DEVALUATIONS, AGGREGATE OUTPUT AND INCOME DISTRIBUTION*

by

Sebastian Edwards

University of California at Los Angeles

and

National Bureau of Economic Research

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CHAPTER 8

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ABSTRACT

This paper corresponds to Chapter 8 of the forthcoming book Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries. This work investigates several aspects related to exchange rates in developing nations. Theoretical models of equilibrium and disequilibrium exchange rates are developed; the behavior of real exchange rates is investigated for a large cross section of countries; and the effectiveness of devaluation is assessed for a group of 39 developing nations.

Chapter 8

Devaluations, Aggregate Output and Income Distribution

Even under conditions of severe macroeconomic and real exchange rate disequilibrium economic authorities in the developing countries many times resist devaluing their currency. Instead, as was shown in Chapter 6, in many cases they have tried to impose tariffs, import quotas and other forms of exchange controls in an effort to avoid the depletion of international reserves that is usually associated with real exchange rate overvaluation.[1] How can we explain this historical regularity? Why do economic authorities in these countries usually prefer to implement highly distortionary controls instead of devaluing? A possible explanation lays on the political consequences of devaluation. In his classical study Richard Cooper (1971a) reported that in the majority of 24 cases he analyzed the Finance Minister that had engineered the devaluation had been ousted from office 18 months after the exchange rate realignment.[2] If, indeed, devaluations destroy the political career of their proponents, there is a good reason for politicians to resist them, and to consider them only as a measure of last resort.

This explanation, however, begs the question on why are the architects of devaluation ousted from office so often. In many ways this is a paradoxical result, since according to the traditional theory devaluation should be highly beneficial for a country with a severe real exchange rate overvaluation and an imminent balance of payments crisis. A possible explanation for this "puzzle" is related to the idea that under some (plausible) circumstances devaluations are not as beneficial as the traditional theory suggests. In fact, it is possible that although devaluations will help improve the external position of a country, they may result in a reduction of output, increased unemployment and/or in a worsening of income distribution.[3] If indeed devaluations have these negative effects, they may very well result in the firing of those high officials that proposed and backed that measure.

The purpose of this chapter is to analyze the real output and income distribution effects of devaluations. The analysis of the real output effects is done in two ways. First, data for the 39 devaluation episodes identified in Chapter 6 are closely scrutinized following the same methodology as the one used in Chapters 6 and 7: the behavior of a number of key variables related to aggregate output in the period elapsed between three years before the devaluation and three years after the devaluation is analyzed. The emphasis is placed on real growth and aggregate gross investment. A limitation of this type of analysis, however, is that it concentrates on the behavior of the key variables "before" and "after" the devaluation, without taking into account the possible role of other policies or external events. This problem is avoided by the second approach taken in this chapter: an equation for aggregate output in an open economy is estimated for a group of countries. In addition to the possible effect of the exchange rate on output, this equation incorporates the role of monetary policy, fiscal policy and exogenous terms of trade effects.

The analysis of income distribution effects is limited by the availability of data, and concentrates on real wages and on the evolution of factoral distribution of income. The fact that there have virtually been no systematic cross country empirical studies on devaluation and its effects on income distribution is in part a reflection of the lack of reliable data on income distribution in these countries.[4]

The chapter is organized as follows. In Section 8.1 a macroeconomic model of a dependent economy with imported intermediate goods and foreign debt is developed to analyze the way in which devaluations affect aggregate output and employment. In Section 8.2 we look at the experience of our 39 devaluation episodes. Once more we use nonparametric tests to compare the behavior of these countries to that of the control group. Section 8.3 presents results from the estimation of the model from Section 8.1. Section 8.4 deals with the effects of exchange controls and distortions on real activity. Section 8.5 focuses on income distribution during the period surrounding our 39 devaluation episodes.

8.1 Are Devaluations Contractionary?: A Theoretical Model

Although the theoretical possibility of devaluations being contractionary has been recognized by a number of authors, there has been a very limited empirical work related to this issue. Modern theoretical discussions on contractionary devaluation go back at least to Hirshman (1949) and Diaz Alejandro (1965). Cooper (1971a,b) provided important empirical evidence in his cross country studies. More recently Krugman and Taylor (1978), Gylfason and Schmid (1983), van Wijnbergen (1986), Buffie (1984), Branson (1986) and Larrain and Sachs (1986) have provided further theoretical refinements. Empirical studies based on the "before" and "after" approach include Cooper (1971b) and Krueger (1978). Gylfason and Schmid (1983), Gylfason and Risager (1984), and Branson (1986) presented results based on simulation analyses. Edwards (1986a) provides one of the very few regression analysis.

From an analytical point of view devaluations can affect the real sector of the economy through a number of channels. According to the more traditional views a devaluation will either have an expansionary effect on aggregate output or, in the worst of cases, will leave aggregate output unaffected. If there is unutilized capacity a nominal devaluation will be expansionary, and total aggregate output will increase. On the other hand, if the economy is operating under full employment, the nominal devaluation will be translated into equiproportional increases in prices, with the real exchange rate and aggregate output not being affected. This particular aspect of the more traditional approaches has recently been challenged by the neo-structuralist critique. Taylor (1983), Katseli (1983), van Wijnbergen (1986) and others have argued that in the less developed countries it is highly plausible that real output will decline after a nominal parity adjustment.

There are several theoretical reasons why, contrary to the traditional views, a devaluation can be contractionary and generate a decline in aggregate real activity, including employment. First, through its effect on the price level, a devaluation will generate a negative real balance effect. This, in turn, will result in lower aggregate demand and, under some circumstances, lower output. Second, a devaluation can generate a redistribution of income from groups with a low marginal propensity to save to groups with a high marginal propensity to save, resulting in a decline in aggregate demand and output. (See, for example, Diaz-Alejandro, 1965. See also Krugman and Taylor, 1978.) Third, if the price elasticities of imports and exports are sufficiently low, the trade balance expressed in domestic currency may worsen, generating a recessionary effect. And fourth, in addition to these demand-related effects, there are a number of supply-side channels through which devaluations can be contractionary. For example, van Wijnbergen (1986) has recently developed a model with intermediate goods and informal (curb) financial markets, where a devaluation results in an increase in the domestic currency price of intermediate inputs, and in an upward shift of the aggregate supply schedule.

In this section a model to analyze the effects of nominal devaluations on aggregate output and employment in a small country is developed. The model analyzes the case of an economy that produces three goods -- importables (M), exportables (X) and nontradables (N) -- and uses imported inputs in the production of the nontradables. The model is sufficiently general as to include the results of Cooper (1971b), Krugman and Taylor (1978), Hanson (1983) and Branson (1986) as special cases. Although the analysis concentrates on devaluations, the model can easily handle the case of a terms of trade shock. This is indeed done in the empirical section of the chapter.

