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Volume Author/Editor: Anne O. Krueger

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Chapter Author: Anne O. Krueger

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Chapter 5

Measuring Changes in Exchange Rates

The background has now been established to analyze the policies comprising the devaluation packages in each of the twenty-two Phase III episodes covered by the country studies. In this chapter, focus is upon economically meaningful measurement of exchange rate changes in each case. Chapter 6 is devoted to an analysis of how these changes affect liberalization, bias reduction, rationalization, and reduced variance in effective protection accorded by the regime to different sectors and subsectors of the economy.

The first section of this chapter presents estimates of the changes in nominal and effective exchange rates that represented the gross and net devaluations in the Phase III episodes analyzed in the country studies. The next section covers the relationship between the nominal and effective exchange rate changes and the real exchange rate. Concern in this chapter is with the measurement of the "impact" variables in Phase III episodes and not with their effects. Later chapters are devoted to investigating the effects of the policy measures that comprise Phase III, but that can be done only after the changes in other policy instruments also in the devaluation package are reviewed.

I. NOMINAL AND EFFECTIVE EXCHANGE RATES

The type of theoretical and empirical analysis that would be appropriate for many issues must often be significantly modified in the presence of a complicated Phase II regime. In the case of devaluation in a QR context, deficit reduction may not be the major criterion for evaluating the effects of devalua-

tion, and such effects as premium reduction must be taken into account. Considerations such as these require modification of the basic theory, and the parameters relevant for empirical work must be correspondingly amended.

There is nothing in the nature of QR regimes that requires any change in theory about exchange rates. However, Phase II regimes often have a number of price measures superimposed on the basic parity exchange rate, so that the nominal price of foreign exchange does not reflect the actual amount of local currency paid or received per unit of foreign exchange.[1] It is this amount, not "the" exchange rate, that is theoretically relevant and should be measured.[2]

This section examines the phenomena that give rise to differences between nominal and effective exchange rates and to differences between the magnitudes of net and gross devaluation. In practice, of course, there is not a single EER, either for imports or for exports. For present purposes, however, it will be convenient to discuss "the" import EER and "the" export EER. Changes among EERs for different categories of exports and imports are examined in Chapter 6.

Definitions

It is useful to begin by precisely defining the various exchange rate concepts.[3] Let:

E_t = the parity at time t, i.e., the number of units of local currency per unit of foreign exchange at the official exchange rate (also called the nominal exchange rate).[4]

EER_{i_t} = the effective exchange rate for the ith transaction category at time t.

n_{i_t} = the value of all surcharges against imports of commodity i per dollar c.i.f. expressed as a percentage of the c.i.f. price. Omission of the subscript i implies the average rate for all imports.

p_{i_t} = the domestic price of the ith commodity.

q_{i_t} = the foreign price of the ith commodity expressed in foreign currency.

r_{i_t} = the value of export encouragement schemes, other than outright subsidies, per dollar of exports f.o.b. of the ith export category expressed as a percent of the f.o.b. price. Omission of the subscript i yields "the" export rate.

s_{i_t} = the subsidy (or tax, in which case s_{i_t} is negative) per dollar of exports f.o.b. of the ith commodity, expressed as a percent of the f.o.b. price.

$S_{i_t} \equiv 1 + s_{i_t} + r_{i_t}$

t_{i_t} = the ad valorem tariff on the ith commodity.

$T_{i_t} \equiv 1 + n_{i_t} + t_{i_t}$

With this notation the various exchange rate and devaluation concepts are readily defined. A gross devaluation is a change in the nominal, or parity rate. The parity rate base may be either the local or the foreign currency; that is, the parity rate may be defined in terms of the number of units of local currency per unit of foreign currency or in terms of the number of units of foreign currency per unit of local currency. It makes little difference which definition is used as long as one is used consistently when comparing magnitudes of devaluation among various countries. The analysis in this book uses the former definition, which is essentially a "price of foreign exchange."

The amount of devaluation is usually expressed as a percentage change in the parity rate. This amount based on foreign currency does not equal the percentage gross devaluation defined in terms of local currency.[5]

Effective exchange rates (EERs) are nominal exchange rates plus the various pricing charges superimposed upon the basic rate. Addition of those charges per unit of foreign exchange to the parity exchange rate should yield the amount of local currency actually paid (or received) per unit of foreign currency of imports c.i.f. (or exports f.o.b.). It is extremely important to note that the EER concept pertains to the rate at which local currency units translate into foreign currency for various transactions.

