of the equilibrium level of production of $F$ from 1,000 units to 900 million units generates a rectangle of welfare gain, whose base is 100 million units and whose height is 60 cents. This rectangle is marked (surrounded by a double dashed line) in Graph A of Figure 5.9.

Please note that the base of this rectangle is 100 million units (in dollars’ worth), while the base of the triangle in the steel imports market (Graph B) is only 20 million units (in dollars’ worth). In contrast, the height of the upper triangle (labeled V in the insert) within the rectangle of gain, but above the original supply curve $S_F$, is 30 cents, while the height of the triangle in the steel import market (Graph B) is 1.50 (150 percent tariff). From this we can see that the triangle labeled V, with a base of 100 million units and a height of 0.30 has the same area as the triangle in Graph B, whose height is 1.50 and whose base is only 20.

This shows how the net gain at step 2 is equal to the rectangle of gain in Graph A, minus the triangle labeled V. This gain is precisely the saving of the production cost of the original tariff $T^a_F$, as production is reduced from 1,000 million to 900 million units.

It is easy to see by extrapolating in the diagrams how a tariff of 300 percent on steel (raising its price to 4.0) would drive the production of finished goods back to 800 million units, thus completely annulling its production cost. The rectangle of gain would
now be larger, since it has a base equal to $200 million worth. But the triangle of cost in the market for steel imports would also be larger, its base would be $40 million worth instead of $20 million worth, and its height would now be 3.0 (300 percent tariff).

When the cost triangle from the steel imports market (equal to the triangle above the original supply curve $S_F$) is subtracted from the rectangle in the finished goods market, the result is a net gain which is equal to the initial "triangle of producer cost." This was precisely what was shown, in a didactically more convenient way, in Figures 5.7 and 5.8.

5.07 Concept of supersubstitutes

With the analytical underpinning of the previous section, we can now take up the concept of supersubstitutes in international trade. If it takes $20 worth of steel imports to produce $100 worth of finished goods, then anything that cuts steel imports by an amount $\Delta M_s$ (measured in dollars' worth) will have to end up by cutting the production of finished goods by five times $\Delta M_s$ (also measured in dollars' worth). But, cutting the production of finished goods will mean increasing imports of such goods by a like amount. (You will recall that their price is unaffected by the imposition of $T_s$, remaining at $P_F = P_F^* + T_F^*$.)

The preceding statement is true of anything that affects imports of steel (so long as such imports remain the sole source of steel as an input into the production of finished goods, and so long as the relevant coefficient remains fixed at 0.20). Hence, it must hold true when the cause of the reduction in $M_s$ is a rise in $T_s$. This leads to the surprising result that the coefficient ($R_{FS}$) relating imports of finished goods to the tariff on steel is greater in absolute value than the coefficient ($R_{SS}$) relating imports of steel to...
its own tariff. In fact, we have $R_{fs} = -5 R_{ss}$, or (more generally) $R_{fs} = (-1/a_{sf}) R_{ss}$. Here, $a_{sf}$ is the input-output coefficient relating the input of steel to the corresponding production of finished goods.

In terms of Figure 5.9, a 150-percent tariff on steel leads to a reduction of steel imports by $20 million worth. But the reduction of finished goods imports is $100 million worth. Thus, the impact effect of $T_s$ is to increase the demand for foreign currency, and to raise the real exchange rate. Other imports (besides steel and finished goods) will thus be squeezed in the net by the imposition of a tariff on steel, while exports taken as a group will be stimulated. All this is opposite to the set of effects that occur in "normal" cases like that of the tariff on grains, (see Section 5.02). What is happening is that, through the exchange-rate effect, "other imports" are made to behave as if they were complements of steel. That is, increasing the tariff on steel deters these other imports (such as grains) at the same time as it causes imports of finished goods to expand.

The other anomalous attribute of the phenomenon of supersubstitutability is that exports expand when the tariff on steel is raised. Thus, raising the tariff on a good that serves exclusively as an input into the production of importables is a trade creating, not a trade-restricting move. This aspect—of a tariff on an input into importables being trade-creating—remains true even when that tariff becomes so high that increases in it are welfare-reducing. In the example, even if $T_s$ were raised above 300 percent, each successive increment would still have a net positive impact on the demand for foreign currency (arising out of both steel and finished-goods imports combined). This net positive impact would have the consequence of raising the real exchange rate, thus stimulating exports while deterring other imports.
Lessons

Four lessons can be learned from the discussion of supersubstitutes.