Although similar in spirit to the model in Chapter 3, the model presented here has a number of features that make it particularly suitable for analyzing the aggregate output consequences of devaluation. Specifically, the incorporation of imported intermediate inputs, foreign debt and wage indexation and the relaxation of the full employment assumption allow us to highlight three important potential channels through which devaluation may affect output. In some ways these new assumptions can be considered to better reflect the characteristics of developing nations. It is important to notice, however, that these new assumptions don't affect in any fundamental way the main results from Chapters 2 and 3 regarding equilibrium and disequilibrium real exchange rate behavior. What they do, however, is introduce in a clear way important interactions between devaluations and real economic activity.[5]

Consider a small country that produces exportables (X), importables (M), and nontradable goods (N). The capital stock is sector specific and fixed during the relevant run discussed here. As in Branson (1986), the production of nontradables requires the use of labor, (specific) capital and an imported input. To simplify the exposition, it is assumed that exportables and importables are produced using capital and labor only.[6] Moreover, it is assumed that the world prices of X and M do not change. As will be seen below, however, the model can be easily manipulated to analyze effects of changes in the external terms of trade on output and employment. It is also assumed that this country has a stock of foreign debt, whose nominal value in foreign exchange is equal to D*. As is the case in many developing countries it is assumed that due to institutional reasons the behavior of nominal wages is governed by an indexation rule that ties changes in wages to changes in the price level. In order to focus on the effects of devaluations on output and employment, the monetary sector is extremely rudimentary, almost non-existing. No distinction is made between anticipated and unanticipated money changes, nor do we incorporate the role of foreign money. In the empirical implementation of the model, however, a more sophisticated role for money is considered.

The model is given by equations (8.1) through (8.10):

$$y = N^S + \frac{EP_X}{P_N} X^S + \frac{EP_M}{P_N} M^S - \frac{EP_I}{P_N} I - \frac{Ei^*D^*}{P_N} \tag{8.1}$$

$$N^d = N\left(y, \frac{P_N}{EP_M}, \frac{P_N}{EP_X}, \frac{B}{P_N}\right) + G \tag{8.2}$$

$$N^S = k[\beta I^{-\rho} + (1-\beta)V^{-\rho}]^{-1/\rho} \tag{8.3}$$

$$V = L_N^{\gamma} \bar{K}_N^{(1-\gamma)} \tag{8.4}$$

$$X^S = L_X^{\theta} \bar{K}_X^{(1-\theta)} \tag{8.5}$$

$$M^S = L_M^{\delta} \bar{K}_M^{(1-\delta)} \tag{8.6}$$

$$\hat{W} = \omega\hat{P} \tag{8.7}$$

$$P = P_N^{a_1} (EP_X)^{a_2} (EP_M)^{(1-a_1-a_2)} \tag{8.8}$$

$$N^d = N^s \tag{8.9}$$

$$g = P_0^N N + P_0^X X + P_0^M M - P_0^I I \tag{8.10}$$

where the following notation is used.

y = real income in terms of nontradable goods;

N^s, N^d = supply and demand for nontradables;

X^s = supply of exportable goods;

M^s = supply of importable goods;

I = imported intermediate inputs;

V = value added in the nontradables good sector;

P_X, P_M, P_I = world prices of exportables, importables and intermediate goods expressed in terms of the foreign currency;

E = nominal exchange rate, expressed as units of domestic currency per unit of foreign currency;

P_N = domestic nominal price of nontradable goods;

i^* = world interest rate;

D^* = stock of external debt in foreign currency;

B = nominal stock of base money, assumed to be equal to the nominal stock of money;

G = real government expenditure in terms of nontradable goods;

L_N, L_X, L_M = labor used in nontradable, exportable and importable sectors;

$\bar{K}_N, \bar{K}_X, \bar{K}_M$ = (fixed) capital stock in N, X and M sectors;

P = price level;

W = nominal wage rate;

g = real gross domestic product (GDP) in terms of purchasing power of period 0; where P_0^N, P_0^X, P_0^M and P_0^I are the base period prices.

Equation (8.1) is real income in terms of nontradable goods. Equation (8.2) is the demand function for nontradables, which is composed of the private sector demand N plus the government's demand G. It is assumed that the private sector demand for N depends on real income, relative prices and the real stock of money.

Equation (8.3) is the production function for nontradable goods. It is a two stages CES function with an elasticity of substitution between value added and imported inputs equal to $\sigma = (1+\rho)^{-1}$. Equation (8.4) specifies that value added in the nontradables sector is produced using Cobb-Douglas technology, and that the capital stock in that sector is fixed. Equations (8.5) and (8.6) are the production functions for X and M, which are assumed to be Cobb-Douglas.

Equation (8.7) is the indexation rule, and establishes that nominal wages are adjusted in a proportion ω of inflation. This equation assumes that due to institutional reasons (unions and other rigidities) the labor market does not clear. If, on the contrary we assume full flexibility in the labor market, equation (8.7) should be replaced by a labor supply equation. Equation (8.8) is the definition of the price level. From (8.7) and (8.8) we get that nominal wages are adjusted according to the following rule: $\hat{W} = \omega_1 \hat{P}_N + \omega_2 \hat{E}$, where $0 \leq (\omega_1 + \omega_2) \leq 1$. Equation (8.9) establishes that in equilibrium the nontradable goods market clears. Finally, equation (8.10) is real GDP in terms of period 0 purchasing power. The modeling strategy is to find how devaluations -- that is, changes in E -- affect the level of employment and real economic activity (g).

This model is quite general and differs from previous work in various respects. First, in contrast with Cooper (1971c), Krugman and Taylor (1978), Taylor (1979) and Hanson (1983), who assume a mark-up pricing in the nontradables good sector, in this model we have a fully specified supply side. Second, unlike Krugman and Taylor (1978), Gylfason and Schmid (1983), Gylfason and Radetzki (1985), Hanson (1983), and Branson (1986) in this model households are allowed to consume all three goods. Third, the current model also incorporates the existence of external debt. In the discussion that follows it will be pointed out how this model can be simplified to generate as special cases the results previously obtained in the literature.

Assuming profit maximization and perfectly competitive firms we can obtain from equations (8.3), (8.4), (8.5) and (8.6) the demand functions for imported inputs and labor in each sector:

$$I = A_0(P_N/eP_I)^{\sigma}\ N, \tag{8.11}$$

$$L_N = A_1(P_N/W)^{1/[1+\gamma(1-\sigma)/\sigma]}\ N^{1/\sigma[1+\gamma(1-\sigma)/\sigma]}, \tag{8.12}$$

$$L_X = \theta(eP_X/W)X, \tag{8.13}$$

$$L_M = \delta(eP_M/W)M, \tag{8.14}$$

where A_0 and A_1 are constants.