In the absence of quantitative restrictions, the EER for a particular commodity times its foreign price should yield an estimate of the domestic price net of domestic handling charges. When quantitative restrictions are present, the difference between the domestic price and that estimate represents the premium on a unit of the commodity in question. EERs, therefore, represent something akin to a "true nominal tariff" or "true subsidy" in the absence of quantitative restrictions.[6] When quantitative restrictions are present, estimates of EERs must be employed, along with domestic-price/foreign-price comparisons, in order to estimate the premiums generated by quantitative restrictions.

Although there is nothing conceptually complicated about EERs, obtaining data with which to estimate them is often something else again. Baldwin's explanation of his procedures for estimating EERs aptly illustrates this:

> The pattern of a high degree of protection from import competition to domestic producers of nonessential goods and a low degree of protection to local producers of essential consumer goods and essential producer goods began to emerge by 1951. Tariffs were still not being imposed on U.S. imports because of the preferences granted American goods, but the base of the sales tax on luxury items was changed to grant protection to local producers equivalent to a 50 per cent duty. A slight degree of protection, 1.75 per cent, resulted from similar sales tax changes for essential consumer goods. In addition, the special 17 per cent excise tax on sales of foreign exchange was levied in 1951, but with essential consumer goods and capital goods for "new and necessary" industries being exempted from this tax. Thus, in addition to the protective effects of the 80 per cent margin-deposit requirement (0.024 x P2.000 = P0.05), the EER for imports of

nonessential consumer goods exceeded the official figure of P2 per dollar both because of the discriminatory sales tax (0.5 x P2.00 = P1.00) and the 17 per cent special excise tax on foreign exchange sales (0.17 x P2.00 = P0.34). The combined impact of these taxes is an EER of P2.00 + P0.05 + P1.00 + P0.34 = P3.39 per U.S. dollar.[7]

A similar estimation procedure must be repeated for each category of commodities for which the set of applicable charges differs and also for each time the charges change.

The amount of net devaluation is the percentage change in the EER. The difference between gross and net devaluation can be called the replacement component of a parity change. The difficulty, of course, is that there is no single number to represent "the" EER. Most country authors did not even attempt to estimate a single number as generally valid, but used weighting schemes to estimate the import and export EERs.[8]

Gross and Net Devaluations

Table 5-1 gives estimates of the parity exchange rates and EERs for imports and exports before and after each of the twenty-two Phase III episodes. The final three columns give the percentage devaluation for the parity rate and for import and export EERs. As already indicated, the import and export EERs are weighted averages of individual rates and provide only a rough indication of the order of magnitude of the net devaluation experienced in each Phase III episode.

Problems of Estimation

As can be seen from the notes to Table 5-1 and even more from the discussions of the estimates in the individual country studies, it is no simple matter to provide an estimate of the amount of gross devaluation, much less of net devaluation. Much of the difficulty is inherent in the nature of Phase II: by the time a country has decided to devalue its currency, controls and detailed categories of exchange rates have multiplied to the extent that it is often not obvious which—if any—exchange rate should be used to represent the parity exchange rate. For example, Brazil (1957), Chile (1956, 1959, and 1965), Colombia (1962), and the Philippines (1960-1962) all embarked upon Phase III episodes from a regime of multiple exchange rates, and the official rate was meaningless except for a few small categories of government transactions. In contrast, Turkey imposed an almost uniform import tax of TL6.20 per dollar in August 1958, but did not officially alter the exchange rate for two years.[9]

Another problem of some importance is that Phase III episodes often cover a period of several months or years. Not only is the question of timing

Table 5-1. Gross and Net Devaluations Accompanying Phase III Episodes, Ten Countries

Country	Devaluation Year	Exchange Rates (local currency units per U.S. dollar)						Devaluation (percent increase in currency units per U.S. dollar)		
		Official Parity		Effective Exchange Rates						
				Imports		Exports				
		Old	New	Old	New	Old	New	Gross	Import EER	Export EER
Brazil	1957	65.6	90.5	68	112	53	65	38	65	23
	1961	205.1	318.5	263	381	160	245	55	45	53
	1964	620.0	1850.0	887	2253	884	1874	198	154	111
Chile	1956	.181	.351	.219	.432	.181	.351	94	97	94
	1959	.715	1.049	.846	1.524	.715	1.049	47	80	47
	1965	2.418	3.237	2.850	3.847	2.471	3.310	34	35	34
Colombia	1951-52	1.95	2.50	n.a.	n.a.	2.86	2.82	28	n.a.	−1
	1957-58	2.50	5.31	n.a.	n.a.	5.57	5.71	112	n.a.	3
	1962	8.79	11.14	n.a.	n.a.	8.85	10.34	27	n.a.	17
	1965	12.74	13.50	n.a.	n.a.	12.65	12.91	6	n.a.	2
	1967-68	13.50	15.82	n.a.	n.a.	13.40	16.71	17	n.a.	25
Egypt	1962	35.2	43.5	41.5	42.9	42.2	43.5	23	3	3
Ghana	1967	.71	1.02	1.08	1.50	.59	.84	44	39	42
India	1966	4.775	7.576	6.63	9.23	5.51	6.79	59	39	23
Israel	1952	.36	.70	.40	.81	.41	.81	97	107	98
	1962	1.80	3.00	2.60	3.47	2.66	3.02	67	33	14
South Korea	1961	62.5	127.5	100.2	147.0	147.6	150.6	104	47	2
	1964	130	214	148.1	247.0	189.4	281.4	65	67	49
Philippines	1960-62	2.00	2.95	3.27	4.13	2.00	3.15	48	26	57
	1970	3.90	6.40	5.82	8.70	3.90	5.15	64	49	32
Turkey	1958-59	2.80	9.00	5.94	17.90	3.17	5.87	221	201	85
	1970	9.00	15.00	16.34	23.99	9.96	12.90	67	47	34