1. Tariffs on imports that are inputs into the production of importable goods have anomalous effects. They cause the demand for foreign currency to increase, exports to expand, and total trade to rise.

2. The second best optimum tariff on such an input is a multiple (>1) of the tariff on the tradable good in whose production it is used.

3. A final import product whose domestic production uses an imported input is a supersubstitute for imports of that input, with imports of the final product expanding by more (generally much more) than imports of the input contract, as the tariff on the input is raised.

4. Anomalously, imports of goods that do not belong to the directly affected input-output nexus behave (in the net) as if they were complements to imports of the input whose tariff is being changed. These “other imports” will tend to fall as the tariff on the input is raised, and to rise when that tariff is lowered. This anomalous result is a consequence of the effect of the input tariff on raising the real exchange rate.

Regular and super substitutability

Up to this point, this exposition has dealt with very clear cases: one good (grains) that is not an input into any tradable, and another set of goods (steel, molybdenum, and aluminum) that function only as inputs into import substitutes. In this section, we take cloth as an example of a good that serves both as an input into the production
of tariff-protected import substitutes (suits, dresses, and so forth) and as a final product in its own right.

We assume that imported cloth accounts for 50 percent of the cost (at world prices) of producing suits, and that a preexisting tariff of 60 percent prevails on imports of suits. Thus, if the only use of imported cloth were to produce suits, the second-best optimum tariff on cloth would be 120 percent.

But simultaneously, cloth is demanded as a final product, let us say for uses (upholstery, draperies, etcetera) that bear no relation to the production of suits or of any other import substitute. In this segment of demand for cloth, the situation is similar to that for grains. If this segment constituted the entire demand for imports of cloth, it would give rise to a second-best-optimum tariff on cloth that lay somewhere between zero and 60 percent (see Section 5.03).

What happens when the two uses of cloth are simultaneously present? We need to consider that cloth is a tradable good, and that the tariff on cloth will raise its relative price to users within the tariff-imposing country. Whatever is the rise in the price of cloth in the first market (where it is an input into suits), the same rise will be seen by buyers in the second market (where cloth is a final product). We can therefore divide $R = R_{IC} + R_{AC}$. Each of these parts reflects the response in its own segment of the market for cloth.

Now $R_{IC}$ is related to $R_{Fe}$, the reaction of the equilibrium quantity of finished goods imports to a rise in the price of cloth, by the relation $R_{IC} = -a_c R_{Fe}$. Here $a_c$ is the input coefficient of cloth into suits—that is, the fraction (assumed in our numerical example to be 50 percent) of the cost of the suit, at world market prices, that is accounted for by cloth. So $R_{Fe} = (-1/a_c)R_{IC}$. 

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Using the above information, we can calculate the second-best optimum tariff on cloth, with a preexisting tariff $T^o_F$ of 60 percent on suits. The efficiency cost of the tariff on cloth, reflected in its own market, will be a triangle ($-\frac{1}{2} R_c T^2_c$). A small change in $T_c$ will thus produce an increment of efficiency cost equal to $-T_c R_c \Delta T_c$. This incremental cost can also be written as $-T_c (R_{1c} + R_{2c}) \Delta T_c$; this expression explicitly reflects the two components of demand for imports of cloth.

The gain from the imposition of $T_c$, in this example, comes exclusively from its effect on the equilibrium level of imports of suits, which are already distorted by the tariff $T^o_F$. The measure of gain in this market is $T^o_F R_{fc} \Delta T_c$.

The second-best-optimum level of $T_c$ (denoted by $T^*_c$) is found by setting the increment of cost equal to the increment of gain. Thus:

$$-T^*_c (R_{1c} + R_{2c}) \Delta T_c = T^o_F R_{fc} \Delta T_c.$$

But $R_{fc} = (-1/a_c) R_{1c}$, so we have:

$$T^*_c = (1/a_c) T^o_F [R_{1c} / (R_{1c} + R_{2c})].$$

That is, the second-best optimum tariff on cloth is in this case a fraction of the level it would have been if the imported cloth were used only for making suits. The relevant fraction is given by the share occupied by the first market in the total reaction of the equilibrium level of cloth imports to a change in cloth tariffs.