In order to find out how changes in the nominal exchange rate affect total real output and employment, it is first necessary to investigate the way in which devaluations affect the nontradable goods market. From equations (8.1), (8.2), (8.7) and (8.12), and using expressions for the supply functions of X and M obtained from (8.5), (8.6), (8.13), and (8.14), we can derive the following equation for the rate of change of the demand for N (where as customary, $\hat{X} = (dX/dt)(1/X)$).

$$\hat{N}^d = D_1\hat{e} + D_2\hat{P}_N + D_3\hat{B} + D_4\hat{G} \tag{8.15}$$

where the D's are given by:

$D_1 = Q[(\lambda_X+\lambda_M) + (\lambda_X\epsilon_X+\lambda_M\epsilon_M)(1-\omega_2) - (\eta_X+\eta_M)/\phi - \lambda_I(1-\sigma) - \lambda_D^*]$

$D_2 = -Q[(1-\lambda_N) + \mu/\phi - (\eta_X+\eta_M)/\phi + \lambda_I\sigma + (\lambda_X\epsilon_X+\lambda_M\epsilon_M)\omega_1]$

$D_3 = \mu/Q$

$D_4 = G/NQ$

and

$Q = \phi/[1-\phi(1 - (\lambda_X+\lambda_M-\lambda_{D*}))]$.

And where $\phi = (N^P/N)\eta_y$, and (N^P/N) is the ratio of private to total demand for N. η_y is the income elasticity of demand for N; $\lambda_X, \lambda_M, \lambda_N, \lambda_I, \lambda_D^*$ are ratios of exports, imports, nontradables, imported inputs and debt payments to total income (i.e., $\lambda_X = (EP_XX)/(P_Ny)$); η_X and η_M are the price elasticities of demand for N with respect to P_N/P_X and P_N/P_M, and consequently are negative. ϵ_X and ϵ_M are the price elasticities of supply for X and M (i.e., $\epsilon_X = \theta/(1-\theta) > 0$, $\epsilon_M = \delta/(1-\delta) > 0$). μ is the demand elasticity of N with respect to real cash balances, and consequently positive. Stability requires that $Q > 0$.[7]

D_1 captures the effect of a nominal devaluation on the demand for nontradables (with other things given), and its sign is undetermined. The reason is that D_1 combines both an expenditure switching effect -- where a higher E will tend to increase the demand for N -- and an expenditure reducing effect. The expenditure switching effect is given by $\{(\lambda_X+\lambda_M) + (\lambda_X\epsilon_X+\lambda_M\epsilon_M)(1-\omega_2) - (\eta_X+\eta_M)\phi\} > 0$. By increasing the relative price of M and X the devaluation will result in a substitution in consumption away from these goods towards N. The term $(-\lambda_D^*)$ is the pure expenditure reducing effect, that captures the effect of the higher domestic currency value of foreign liabilities (D^*) resulting from the devaluation.

The term $-\lambda_I(1-\sigma)$ in D_1 captures the effect of the devaluation on intermediate inputs and its sign depends on the elasticity of substitution between value added and intermediate inputs. If σ is very low (i.e., $\sigma = 0$), a devaluation which increases the price of intermediate inputs will result in a significant backwards shift of the supply of N, reducing real income and, consequently, the demand for all goods, including N. If the expenditure reduction effect dominates then $D_1 < 0$. D_2 is the (total) price elasticity of demand for N and is negative, capturing the fact that, with other things given, an increase in P_N will result in a reduction of the quantity demanded of nontradable goods. D_3 captures the effect of increases in (real) money balances on the demand for N and is positive. D_4 is also positive and measures the role of higher government consumption on the demand for nontradables.

Note that equation (8.15) is very general and includes, as special cases, a number of previous models. For example , if $\epsilon_X = \epsilon_M = \omega_1 = \omega_2 = \lambda_{D*} = 0$ and $\hat{P}_N = v\hat{E}$ (i.e., there is mark-up pricing for nontradable goods), equation (8.15) corresponds to Hanson's model. Moreover, if in addition we assume that $\lambda_M = \sigma = 0$ equation (8.15) becomes equivalent to the model by Krugman and Taylor (1978).

Let us now turn to the supply side for nontradable goods. From the first order conditions (8.11) and (8.12) we obtain expressions for $\hat{I}$ and $\hat{L}_N$. Using the wage indexation equation (8.7) to eliminate $\hat{W}$, we finally obtain the following equation for changes in the supply for nontradable goods:

$$\hat{N}^s = S_1\hat{P}_N + S_2\hat{E} \tag{8.16}$$

where the S's coefficients are equal to:

$$S_1 = (\frac{1}{1-\gamma}) \left\{\frac{\pi_1}{\pi_2} (\sigma(1-\gamma)+\gamma) + \gamma(1-\omega_1)\right\} > 0,$$

$$S_2 = -(\frac{\sigma(1-\gamma)+\gamma}{1-\gamma}) [\pi_1/\pi_2 + \gamma\omega_2] < 0,$$

and π_1 and π_2 are the shares of value added and intermediate inputs in the production of N.

From (8.16) it is possible to see that, with other things given, an increase in P_N generates an increase in the supply of home goods, while a devaluation will shift the aggregate supply curve upward and to the left, tending to reduce the supply of home goods. The channel through which this happens is the effect of the devaluation on the price of the imported intermediate inputs. As the devaluation makes these inputs more expensive, in domestic currency, the marginal cost of producing nontradable goods increases.

Combining (8.15) and (8.16) we can obtain final expressions for $\hat{N}$ and $\hat{P}_N$:

$$\hat{N} = \left\{\frac{D_2S_2-D_1S_1}{D_2-S_1}\right\} \hat{E} - \left\{\frac{D_3S_1}{D_2-S_1}\right\} \hat{B} - \left\{\frac{D_4S_1}{D_2-S_1}\right\} G \qquad (8.17)$$

$$\hat{P}_N = \left\{\frac{S_2-D_1}{D_2-S_1}\right\} \hat{E} - \left\{\frac{D_3}{D_2-S_1}\right\} \hat{B} - \left\{\frac{D_4}{D_2-S_1}\right\} \hat{G} \qquad (8.18)$$

From (8.17) it follows that:

$$(\hat{N}/\hat{E}) \gtrless 0$$

$$(\hat{N}/\hat{B}) > 0$$

$$(\hat{N}/\hat{G}) > 0.$$

Whether a devaluation will reduce or not the (equilibrium) output of nontradable goods will depend on whether $(D_2S_2-D_1S_1)$ is positive or sufficient condition for having a contractionary devaluation is that the devaluation shifts back both demand and supply for N. This will be the case when $D_1 < 0$. However, under the more plausible case where on the demand side the expenditure switching effect dominates in (8.15) (i.e., $D_1 > 0$), there will be two forces that will operate in the opposite directions. On one hand, the demand for nontradables will increase as a result of the devaluation, while on the other hand the higher cost of imported intermediate inputs will contract the supply. In this case whether a devaluation results in a higher or lower N will be an empirical question. With respect to the price equation (8.18), if the expenditure switching effect dominates in demand $(D_1 > 0)$, then the devaluation will always increase P_N. This is because in this case both supply and demand shift upward. In the rest of this section and unless otherwise stated, we will assume that $D_1 > 0$.