n.a. = not available.

Source: Except as otherwise noted, parity rates were obtained from International Monetary Fund, *International Financial Statistics.* All other data are from individual country studies, as follows:

Brazil—Parity rates for 1957 taken as the "free rate" as given in *International Financial Statistics.* Export and import effective exchange rates given by Fishlow; export rate is for commodities other than coffee.

Chile—The export EER is that applicable to the so-called "legal cost of production" for large-scale mining. For other exports, movements in the EER are generally parallel to those in the large-scale mining rate.

Colombia—Parity data are from Díaz-Alejandro, Table 4-8, and are the average nominal rates for the end of the relevant quarter. Díaz was unable to obtain the data to estimate import EERs. Export data are an average of the minor export rate, given in Díaz's Table 2-9, and the coffee rate, with the latter given a weight proportionate to its share in export earnings in the year in question.

Egypt—Net devaluation figures based on December 1961 ("old") and May 1962 ("new") arrangements. See Hansen and Nashashibi for details.

Table 5-1 (cont.)

Ghana–Leith, Tables 2-1 and 2-2.

India–All data are from Bhagwati and Srinivasan, Table 2-1. Choice of an export EER follows their discussion in note 1 to that table.

Israel–All data are from Michaely, Table 5-1. The 1952 "new" parity figure is a weighted average of formal rates; the parity was adjusted in December 1953. See Michaely, p. 120.

South Korea–Parity rates are the *average* official rates over the years before and during the devaluations, i.e., 1960 and 1961; and 1963 and 1964. Actual devaluations were from 100 to 130 won to the dollar in February 1961, and from 130 to 255 won to the dollar in May 1964 combined with a float to 270 won to the dollar by August 1964. The effective exchange rates are averages for the same set of years.

Philippines–The export rate given in Column 6 for 1960-1962 is for traditional exports for 1962.

Turkey–The import EER fell from TL17.90 per dollar in August 1958 to TL14.31 per dollar in December 1958, and the export EER reached TL9 per dollar by August 1960.

significant for evaluation of real exchange rate changes, but even characterization of the exchange rate change has a time dimension. South Korea provides a good example. The South Korean devaluation of May 1964 moved the dollar exchange rate from 130 won to 255 won, but the rate was then allowed to float, and it reached 270 won per dollar by August 1964. The Philippines similarly achieved their 1960-1962 exchange rate alteration over a fairly long period, introducing new (multiple) rates in 1960 and gradually narrowing the spread of rates until there was virtual unification at the new rate in 1962. Chile's episodes also were characterized by gradual rate changes over a period of time. In these instances the path of the exchange rate during the Phase III episodes is of significance in analyzing the effects of the devaluation.

Even more complex are the cases where devaluation consists essentially of a move from reliance upon quantitative restrictions to greater dependence upon pricing via the introduction of multiple exchange rates. The Israeli Phase III episode of 1952-1955 provides a perfect example. As Michaely has described, Israel experienced huge inflationary pressures in the early years of her existence. Prices were left virtually unaltered, however, as physical allocations were the rule of the day. In 1952 a gradual shift toward reliance on pricing began. Multiple exchange rates were introduced, although the official parity was left completely unchanged. Over the next three years, commodity and other transactions were shifted between exchange rate categories; this enabled the authorities to increase the degree of reliance upon the price mechanism. In all these cases the varying time period during which changes took place complicates the task of analyzing the devaluation. The fact that even measuring the parity change is difficult only serves to underline the notion that examination of a single number cannot provide very much information about the underlying economic mechanism.