Let us follow through with the numerical example. If, as the tariff on cloth is imposed, half of the substitution away from cloth occurs...
in the input segment and the other half in the final-product segment of the cloth market, this would lead to:

\[
\frac{R_{1c}}{(R_{1c} + R_{2c})} = 0.5, \quad \text{and} \quad T^*_c = \left(\frac{1}{0.5}\right) T^*_F(0.5).
\]

Thus, in this case, \(T_c^*\) would equal \(T_F^*\) or 60 percent.\(^5\)

**Lessons**

Two lessons can be drawn from the exercise in this section:

1. The fact that imported goods that are used as inputs also have some uses as final products does not seriously modify the result that second-best optimum tariffs on inputs will normally equal or exceed the level of tariffs on the final products into whose production they enter.

2. The only important exceptions to the above lesson are cases where the import in question is predominantly a final product, which only incidentally enters as an input into the production of protected goods.

**Exports: Case of supercomplementarity?**

If an import like steel has a *supersubstitute*, does it have a corresponding relationship with exports of goods in whose production it is used?

The answer to this technical question is yes. When a tariff is levied on an imported input like steel, the effect is to raise the costs faced by producers of all the goods in which steel is an input. If steel enters into an export product, say appliances, the tariff on steel will raise their cost and reduce their domestic production. If \(a_{SA}^*\) is the input coefficient of steel in appliances, the reduction in
the production of appliances will be $1/a_{SA}$ times the reduction in the amount of steel going to this use. The reduction in production will be fully reflected in reduced exports, since appliances are assumed to be tradable products whose demand in the home market can be presumed to remain unchanged (or, if anything, to increase due to substitution effects away from nontradables having some steel content).

Thus, if steel imports were used only to produce appliances, and if $a_{SA}$ were one-third, then a tariff on steel would end up causing a reduction of exports that was three times the fall in steel imports. I believe it is not inappropriate to call this a case of supercomplementary between exports of appliances on the one hand and imports of steel on the other.

Let us play out the rest of the scenario for this case. The rise in the tariff on steel would cause a reduction of, say, $20$ million in imports of steel and of $60$ million in exports of appliances. This would leave a gap in the balance of trade, which presumably would be filled by a rise in the real exchange rate (that is, in the real price of foreign exchange). The consequence of this rise would be to stimulate exports and to reduce the incentive to import goods other than steel.

At the final accounting, imports of steel would be down by some amount, exports of appliances would be down by three times that amount, other exports would have increased in the net, while other imports would have fallen. The total effect on trade would be negative, for we are assuming trade is balanced, and we have seen that both categories of imports have fallen.

The fact that exports of appliances are supercomplements to imports of steel has, however, no direct implication for the second-
best optimal tariff on steel, so long as appliance exports are not themselves subject to special taxes, subsidies, or other distortions.\textsuperscript{6} But this does not mean that we should forget about the phenomenon of supercomplementary, simply because no distortions are present in export markets. For example, a tariff on an imported input that serves an export product will generate an initial trade deficit. Equilibrating this deficit will carry with it a net decrease in other imports. If those imports are subject to tariff, rectangles of efficiency cost will be generated by this indirect route.

In real-world cases, imported inputs will often serve simultaneously as inputs into a number of different importable and exportable products. Complicated sets of effects can follow, and care should be taken not to neglect them. Attention should be paid especially to estimating the likely direct effect of a given action (such as a tariff on an imported input) upon the balance of trade. To the degree that the tariffed input enters the production of export goods, the impact effect will be to reduce trade, though the real exchange rate will again rise, and stimulate “other” exports.\textsuperscript{7}

The effect of a tariff on an input into tradables production is always to raise the real exchange rate and to reduce the total volume of tradables production and demand. The open question is whether total trade will increase or decrease. This is the only question for which the answer varies as we shift from:

\begin{itemize}
  \item[a.] raising a tariff on an input into importables production;
  \item[b.] raising a tariff on an input into the production of export goods.
\end{itemize}

The effect of step a is to increase total trade, as exports must expand to help fill the newly-expanded demand for imports. The effect of step b is to contract total trade because the immediate fall
in exports is only partly offset by the induced response; the remaining part of the induced response is a contraction of imports.