The effects of a devaluation on the level of sectoral employment is obtained from equations (8.12), (8.13), (8.14), (8.17) and (8.18):

$$\hat{L}_N/\hat{E} = [\frac{1}{\sigma(1-\gamma)+\gamma}] [(\frac{1}{D_2-S_2})(D_2S_2-D_1S_1 + (1-\omega_1)\sigma(S_2-D_1) - \omega_2\sigma] \qquad (8.19)$$

Again, the sign of this elasticity is ambiguous; the final effect of a devaluation on employment in N will depend on the relative values of the different structural parameters in the model.

From equations (8.5), (8.6), (8.7) and (8.8), changes in production of X and M are equal to $\epsilon_X(\hat{E}-\hat{W})$ and $\epsilon_M(\hat{E}-\hat{W})$. Thus, as long as the nominal devaluation reduces the real product wage in these two sectors -- that is, as long as the nominal devaluation results in a real devaluation -- there will be an expansion in their output. A sufficient condition for this is that the weight of P_N in the indexation rule (ω_1) is zero. A necessary condition, on the other hand, is that ω_1 is not "very large". If $\omega_1 \leq (1-\omega_2)\ [(D_2-S_1)/(S_2-D_1)]$, the nominal devaluation will always result in a real devaluation (i.e., $(\hat{E}-\hat{W}) > 0$) and the output of X and M will increase. Notice, however, that even if the nominal devaluation results in a real devaluation, production of home goods can either increase or decrease; that is the sign of $(\hat{N}/\hat{E})$ is still undetermined. If indeed output of N goes down by a sufficiently large amount, aggregate output could be reduced, even if output of X and M increases.

To sum up, the model presented above has clearly indicated that there is a (nontrivial) possibility for devaluations to reduce aggregate output. Whether they do it or not is, in fact, an empirical issue. It is possible to generate testable equations from this model. For example, taking log differences of equation (8.10) and using the expressions for changes in N, X, M and P_N it is possible to derive after some simple manipulations the following double log estimable expression for the log of real GDP:[8]

$$\log g = \text{constant} + a_1 \log E + a_2 \log B + a_3 \log G + u \qquad (8.20)$$

where the parameters a_1, a_2 and a_3 are functions of the different elasticities and structural coefficients, and u is assumed to be an error term with the usual characteristics. a_1 is the elasticity of real GDP with respect to the nominal exchange rate, and can be either positive or negative. In fact, one of the purposes of the empirical analysis in Section 8.3 of this chapter is to use historical data to elucidate the sign of a_1. The coefficient a_2 captures the response of real GDP to changes in the quantity of money, and it is expected that it will be greater than or equal to zero. Finally, a_3 measures the effect of fiscal policy -- in our case government demand for N -- on real GDP and is expected to be greater than or equal to zero. In Section 8.3 equations similar to (8.20) are estimated using data for a group of developing countries.

8.2 Devaluations and Economic Activity in the 39 Devaluation Episodes

This section provides a preliminary empirical analysis of the contractionary devaluation issue. We analyze the evolution of two measures of real economic activity in the period surrounding the 39 devaluations episodes of Chapter 6. Table 8.1 summarizes the distribution of the rate of growth of real GDP in our devaluation episodes during the period going from 3 years prior to the devaluation to 3 years after the devaluations. As can be seen three years prior to the devaluation the distribution for the devaluing countries is very similar to that of the control group. In fact the value of the $\chi^2(2)$ statistic is 0.036 (level of probability 0.98), being unable to reject the null hypothesis of both distributions being equal.

Things, however, look increasingly different as we move towards the devaluation year. More specifically, notice that the year of the devaluation the median for crisis countries (4.2%) is below the first quartile for the control group (4.5%), and that the third quartile for the devaluers (6.1%) is below the median for the countries with a fixed exchange rate (6.4%). In fact for this year the $\chi^2(2)$ has a value of 6.5 (level of probability 0.04), indicating that the null hypothesis of both distributions being equal during that year is rejected at conventional significance levels. As can be seen in the table, the crisis countries exhibit a fairly rapid recovery during the three years that follow the devaluation. However, this recovery process is uneven, with the top 25% of the countries doing exceedingly well -- the third quartile for the crisis ratios greatly exceeds

TABLE 8.1

Growth of Real GDP in Devaluing and Control Group Countries

(percent)

	First Quartile	Median	Third Quartile
A. 39 Devaluation Episodes			
3 Years Before	4.7	6.0	7.4
2 Years Before	3.6	6.1	8.4
1 Year Before	2.3	5.4	7.3
Year of Devaluation	1.2	4.2	6.1
1 Year After	3.1	4.7	6.4
2 Years After	3.1	4.7	6.4
3 Years After	3.2	5.8	9.2
B. Control Group of Nondevaluing Countries			
	4.5	6.4	7.4

Source: See Text.

the control group 3 years after the devaluation -- while the rest of the devaluing countries growth still lag its behavior from the period preceding the devaluation. For the group as a whole the $\chi^2(2)$ are 3.07 and 6.31 two and three years after the devaluations (levels of probability 0.2 and 0.04), clearly supporting the hypothesis that at that time these nations still behave differently from the control group of fixers.

Table 8.2 contains the list of those countries that had a particularly poor performance in terms of growth of real GDP in the year of the devaluation or during any of the 3 years that followed. In constructing this table the countries in the lowest 25% of the distribution for real GDP growth for each year were included. An asterisk in this table means that for that particular country the rate of growth of real GDP deviates by more than one standard deviation from the average growth for that country during the eight years prior to the devaluation. The distribution of poor performers is somewhat uniform across geographic regions and across type of devaluers -- stepwise or crawlers. Notice however, that in Table 8.2 there are a large number of countries that devalued in 1982, in the midst of the international debt crisis. This, of course, suggests that the poor performance experienced by these countries during this period may not have been fully the result of the devaluation itself, but of the (exogenous) circumstances surrounding it. In Section 8.3 below we use regression analysis in an effort to isolate the role of devaluations from that of other factors including terms of trade disturbances.