Magnitude of Gross Devaluations

The column of Table 5-1 showing the magnitude of gross devaluation in each instance of a Phase III episode represents the percentage increase in the official parity (or its closest approximation) given in the first two columns.

As can be seen, most of the gross devaluations have been quite sizable: only three involved less than a 25 percent increase in the nominal price of foreign exchange. In four cases the gross devaluation exceeded 100 percent; that happened in Brazil in 1964, where the exchange rate was altered from Cr$620 to Cr$1850 per U.S. dollar, and also in Colombia in 1957/58, in South Korea in 1961, and in Turkey in 1958. The Israeli devaluation of 1952 virtually doubled the price of foreign exchange, and many more devaluations involved increases of much more than 50 percent. These numbers stand in glaring contrast to the magnitude of exchange rate alterations in industrialized countries; the British devaluation of 15 percent in 1967 was regarded as large; the depreciation of the American dollar after 1971 seemed to many observers to have been sizable, and yet it never reached 25 percent.

Net Devaluation

The middle columns of Table 5-1 give the EERs for imports and exports before and after each Phase III episode. One point that is extremely important is the considerable differential between export and import EERs, both before and after Phase III episodes. In Ghana, for example, the average import EER was 1.08 before devaluation and 1.50 afterward. Export EERs, by contrast, were 0.59 and 0.84, respectively—about half the levels of the comparable import EERs. The relationship of import and export EERs, along with the premiums on QRs, is an important determinant of the bias of the trade and payments regime, which is discussed in Chapter 6.

For present purposes the phenomenon of note is the wide divergence possible between nominal and effective exchange rates. It is the EERs, and not the nominal exchange rates, that are relevant for most purposes, and it is evident that one cannot use the nominal exchange rate as a proxy. The final columns of Table 5-1 compare the percentages of gross devaluation and net devaluations for imports and for exports.

In Israel's 1962 Phase III episode, for example, the nominal devaluation was 67 percent, while the import EER rose 33 percent and the export EER increased only 14 percent. The differences were explained by Michaely as follows:

> On the export side, the difference between the formal and effective rates of devaluation was achieved by the abolition of most export subsidies. Since the subsidies had been applied partly in discriminatory fashion, their abolition resulted in

> greater uniformity of the effective-rate system in exports. . . .
>
> In imports, the lower rate of increase of effective rates—compared with the rate of formal devaluation—was due to the lowering of many tariff rates (as well as the automatic decline of rates which were specific rather than ad valorem—although this factor was not very significant in Israel). . . .[10]

In most cases gross devaluation exceeded net devaluation for both exports and imports. The extreme case is probably Egypt, where the 23 percent formal devaluation resulted in only a 3 percent change in EERs for both exports and imports after the government had removed import surcharges and export subsidies and inducements that had built up over the period since the early 1950s. In most instances, however, the net devaluation was sizable, even if smaller than the gross devaluation. In a few instances devaluations have been accompanied by measures that increased the EERs even more than the parity rate. For example, in Brazil in 1957 a tariff system was introduced simultaneously with devaluation, resulting in a 65 percent increase in the average import EER, although the gross devaluation was only 38 percent.

Insofar as the EER represents the combined product of the exchange rate and of special charges and subsidies, the two elements may be viewed as substitutes; that is, the effect of devaluation may be offset by the effect of adjusting other factors affecting the domestic price of foreign exchange. At first glance one would expect that economic behavior would be unaffected by the proportion of the EER that represented the exchange rate itself and the proportion that represented special tariffs and charges or incentives and subsidies. After all, it is the EER that represents the "price" of a unit of foreign currency, and that is the "price" that theory suggests is relevant. By and large the evidence from the country studies suggests that the naive expectation is correct. Authors in most instances worked with changes in the EERs and regarded them as relevant variables.

One can, however, conjure up examples in which that might not be the case. If governments can more readily manipulate the nonexchange rate components of the EER, greater certainty might attach to exchange rate changes than to subsidies and surcharges, and thus one might have a different response to the same EER change depending on its composition. This is especially true of short-run expectations surrounding devaluation. The 1958 Turkish devaluation, for example, was not an exchange rate change. It was accomplished by manipulating taxes and subsidies rather than by a formal alteration of the exchange rate. There seems little doubt that altering the exchange rate would have led to less uncertainty about the future path of the EER. There was probably more speculation against the Turkish lira following devaluation than would have occurred had the EER change been accomplished by a parity change.

Among the ten country studies, only in the case of South Korea did the authors feel that the difference between the formal and informal components of EERs might be significant enough to evaluate separately the effects of the exchange rate and other components of the EER. In South Korea during the entire period following 1960, export incentives were granted over and above the exchange rate itself. The nonformal component of the rate was frequently adjusted. As Table 5-1 shows, the export EER was well above the parity rate both before and after each Phase III episode. Indeed, the export EER changed very little with the 1961 devaluation.