**Lessons**

Four lessons can be drawn from the discussion in this section:

1. A final exportable product using an imported input is a *super-complement* to imports of that input. Exports of that product will fall more (generally much more) than imports of the input when the tariff on the input is raised.

2. In the presence of such supercomplementarity, the impact effect of the tariff on the input would be to generate a trade deficit. In the full equilibrium that would follow, imports of goods other than the tariffed product would have fallen in the net, exports other than the one using the tariffed input would have risen, and the level of trade as a whole would have fallen.

3. Tariffs on an input into tradables production always raise the real exchange rate by shifting the aggregate supply curve of tradables to the left by more than the aggregate demand. The total production of tradables thus always falls, as the autonomous decrease in tradables production always outweighs the induced rise.

4. The effect on total trade of placing a tariff on an input will differ according to whether the affected good is an input into the production of importables or of exportables. If the input enters into importables, the impact effect shifts the import demand curve to the right; to fill the trade gap thus created, exports must expand, which will increase the total trade. If the input enters in the production of exports, the impact effect is to shift the supply curve of exports to the left; the process of adjusting to this shift induces a decline in imports and consequently on total trade.
Some policy implications

When export industries use imported inputs that are subject to tariffs, the simplest policy response is to rebate the implicit tariff at the point where the final product is exported (see Chapter 2, Appendix 2). Such rebating is fully in accord with the rules of the General Agreement on Tariffs and Trade (GATT), as is also the rebating of any domestic indirect tax. A rebating policy insulates exports from the disincentive effects of tariffs on inputs; indeed, to the degree that such tariffs turn out to be trade-creating (as they are likely to be once their direct trade-destroying effects on exports have been annulled), their indirect effect will be to stimulate exports.

Thus, there can be little doubt that rebating (the application of “border tax adjustments” in accordance with GATT rules) is the preferred way of dealing with the potential disincentive effects that input tariffs may have on exports. However, circumstances may arise in which this preferred approach is not feasible. The difficulties are mostly likely to be administrative in nature, and stem from the difficulty of assembling customs agents of sufficient skill, talent, and probity to implement a successful rebating policy.

If a rebating policy is ruled out, the argument for tariffs on imported inputs is significantly weakened, and the wisdom of a uniform tariff as the ultimate goal or norm is called into question. Few experts would quarrel with replacing the uniform tariff norm under such circumstances by the more demanding goal of a zero tariff, but this is likely to be Quixotic in the extreme, especially in countries that have a low administrative capacity, or that rely on trade taxes for the revenue they provide, or both.

If neither uniform tariffs nor free trade is a practicable target, the tariff policy may be left without any clear guideline. Usually in
such instances, the solution may be found in a pragmatic approach that is sensitive to the issues discussed in this chapter. For example, such a pragmatic policy might entail:

- a. levying a uniform tariff rate \((t^*)\) on most imports that are final products;
- b. placing tariffs at the same rate \((t^*)\) on imports that are principally inputs into the domestic production of import substitutes; and
- c. allowing to enter duty free any imported inputs that mainly enter into the production of exports.

Such a policy would leave in a "limbo" category only those imported inputs that enter significantly into the production both of import substitutes and of export products. Pragmatism would suggest, for such imports, a tariff rate somewhere between zero and \(t^*\), calibrated perhaps by the relative importance of the good in question as an input into export production on the one hand versus import-substitute production on the other.

**Footnotes**

1. Technically, the rise in the internal price of grains will cause a general shift of the demand on supply pattern, the demand for substitutes increasing, and that for complements decreasing. On the supply side, the increase in grains production will entail a net extraction of resources from other uses. The likely consequence of this will be to shift the demand for other tradables to the right and their supply to the left, by some fraction of the reduction in imports of grains. This much adjustment can take place without a change in the real exchange rate. But normally, some part of the response to the rise in the price of grains will fall on nontradables. Thus, the
direct impact of \( T_G \) on the demand for foreign exchange will be larger than its immediately induced effects on the demand for other tradables. To maintain balanced trade under these circumstances, the real exchange rate will have to change. This will entail reactions of all tradable goods, in accordance with their relative elasticities of supply and demand in response to changes in the real exchange rate. The reaction coefficients \( R_{GG} \) and \( R_{FG} \) in the text, as well as any similar reaction coefficients used later in this chapter, represent the full effect of \( T_G \) on imports of \( G \) and \( F \). Specifically, they contain both the standard substitution effect and whatever real exchange-rate effect is required to maintain equilibrium in the trade balance.