Table 8.3 takes us away from the direct sphere of output and looks at the evolution of the investment-GDP ratio before and after the crisis. The reason for looking at this variable is that it has been suggested by some authors (i.e., Branson 1986) that investment may be one possible channel

TABLE 8.2

Countries With Poor Real Performance In Years Of Devaluation

Or Years Following Devaluation

		Rate of Growth of Real GDP %
A. - Year of Devaluation		
India	1966	1.1*
Jamaica	1978	0.6
Nicaragua	1979	-26.4*
Yugoslavia	1965	1.1
Bolivia	1982	-8.7
Chile	1982	-14.1
Ecuador	1982	1.2
Mexico	1982	-0.6*
Korea	1980	-2.9*
B. - One Year After Devaluation		
Bolivia	1979	0.5
Costa Rica	1974	2.1
Guyana	1967	0.2
Jamaica	1978	-1.7
Peru	1967	0.0*
Bolivia	1982	-7.7*
Chile	1982	-0.7
Ecuador	1982	-2.8*
Mexico	1982	-5.3*
Kenya	1981	1.8
C. - Two Years After Devaluation		
Argentina	1970	2.2
Bolivia	1979	-0.9
Egypt	1962	3.0
India	1966	3.0*
Jamaica	1978	-5.8*
Trinidad	1967	0.1
Venezuela	1964	-1.7
Yugoslavia	1965	3.0
Peru	1975	-0.3

Table 8.2 (cont.)

		Rate of Growth of Real GDP %
D. - Three Years After Devaluation		
Bolivia	1979	-8.7*
Cyprus	1967	3.1
Egypt	1962	2.9
Jamaica	1978	2.5
Nicaragua	1979	-1.2*
Chile	1982	2.4
Kenya	1981	0.4*
Mexico	1982	2.7
Peru	1975	-1.7*

*An asterisk means that the rate of growth of real GDP is below that country's average for the previous 8 years by more than one standard deviation.

Source: See text.

TABLE 8.3

Investment Ratio in Devaluing Countries and Control Group

(percent)

	First Quartile	Median	Third Quartile
A. 39 Devaluation Episodes			
3 Years Before	22.5	18.0	15.6
2 Years Before	23.6	18.1	14.5
1 Year Before	22.2	18.3	15.2
Year of Devaluation	21.8	17.6	15.1
1 Year After	20.9	17.3	15.7
2 Years After	21.8	18.0	15.2
3 Years After	24.1	18.4	15.7
B. Control Group			
	21.8	18.1	15.2

Source See text.

through which devaluations negatively affect future economic activity. As can be seen these distributions look very similar for the devaluers 3 years prior to the crisis and for the control group; the $\chi^2(2)$ was equal to 1.3. However, the year of the devaluation, and more markedly one year after the devaluation, the median and first quartile for the devaluers exhibit an important decline. The $\chi^2(2)$ statistics have values of 4.9 and 6.2, indicating that in fact the probability that these distributions are equal to that of the control group is now greatly reduced.

To sum up, the evidence discussed here regarding the 39 devaluation episodes strongly suggests that in many cases devaluations have historically been associated with declines in the level of economic activity around its trend. These results provide some preliminary evidence that tends to support the contractionary devaluation hypothesis. This evidence is only suggestive, however, since it does not distinguish devaluation from other policies and disturbances. This is done in the next section where the results obtained from a number of regressions based on the model of Section 8.1 are reported.

An important characteristic of the distributions of real growth summarized in Table 8.1, that should be kept in mind, is that for the devaluers real GDP growth starts exhibiting a decline <u>before</u> the date of the actual devaluation. This finding suggests that the imposition of exchange and trade controls that precede most devaluations introduce important distortions that negatively affect the performance of the economy. Interestingly enough, this possibility has not been addressed by those authors that support the neostructuralist critique to devaluation. This is particularly surprising given the fact that the effect of exchange controls and black markets on the cost of imported inputs will work in these models in <u>exactly</u> the same way as a devaluation.

8.3 Regression Analysis

In this section results obtained from a regression analysis based on the model of Section 8.1 are reported. These regression results allow us to focus on the effects of devaluation, maintaining other factors constant. The following extended version of equation (8.20) is the basis of the estimation:

$$\log g_t = \gamma TIME + \Sigma\beta_{1i} M_{t-i} + \Sigma\beta_{2i} \log TOT_{t-i} + \Sigma\beta_{3i} \log GCGDP_{t-i} + \Sigma\beta_{4i} \log E_{t-i} + u_t \quad (8.21)$$

where as before g_t is real GDP.

In equation (8.21) some modifications have been introduced in relation to the model of Section 8.1. First, in (8.21) there is a time trend (γ), and lagged values of the different RHS variables have been included. Second, a general term "money" (M_{t-i}) has been incorporated. This is because two alternative concepts for the monetary variable were used. First, as indicated by the model, actual changes in the log of nominal money -- which were denoted by ΔM_{t-i} -- were included. Second, instead of changes in the actual quantity of money as in equation (8.20), equation (8.21) also incorporated the role of monetary innovations or <u>money surprises</u> (MS_i). This is in the spirit of the rational expectations hypothesis that suggests that only unanticipated changes in money will have any effects on real output. In the case where actual money is used it is expected that $\Sigma\beta_{1i} = 0$. If, however, the rational expectations' specification is appropriate it is expected, then, that $\Sigma\beta_{1i}$ will be positive. Third, the role of changes in the external terms of trade (TOT) was also incorporated. Although this factor did not appear in an explicit way in the solution of the model of Section 8.1, it is clear from its structure that a worsening of the terms of trade (i.e., a reduction in TOT) will result in a reduction of real GDP. It is expected then that $\Sigma\beta_{2i}$ will be positive. The coefficients β_{3i} measure the role of fiscal policy and according to the model it is expected that they will be positive.

The main interest of this analysis lays on the coefficients of the exchange rate -- the β_4s. If devaluations are contractionary it is expected that they will be significantly negative. If, however, devaluations are expansive as suggested by the more traditional theories the β_4s will be positive. Naturally, it is possible to have a short run effect that goes in one direction and a long run effect that goes in the opposite direction. For this reason in equation (8.21) a number of lags have been incorporated.

Since equation (8.21) is a reduced form based on the model in Section 8.1, the exchange rate appearing on the RHS is the nominal exchange rate. This is because, in deriving (8.20) all endogenous variables -- including the real exchange rate -- have been solved for. However, in order to more closely investigate the effect of real devaluations on real output, and to be able to compare our results from those of other studies, we also run regressions replacing $\log E_{t-i}$ for $\log e_{t-i}$ (where e is the real exchange rate):

$$\begin{aligned}\log g_t = \tilde{\gamma}\text{TIME} &+ \Sigma\tilde{\beta}_{i1} M_{t-i} \\ &+ \Sigma\tilde{\beta}_{2i} \log\text{TOT}_{t-i} + \Sigma\tilde{\beta}_{3i} \log\text{GCGDP}_{t-i} \\ &+ \Sigma\tilde{\beta}_{4i} \log e_{t-i} + \epsilon_t \qquad (8.22)\end{aligned}$$

where, as before, M_{t-i} refers either to percentage changes in broadly defined money (ΔM_{t-i}) or to money surprises (MS_{t-i}).