South Korea's significant and frequent variation in the importance of the nonformal component of the EER, without any obvious relation to the phases of the regime, permitted the sensitivity of exports to each component to be tested. As explained by the authors:

> The sensitivity of exports can be tested by using exports of manufactured goods (XGM) as the dependent variable, and nonagricultural output (YNA), the official exchange rate on a purchasing-power-parity basis (ORD), and all other export incentives (i.e., a combination of multiple exchange rate premiums and subsidies denoted by SUBX) as explanatory variables. If the whole period 1955 to 1970 is included, the results are very poor. From 1957 to 1970, we obtain the following result:
>
> $$\underset{\quad}{XGM} = \underset{(-3.92)}{-241.4847} + \underset{(11.29)}{0.3323YNA} + \underset{(1.70)}{0.2629ORD} + \underset{(1.27)}{0.1471SUBX}$$
>
> Estimation Technique: Cochrane-Orcutt Iterative Technique
>
> $R^2 = 0.9900$
> $d = 1.3742$
> $\varrho = 0.8701$
>
> The coefficient of YNA is highly significant, which indicates that general capacity in nonagriculture is the most significant factor explaining exports. . . . The elasticity of manufactured exports with respect to changes in the exchange rate (ORD) is 2.14 and with respect to export subsidies is 0.95. The coefficients of the official exchange rate ORD and the subsidy level of exports, SUBX, however, are not significant.[11]

When the authors used the period 1963 to 1970 (for which there is reason to believe structural change had already occurred), they obtained elasticities equal to 6.16 for ORD and 4.69 for SUBX, although the degrees of freedom are limited for the period as a whole, and the range of variation is small. The evidence is, therefore, far from definitive, but suggests that in the South

Korean case the exchange rate itself may have had somewhat more impact on economic behavior than the nonformal component of the EER. That result, however, appears to have been the exception, and even there the magnitude of the difference is not overwhelming.

II. REAL EXCHANGE RATE CHANGES

It is not EERs per se that are of importance, but rather it is the relative price of tradables to nontradables and of exportables to import-substitutes and importables. In theory, therefore, a price adjustment should be made to estimate the change in the real exchange rate (that is, to arrive at price-level-deflated effective exchange rates, or PLD-EERs) following devaluation. In practice, recognizing the role of price level changes involves a number of problems. Quite aside from the usual problems of variance in EERs and of finding an appropriate price index, there is a question about the appropriate time period for making the adjustment. These difficulties may be of considerable significance empirically, and they deserve attention, even though satisfactory solutions are not at hand.

Variation in the Real Exchange Rate and Expectations

A difficult theoretical problem, and one that will not be dealt with here, is how to separate the effects of variation in the real exchange rate from those caused by uncertainty about the future course of the real exchange rate. It is virtually impossible to develop an internally consistent model within which the future path of the exchange rate is known with certainty and makes discrete jumps; speculative pressures would prevent realization of that path unless the behavior of the domestic nominal interest rate were bizarre. Moreover, if these difficulties could be overcome, a problem would arise as to how production and consumption decisions would change relative prices over time; producers and consumers could always stockpile, and inventories would adjust unless storage costs were very high. Although a satisfactory analytical model has not been developed, the response to changes in the nominal, and also the real, exchange rate must be affected by the facts that inflation rates vary, that in some countries exchange rate changes are large and infrequent, and that there is uncertainty both about future inflation rates and about the timing and magnitude of future devaluations.

Consider, for example, the Chilean experience since 1950. Table 5-2 presents Chilean PLD-EERs for several categories of commodities for years surrounding the three Chilean Phase III episodes. These rates include the premium on import licenses and thus cover the effects of QRs as well as price

measures.[12] While there are many other real rates reported by Behrman, the behavior of those other rates is not dissimilar to that reported in Table 5-2. In the absence of information about the date of the Chilean devaluations, it would be very difficult for an observer of the data in Table 5-2 to infer when those devaluations took place. To illustrate with the 1956 devaluation, of the five real exchange rates shown, two were higher in 1955 than in 1956 or 1957, while three were higher in 1957 than in 1956. Moreover, insofar as there is a discernible pattern over time, it would suggest chronic appreciation of most real rates. While 1959 and 1965 show some net real devaluation, the order of magnitude of the change is not very much greater than changes that occurred in other, nondevaluation years.