2. Even the classical argument for a tariff as a means of exploiting a country's monopsony position (assuming it indeed has some monopsony power) in the world market for an import good can be thought of as a way of "correcting for" a preexisting distortion that prevails in the no-tariff situation. (The distortion arises from an excess of the marginal cost that the country pays for the import good in question over the country's own demand price for that good.)

3. We leave aside the monopsony case because it has relevance only for very large countries, or for other large economic aggregates such as the European Economic Community.

4. In more technical terms, the fall in \( T_F \) has effects on both the demand side and the supply side. On the demand side, new demand for finished goods is generated, shifting demand away from other importables, exportables, and nontraded goods. On the supply side, resources are driven out of the production of finished goods, shifting to the right the supply curves of other importables, exportables, and nontradables. The reduction \( \Delta M_G \) in the demand for imports of grains comes from the combined operation of reduced demand for grains as "other-importables" and of a rightward shift in their supply. These forces will presumably generate
some, but not all the foreign exchange needed for $\Delta M_F$. Additional sources of foreign exchange come from similar forces working in the markets for exportables and nontradables. If the full sourcing of foreign exchange for $\Delta M_F$ came just from importables and exportables sectors, there would be no real exchange-rate effect. Normally, some of the extra demand for the liberalized product (here finished goods) will come from nontradables, and some of the resources released from the production of the liberalized product will go to nontradables. This will generate an initial excess supply of nontradables, the resolution of which will produce a real exchange-rate effect, stimulating the production of importables and exportables, and curtailing their demand. (You will recall that we define $R_{GF} \Delta T_F$ and $R_{FF} \Delta T_F$ to include not only the direct effect of the tariff reduction, but also the indirect effect through the influence of $\Delta T_F$ on the real exchange rate.) The bottom line from all of this reasoning is that it is overwhelmingly likely that the foreign exchange from $\Delta M_F$ will come from several sources, and in particular that not all of it will come from reduced imports of grains. That is all that is needed for $-\Delta M_G$ (the base of the rectangle of loss in Figure 5.6) to be smaller than $\Delta M_F$ (the base of the trapezoid of gain).

5. The above exercise does not take into account the substitution between finished goods and the use of cloth other than as an input into suits. That is to say, it is assumed that when people substitute away from the use of cloth as a final product, they do not shift any demand into imports of finished goods. If we abandoned this assumption in favor of some positive shift, the result would be that $T^*$ would increase (probably by only a modest amount).

6. The general rule in applied welfare economics is that no direct net welfare gains or losses occur when prices and quantities change in markets that are undistorted. The presumption is that in an undistorted market, marginal benefit is equal to marginal cost for each successive unit of increment or decrement from the old
equilibrium quantity to the new one.

7. There is a relatively simple explanation for the apparent paradox that a tariff on an input into tradables should always raise the real exchange rate, but only sometimes lead to an increase in total trade. First, the trade balance can equivalently be expressed as either (a) the excess of exports over imports, or (b) the excess of the total supply for tradables over the total demand. Second, when imports of an input into the production of tradables are restricted, the consequence is invariably to shift both the supply and demand curves of tradables leftward, with supply shifting by more than demand. Hence the real exchange rate must rise and the total quantity of tradables must fall.

Where the tariffed input enters into the production of exportables, we also have the supply curve of exports shifting to the left, and total trade falling. This is a fully natural and intuitive result because of the points already made.

Why, however, does total trade rise when the newly tariffed good is an input into importables production? The answer here is that import demand is an excess demand function, which reflects the difference between demand for importables and supply of importables. In the case in question, the import demand shifts to the right because the supply curve of importables has shifted to the left. The real exchange rate rises, and exports rise in consequence, increasing the total volume of trade. But the rise in the quantity of exportables that is produced is more than offset by the fall in the production of importables. Hence (as must be the case), the total supply curve of tradables (which equals exportables plus importables) shifts to the left, and the equilibrium supply and demand for total tradables both fall, even though the total volume of trade increases.
Figure 5-1. Reduction in tariff on finished goods

Reduction in producer cost

Reduction in consumer cost

$P_F^* + T_F^0$

$P_F^* + T_F'$

$P_F^*$

Finished goods (F)