Results

Equations (8.21) and (8.22) were estimated using pooled data for the 12 developing countries of Chapter 5 -- India, Malaysia, Philippines, Sri Lanka, Thailand, Greece, Israel, Brazil, Colombia, El Salvador, South Africa and Yugoslavia. As in that chapter, these countries were chosen because of data availability: they were the only developing countries that had long enough time series for all the variables of interest (fiscal deficits and terms of trade are the most difficult data to obtain). The time period, as in Chapters 5 and 7 covers 1965 through 1984 for most countries. As can be seen in Chapter 4, all of these countries have experienced important real exchange rate changes (i.e., real devaluations and appreciations) during the period under consideration, and all but El Salvador had also gone through episodes of major nominal devaluations. The exact definition and sources of the data are given in the Appendix 8-A.

Before estimating the rational expectation versions of these equations, that include monetary "surprises", it is necessary to find adequate time series for the unexpected money term MS. In this chapter, as in a number of other studies, this unexpected money growth term is constructed, for each individual country, by taking the differences between actual money growth and the estimated rate of growth of money obtained from a money creation equation.[9] The equation used to generate the expected rate of growth of money should include variables that indeed convey information to the public about central bank behavior. In a large number of developing countries the printing of money is an important source of fiscal deficit financing (Edwards 1983). Consequently, in the money creation equations used in this study the ratio of the fiscal deficit to lagged high-powered money was used as an explanatory variable. Additionally the equation included lagged values of $\Delta \log M$.[10] In all cases the residuals were closely examined in order to make sure that they were white noise, and consequently qualified as proxies for money surprises in the estimation of the real output growth equations.

In the estimation of equations (8.21) and (8.22) the γ coefficient was allowed to differ across countries. In this way the differences in trend growth of real output across countries is accounted for. Also, country dummy variables that capture those elements that are specific to each country, such as country size, were included.[11] Those equations that included the RER as an independent variable were estimated using a two stage least squares procedure.[12]

Table 8.4 contains the results obtained from the estimation of (8.21) and (8.22) for the case of actual money changes. Table 8.5, on the other hand, contains the results obtained when money surprises were included. Details on the estimation technique are provided in the notes to the tables.

Although some of the coefficients are not significant at conventional levels, these results provide support to the view that devaluations have at least a short-run contractionary effect on real output. In all equations the coefficient of the contemporaneous exchange rate variable -- either nominal or real -- is significantly negative. Moreover, its magnitude is quite large, indicating that with other things given, devaluations in these countries have exerted important negative pressures on real output. In all cases the lagged coefficients of the exchange rate variable turned out to be non-significant suggesting that the short run negative effect of devaluations on real GDP is not reverted as time passes. With respect to the long run effects of devaluations on real output, the results are somewhat mixed.

TABLE 8.4

Devaluations and Real GDP In Equations With Actual Money Growth

(OLS and 2SLS)

	(8.21.1)	(8.22.1)	(8.22.2)
log e_t	-	-0.160 (-3.049)	-0.162 (-3.078)
log e_{t-1}	-	0.074 (1.225)	0.073 (1.192)
log e_{t-2}	-	0.003 (0.056)	0.010 (0.176)
log e_{t-3}	-	0.056 (1.347)	0.052 (1.235)
log E_t	-0.199 (-7.019)	-	-
log E_{t-1}	0.019 (0.445)	-	-
log E_{t-2}	0.032 (0.999)	-	-
ΔM_t	0.086 (1.687)	-0.096 (-1.635)	-0.106 (-1.771)
ΔM_{t-1}	0.021 (0.353)	0.035 (0.455)	0.032 (0.424)
ΔM_{t-2}	0.092 (1.826)	-0.058 (-0.937)	-0.061 (-0.985)
log TOT_t	0.103 (3.340)	0.128 (3.380)	0.132 (3.456)
log TOT_{t-1}	0.019 (0.587)	0.066 (1.662)	0.059 (1.447)
log $GCGDP_t$	-0.010 (-1.527)	-	-0.005 (-0.185)
log $GCGDP_{t-1}$	-0.029 (-1.527)	-	-0.031 (-1.313)

Table 8.4 (cont.)

	(8.21.1)	(8.22.1)	(8.22.2)
N	230	230	230
Root MSE	0.044	0.034	0.054
R^2	0.99	0.99	0.99

Notes: The equations with nominal exchange rate as an independent variable were estimated using OLS. The equations with real exchange rates as independent variables were estimated using two stage least squares. Numbers in parentheses are t-statistics. Root MSE is the root mean square error. All equations were estimated using a fixed effect procedure where country specific dummy variables were included.

TABLE 8.5

Devaluations and Real GDP In Equations

With Money Surprises (OLS and 2SLS)

	Equation Nos.			
	(8.21.2)	(8.21.3)	(8.22.3)	(8.22.4)
log e_t	-	-	-0.221 (-3.904)	-0.222 (-3.949)
log e_{t-1}	-	-	0.080 (1.330)	0.083 (1.393)
log e_{t-2}	-	-	-0.002 (-0.389)	-0.025 (-0.451)
log e_{t-3}	-	-	0.069 (1.546)	0.070 (1.586)
log E_t	-0.153 (-6.173)	-0.161 (-5.970)	-	-
log E_{t-1}	-0.008 (-0.211)	-0.011 (-0.263)	-	-
log E_{t-2}	0.033 (1.074)	0.039 (0.997)	-	-
log E_{t-3}	-	-0.007 (-0.242)	-	-
MS_t	0.002 (0.340)	0.039 (0.864)	0.024 (0.375)	0.024 (0.397)
MS_{t-1}	0.046 (1.008)	0.082 (1.790)	0.131 (2.316)	0.132 (2.351)
MS_{t-2}	0.071 (1.565)	-	0.124 (2.197)	0.127 (2.255)
log TOT_t	0.100 (3.138)	-	0.129 (3.338)	0.128 (3.345)
log TOT_{t-1}	0.014 (0.420)	-	0.041 (1.005)	0.040 (1.017)
log $GCGDP_t$	-0.007 (-0.349)	-0.014 (-0.738)	0.007 (0.319)	-
log $GCGDP_{t-1}$	-0.026 (-1.363)	-0.028 (-1.423)	-0.010 (-0.437)	-

Table 8.5 (cont.)

	Equation Nos. (8.21.2)	(8.21.3)	(8.22.3)	(8.22.4)
N	224	223	220	229
Root MSE	0.044	0.046	0.053	0.053
R^2	0.99	0.99	0.99	0.99

Notes: Equations (8.22.3) and (8.22.4) with RERs as independent variables were estimated using 2SLS. Equations (8.21.2) and (8.21.3) that used the log of the nominal exchange rate as an independent variable were estimated using OLS. Number in parentheses are t-statistics. Root MSE refers to the root mean square error. All equations were estimated using a fixed-effect procedure where country specific dummy variables were included. Notice that since lagged money surprises have been used the standard errors reported in this table are subject to the "generated regressor" problem pointed out by Pagan (1984).