Given past experience it would seem plausible that Chileans would come to expect periodic devaluations, and that after devaluation they would expect future erosion in the real exchange rate. After all, the pattern of the three devaluations reported here had also been experienced in the years prior to World War II. To the extent that periodic devaluations are expected, there is a question as to how much the current real exchange rate would affect production decisions. Even if the real exchange rate prevailing immediately after a devaluation made certain export activities appear profitable, most en-

Table 5-2. Chilean PLD-EERS for Five Commodity Groups for Years Surrounding Phase III Episodes

	1965 Escudos per Dollar				
Year	*Agriculture and Forestry*	*Mining*	*Manufacturing*	*Imports*	*Exports*
1954	5.488	3.792	7.610	4.756	3.123
1955	5.940	3.390	8.805	4.560	3.380
1956[a]	5.460	4.040	8.585	5.498	4.104
1957	5.238	4.123	8.248	7.559	4.338
1958	4.557	4.435	7.797	6.679	3.521
1959[a]	4.501	3.953	7.531	6.861	4.002
1960	4.717	3.860	7.302	6.065	3.773
1961	4.668	3.526	6.888	5.517	3.297
1964	4.593	3.134	6.365	5.462	3.309
1965[a]	4.120	3.515	6.373	5.489	3.739
1966	4.035	3.297	5.956	4.793	4.046
1967	4.137	2.913	5.626	4.734	3.650

Note: Data are for premium-inclusive exchange rates.

Source: Behrman, Table A-8.

[a]Devaluation year.

trepreneurs would presumably anticipate reduction in profitability in years ahead as domestic wage and price increases outpaced the nominal exchange rate alterations.

Quite aside from expectations of future erosion of the real exchange rate, year-to-year variation in the Chilean real exchange rate was quite sizable: the export real exchange rate, for example, fell 19 percent between 1957 and 1958. Indeed, for the entire period from 1946 to 1970, the mean export real EER was 3.939, with a standard deviation of 0.557, giving a variance of 0.141. For some other rates, variance was even higher.

Variance such as that experienced in Chile may, itself, be of significance and may affect responses to devaluation. It seems evident, therefore, that no single number can adequately characterize the behavior of the real exchange rate around Phase III; furthermore, the same percentage change in the real exchange rate might elicit very different responses in countries with differing past histories.

Considerations such as these were part of the motivation for the individual country studies; analysis can be satisfactory only when undertaken in the context of the history, institutions, and economic policies in each individual country. Any particular measure of the real rate is by itself inadequate to cover all the influences on responses in individual countries.

Real Exchange Rates and Equilibrium Rates

Attempts to measure equilibrium exchange rates have proved largely unsatisfactory. All that can be observed is changes in the real exchange rate. Even if one knew the real equilibrium rate for a particular period, there is no *a priori* reason to believe that the same real rate would remain an equilibrium rate over time.

There is, however, some reason to believe that, in the absence of sharp terms-of-trade changes, year-to-year changes in the equilibrium rate are likely to be rather small. First, there is the experience of the industrial countries, whose exchange rate changes have been rather small for the greater part, especially if one makes allowances for different rates of inflation. Second, in the absence of terms-of-trade changes, theory suggests that only sharply differing rates of growth of demand for importables (net of domestic supply) and of exports (net of home demand) would require an adjustment in the price of tradables relative to home goods. In general, significant differences in the two growth rates seem to arise mostly because of inflationary monetary and fiscal policies, and the magnitude of the *real* exchange rate adjustments required is probably small in most cases.

If real equilibrium exchange rates tend to be relatively stable under nor-

mal circumstances, then large changes in the real EER are probably not compatible with maintaining an equilibrium rate in the sense defined in Chapter 4. Thus, without knowing the equilibrium real EER, one can infer that inflation, with constant nominal EERs, implies increasing overvaluation (or reduced undervaluation) of the currency, even after one year.

To be sure, there are exceptions. In Chile in the 1960s, for example, the rise in the price of copper permitted liberalization of trade without any change in the real exchange rate and thus represented a fortuitous circumstance that altered the equilibrium real rate. If the same real exchange rate had been sustained in Ghana in spite of the decline in the world price of cocoa, it would have been increasingly overvalued; the measured decline in the real exchange rate therefore probably underestimates the increased departure of the Ghanaian cedi from its equilibrium real rate.

The analysis that follows focuses on changes in real rates, rather than on how they differ from equilibrium rates. Those changes are being interpreted as a proxy for the relevant variable. For most of the countries in the project the difficulty is not too great as long as focus is on the response of exports and other variables to changes in the real exchange rate. What is impossible, however, is any comparison of the degree of overvaluation across countries. To a certain extent, background knowledge of a particular country, combined with observation of movements in the real exchange rate, can be used to make fairly strong inferences about the probable extent of currency overvaluation. This approach, confined to one country, may be defensible even though there are analytical difficulties. To make any comparisons of the degree of overvaluation across countries, however, would be extremely hazardous, and no such inferences should be drawn from the data presented below.