In two of the regressions -- (8.22.1) and (8.22.2) in Table 8.4 -- it is not possible to reject the hypothesis that the sum of the exchange rate coefficients is zero. This suggests that although (real) devaluations have a negative impact effect on output, they are neutral in the long run. However, in the other five regressions the hypothesis that the sum of all exchange rate coefficients is zero was rejected.[13]

Regarding the other variables these results are also quite revealing. Almost all the coefficients of the change of actual money turned out to be nonsignificant at conventional levels. However, in all equations were included at least one of the coefficients of the monetary surprises were significantly positive at conventional levels. These results provide some support to the rational expectations view that it is monetary innovations that matters (Hanson 1980, Edwards 1983). It should be noted that when actual money growth was replaced by growth in domestic credit, the results did not change in any significant way.

The terms of trade coefficients are significantly positive and quite large. This indicates that a terms of trade deterioration will result in a reduction of real GDP relative to its trend. This is an important result, since it illustrates the problems related to comparisons based on "before" and "after" analysis only. For example, as was suggested above, the marked declines in real GDP for some countries in the early 1980s can indeed be attributed in part to the deterioration in most of the developing countries terms of trade during that period. Finally, notice that in all the equations the log of GCGDP turned out to be insignificant.

A number of alternative specifications were also estimated, without altering the thrust of the results reported in Tables 8.4 and 8.5. For example, when the multilateral real exchange rate was used instead of the

RER the estimated contemporaneous coefficient was still significantly negative.

8.4 Distortions, Exchange Controls and Real Output

Most discussions on contractionary devaluations, including the model of Section 8.1, do not specify what are the alternatives to devaluations in conditions of disequilibrium. In reality, however, when faced with adverse external sector conditions economic authorities face the decision of whether to devalue or to implement other policies. As was shown in Chapter 6, in most historical episodes the developing nations have resisted devaluation and have instead imposed exchange and trade controls. An important issue, then, is whether these policies, considered to be alternatives to devaluations, have as well had negative effects on real output. In principle, the model in Section 8.1 can be easily amended to incorporate (some) real output effects of trade controls. In fact, in that model import tariffs on imported intermediate inputs will have a contractionary effect similar to that generated by a devaluation. Moreover, in more complete models distortions will generally have their own negative consequences on output.[14]

In order to test the hypothesis that increased trade impediments, exchange controls and other variables negatively affect real output, equations (8.21) and (8.22) were re-estimated adding the black market premium (BMPR) as an additional RHS variable. As discussed in Chapter 5, this variable is in fact a good "catchall" proxy for the level of distortions in an open economy.[15] The results for the equation that include the nominal exchange rates were:

$$
\begin{aligned}
\log y_{nt} = \; & \underset{(-6.296)}{-0.212} \log E_t - \underset{(-1.090)}{0.056} \log E_{t-1} + \underset{(2.534)}{0.107} \log E_{t-2} \\
& \underset{(-5.352)}{-0.195} \, BMPR_t + \underset{(1.935)}{0.105} \, \Delta M_t - \underset{(-0.711)}{0.045} \, \Delta M_{t-1} + \underset{(2.355)}{0.012} \, \Delta M_{t-2} \\
& + \underset{(2.324)}{0.073} \log TOT_t + \underset{(0.003)}{0.001} \log TOT_{t-2} + \underset{(0.155)}{0.003} \log GCGDP_t \\
& \underset{(-0.419)}{-0.008} \log GCGDP_{t-1} \qquad \text{Root MSE} = 0.043 \quad N = 207;
\end{aligned}
$$

and when the real exchange rate was used the following result was obtained:

$$
\begin{aligned}
\log y_{nt} = \; & \underset{(-3.686)}{-0.231} \log e_t + \underset{(0.671)}{0.045} \log e_{t-2} \\
& - \underset{(-0.029)}{0.002} \log e_{t-2} + \underset{(2.205)}{0.114} \log e_{t-3} \\
& - \underset{(-1.958)}{0.112} \, BMPR_t - \underset{(-0.160)}{0.010} \, MS_t + \underset{(1.682)}{0.097} \, MS_{t-1} + \underset{(1.367)}{0.080} \, MS_{t-2} \\
& + \underset{(3.432)}{0.132} \log TOT_t + \underset{(0.856)}{0.034} \log TOT_{t-1} + \underset{(0.739)}{0.017} \log GCGDP_t \\
& + \underset{(0.249)}{0.006} \log GCGDP_{t-1} \qquad \text{Root MSE} = 0.051 \quad N = 207
\end{aligned}
$$

As can be seen the coefficient of BMPR turned out to be significantly negative at conventional levels. These results then provide evidence supporting the idea that increased distortions in these economies have historically resulted in declines in real output relative to trend. Moreover, these estimates confirm our suspicion that in most of these countries exchange controls are at least partially responsible for the observed deterioration in real output <u>before</u> the devaluation.

8.5 <u>Devaluation, Real Wages and Income Distribution</u>

In this section some of the income distribution ramifications of devaluations are investigated for the 39 episodes followed in this study. First the relation between devaluations and real wages is analyzed. Next, we look at the way in which labor shares in GDP evolved during the period preceding and following these devaluations. The analysis concentrates only on these two variables since in these countries there are very limited data on primary income distribution indicators. In fact, according to data in the World Bank World Tables most of the developing countries have data on the personal distribution of income for at most two out of the last 25 years.

Devaluations and Wages

In a non-growing economy there is a direct relation between real exchange rate movements and real wage rate movements. In fact real appreciations (depreciations) will imply increasing (decreasing) real wages expressed in terms of tradables. To illustrate this consider the following simple model:

$$\hat{P}_t = \alpha \hat{P}_{Tt} + (1-\alpha)\hat{P}_{Nt} \tag{8.23}$$

$$\hat{P}_{Tt} = \hat{E}_t + \hat{P}^*_{Tt} \tag{8.24}$$

$$D^N(P_N/P_T) = S^N(W/P_N, \tau) \tag{8.25}$$

$$\hat{w} = \hat{W} - \hat{P} \tag{8.26}$$

$$\hat{e} = \hat{P}_T - \hat{P}_N \tag{8.27}$$

Equation (8.23) depicts percentage movements in the price level $(\hat{P}_t)$ as a weighted average of changes in the price of tradables in home currency $(\hat{P}_{Tt})$ and the price of nontradables $(\hat{P}_{Nt})$. Equation (8.24) is the law of one price for tradables, where $\hat{P}^*_{Tt}$ is the rate of change in the world price of tradables and $\hat{E}$ is nominal devaluation. Equation (8.25) is the equilibrium condition for the nontradable goods market, where the demand for $N(D^N)$ depends negatively on the relative price of nontradables, and the supply is a negative function of the product wage rate (W/P_N) and of a parameter τ that captures the extent of technological progress and/or productivity gains. If there is no technological progress $\hat{\tau} = 0$. Equation (8.26) defines changes in real wages w, whereas equation (8.27) gives us the evolution through time of the real exchange rate. As before a real depreciation means that $\hat{e} = (\hat{P}_T - \hat{P}_N) > 0$.