Behavior or Real EERs

Even if the equilibrium real rate were constant over time, prices move continuously, whereas net devaluations are usually made in discrete jumps. Finding a number to represent the amount of real devaluation therefore requires the selection of a time period. Compare, for example, the Chilean net devaluation of 1956 with the Indian net devaluation of 1966. Chile increased import and export EERs about 95 percent, while India raised hers by 20 to 40 percent. Those percentages represent the proportionate nominal net devaluations and, in a sense, the instantaneous real devaluation. However, in 1966 India was experiencing an inflation rate of about 10 percent per annum, while Chile's inflation rate in 1956 had been about 75 percent. Chile's devaluation was the larger during the month in which it took place, but India's devaluation restored her real exchange rate to the level of about five years previously, while Chile's

devaluation increased the real price of foreign exchange only to the level of about fifteen months earlier. Even that, as Table 5-2 indicates, was partially offset.

The important question relates to the time period during which a real exchange rate must be maintained in order to induce changes in economic behavior. It seems reasonable to infer that there is some time interval that would induce producers to alter behavior, even if they knew that at a later date prices would revert to their former level. If, for example, it takes one year to shift production strategies, and individuals in both India and Chile expected inflation to proceed at its rate of the preceding year, Indian producers would have been responding to an increase of about 30 percent in the real exchange rate, while Chileans would have been anticipating no more than a 20 percent increase in the real rate by the time production shifted. Thus, in addition to the effects of expectations, the cost of shifting the structure of production and the length of time required to do it also affect responses to exchange rate changes.

Table 5-3 traces the behavior of real exchange rates during the periods around the twenty-two Phase III episodes. For purposes of comparison, the first column gives an indication of the order of magnitude of the net devaluation—taken as the mean of the export and import EER changes given in the last two columns of Table 5-1. The next four columns record the behavior of the real exchange rate for the four years surrounding the devaluation. For ease of comparison, the real EER immediately after devaluation was set equal to 100 so that numbers less than 100 indicate a lower real EER and numbers greater than 100 indicate a higher real EER—that is, a real devaluation. For example, in Israel the inflation rate for the two years preceding the 1962 devaluation was greater than the percent increase in the EER for exports (because export subsidies were removed). The purchasing-power-parity, price-level-deflated EER (PPP-PLD-EER) for exports was therefore lower in 1962 than it had been in 1960. Inflation in the two years following devaluation was not offset by increases in export subsidies, so that the real export EER was about 12 percent lower two years after devaluation than it had been two years before.

It is evident from Table 5-3 that there have been sizable changes in real exchange rates surrounding Phase III episodes and, in general, inflation has tended to result in an appreciation of the real exchange rate within a relatively short time after devaluation. Exceptions are Brazil in 1957; Colombia in 1951, 1965, and 1967; Israel after 1952; the Philippines in 1960; and Turkey in 1958. Brazil's increase was later eroded as inflation persisted, so the exception in that case is more apparent than real. In Colombia the 1965 devaluation was followed by another two years later; in addition, the Colombian data are based on the minor export rate, which was rapidly adjusted to price changes after 1967.

There are, therefore, only three genuine exceptions to the notion that, at a fixed exchange rate, the real exchange rate is quickly eroded if devaluation is to a new, fixed parity. In Israel the 1952 episode was accompanied by a

massive increase in the nominal exchange rate as Israel shifted away from quantitative controls. The real exchange rate increased after the Philippine 1960-1962 episode because inflation rates were extremely low. In Turkey the devaluation was initially accompanied by a failure to adjust fully the exchange rates for traditional exports. Over the next two years these export EERs were increased, thus maintaining constancy of the average export EER; in addition, the Turkish inflation ended after the winter of 1959.

Table 5-3. Net Devaluation and Behavior of the Real Exchange Rate in Surrounding Years, Ten Countries

Country	Devaluation Year	Net Devaluation (percent)	Index of PLD EER (year of devaluation = 100)			
			Two Years before	One Year before	One Year after	Two Years after
Brazil	1957	44	109	97	108	132
	1961	49	86	92	101	85
	1964	132	98	83	101	84
Chile	1956	95	76	82	106	86
	1959	64	108	88	94	82
	1965	34	94	88	108	98
Colombia	1951/52	−1	125	119	121	121
	1957/58	3	80	108	79	83
	1962	17	65	88	73	77
	1965	2	91	96	91	102
	1967	25	98	89	105	107
Egypt	1962	3	102	103	101	96
Ghana	1967	40	75	70	87	80
India	1966	38	81	80	85	85
Israel	1952	102	73	75	116	148
	1962	24	104	97	95	92
South Korea	1961	24	113	111	92	95
	1964	58	87	91	98	96
Philippines	1960/62	41	95	94	115	128
	1970	40	77	76	96	n.a.
Turkey	1958/59	143	67	63	111	114
	1970	40	81	79	91	81

Source: Percent Net Devaluation: Average of export and import percentage increases in currency units per dollar from Table 5-1, except for Colombia, where the export rate is used; index of PLD-EER: Brazil–export rate excluding coffee; Chile–export rate; Colombia–minor export rate PPP adjusted; Egypt–export rate deflated by line 63, *International Financial Statistics*; Ghana–export rate, noncocoa; India–import EER from Table 2-1 of Bhagwati-Srinivasan; Israel–PPP adjusted export rate; South Korea–export rate; Philippines–new export rate; Turkey–weighted export rate.

The striking feature of the data in Table 5-1 compared with that in Table 5-3 is the wide disparity between the magnitudes of gross devaluation, net devaluation, and real devaluation. Despite the very large numbers representing the percentage for gross devaluation in Table 5-1, the largest real devaluation—as of the year it took place—was 50 percent in Turkey in 1958/59, as the real rate rose from 63 to 100. In ten instances the real devaluation was less than 10 percent (including those cases where the real rate appreciated). Even those magnitudes were not sustained, as inflation continued to erode the real rate in most cases.

In summary, the case has been made that real exchange rates, and variations in them, are the relevant variables to which producers respond. Variations occur in the real rates over time and also in the rates applicable to differing categories of transactions. All of these factors are important in evaluating the outcome of exchange rate changes. In Chapter 6 the influence of other components of the policy packages initiating Phase III episodes—especially the effect of changing premiums on import licenses and otherwise altering QRs—will be examined.

NOTES

1. The fact that premiums accrue to import licenses alters the relationship that would otherwise exist between EERs and foreign domestic prices, so analysis of the *effects* of EER changes must be modified.

2. Typically, of course, liberalized regimes have tariffs as a part of the system. The amount of local currency paid for one unit of imports c.i.f. is usually taken to equal the foreign price times the exchange rate. Under liberalized regimes, tariff rates are usually *ad valorem* and seldom change with devaluation. As a consequence the proportionate change in the parity exchange rate and in the effective exchange rate is the same, regardless of tariffs.

3. The symbols used here are also employed in later chapters. For the convenience of the reader, an alphabetical list of all symbols is contained in Appendix B.

4. Even the concept of an official exchange rate is sometimes ambiguous. An example is the Turkish situation from August 1958 to August 1960. During that period the official parity remained at the level set in 1946: TL2.8 = $1. However, there was a tax on virtually all purchases of foreign exchange of TL6.20 per dollar, and a premium of the same amount on sales of foreign exchange for all but traditional exports. Thus, to all intents and purposes the exchange rate was TL9 = $1, and the IMF so recorded it in *International Financial Statistics.* The official rate recorded with the IMF, however, was not altered until August 1960. The Turkish devaluation—and start of the Phase III episode—is nonetheless dated from August 1958.

5. The proportionate change in units of local currency per unit of foreign currency is $(\Delta E_l/E_l)$; the change in foreign currency per unit of local currency is $(E_f/\Delta E_f)$. When using the percentage increase in the price of foreign exchange as the measure, devaluation can exceed 100 percent if the price of foreign exchange more than doubles.

6. Effective rates of protection convert nominal tariff estimates into estimates of protection accorded to value added in domestic production. Appropriate estimation of effective protection rates would therefore start with the use of the tariffs implied by the ratio of EERs to the nominal

exchange rate. The difficulty with the terminology arises because the effective protection literature implicitly assumes that tariffs are the only charges against imports. Once it is recognized that there are often charges other than tariffs, a more precise terminology might be "nominal tariff," "total tariff," and "value-added tariff," but the gain in precision would not warrant the confusion caused by attempting to alter an established terminology.

7. Baldwin, p. 92-93.

8. There is no single weighting scheme that is appropriate, and the data presented in Table 5-1 should be taken as rough estimates of the magnitude of change. Some evidence on the extent of variance in EERs and in the overall protection accorded by different regimes is reviewed in Chapter 6.

9. On the export side, however, some traditional Turkish exports received considerably less than 9 TL per dollar. See Krueger, Chapter IV, for details.

10. Michaely, p. 59.

11. Frank, Kim, and Westphal, p. 85.

12. The difference between the domestic-price/foreign-price relationship and the EERs is the premium. For a more detailed discussion, see Chapter 6.