Using equations (8.25) and (8.26) and assuming no technological change the following expression is obtained:

$$\hat{e}_t = \left(\frac{\epsilon}{\eta+\epsilon}\right) (\hat{P}_{Tt} - \hat{W}) \qquad (8.28)$$

where ϵ is the elasticity of supply of N with respect to the product wage $(\epsilon < 0)$ and η is the elasticity of demand of N with respect to the relative price of N $(\eta < 0)$. This equation states that if the real exchange rate appreciates $\hat{e}_t < 0$, the nominal wage rate is increasing faster than the domestic price of tradables. The opposite will be true if there is a real depreciation: with no productivity gains real depreciations necessarily will be related to declines in the <u>real product wage rate</u> for tradables. This, of course, is a reflection of the fact that the real exchange rate is a measure of the degree of competitiveness of domestically produced tradables. If, however, there are gains in productivity, it is possible to have a simultaneous real depreciation and real wage rate increases. This indeed has been the experience of Korea during much of the last 15 years (Collins and Park, 1987). When the real wage is measured relative to a basket of tradables and nontradables, as in equation (8.26), the following relation holds:

$$\hat{e} = -\left(\frac{1}{\alpha+(\eta/\epsilon)}\right)(\hat{W} - \hat{P}) \qquad (8.29)$$

From this analysis it follows that one would generally expect a rapid increase in real wages in the period preceding a devaluation crisis, with a decline in real wages in those countries that successfully implement a real depreciation. Naturally, countries with very fast productivity improvements will provide an exception to this rule. Another way of looking at this relationship is by stating that unless productivity gains are large, countries that have real wage resistance -- due to indexation mechanisms, for example -- will fail to generate real depreciations after a nominal devaluation.

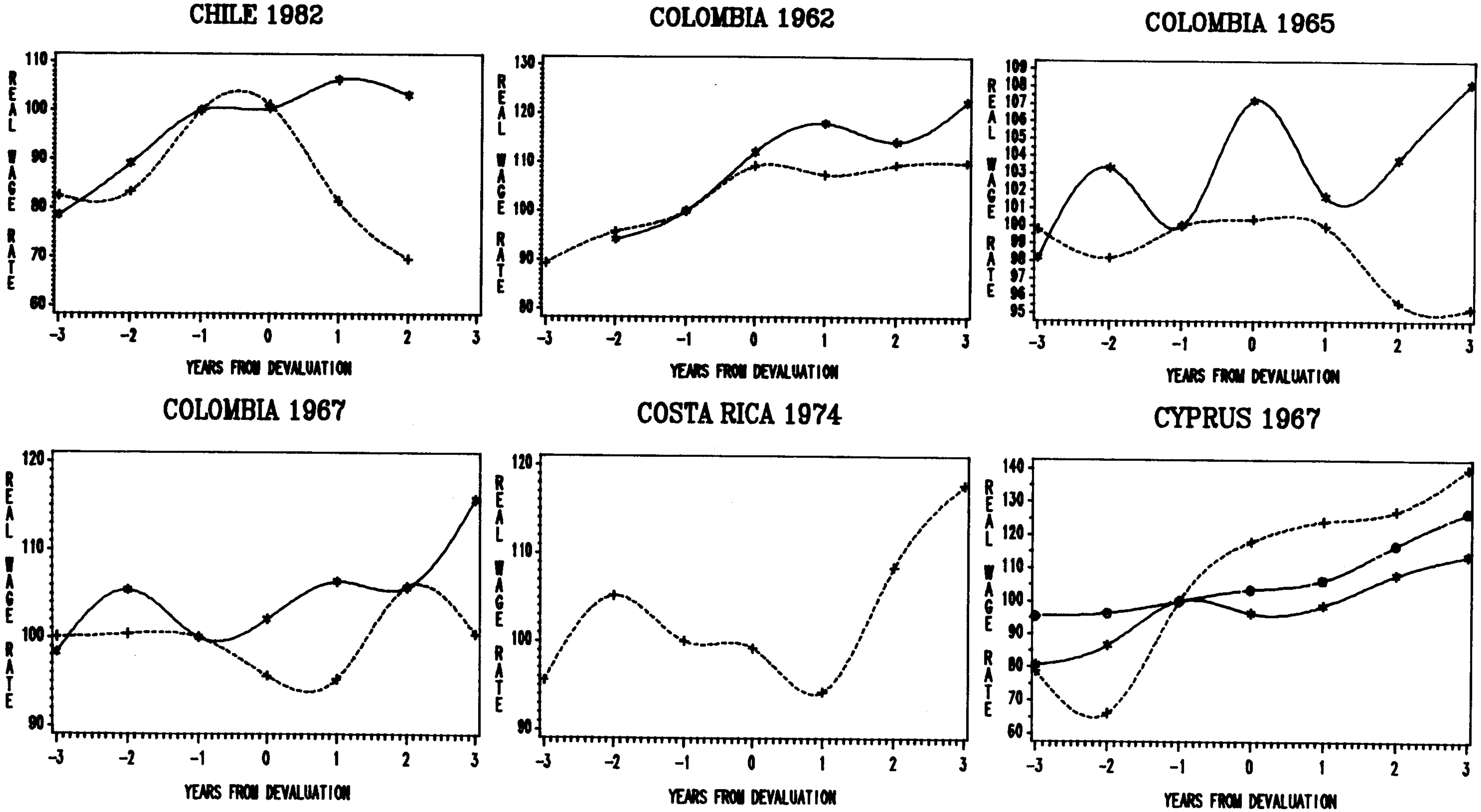
In this study data on three types of wages were analyzed: (a) non-agricultural wages, (b) manufacturing wages, and (c) agricultural wages. These data were obtained from the International Labor Office, and are presented in Table 8.6 through 8.8. In Figure 8.1 these real wage indexes are depicted for the 29 countries that had data. In these diagrams a plus sign (+) is used to represent agricultural wages, an asterisk (*) represents manufacturing wages, while a circle (O) is used to depict non-agricultural wages. Before turning to the analysis of these figures a word of caution is needed regarding the quality of these data. In most developing nations the procedure for collecting wage information is quite deficient, making many of these indexes suspect. For this reason the figures presented here should be taken with a grain of salt and as only providing preliminary information.

The data contained in these tables and figures show a common pattern in a number of countries: real wages exhibited an important increase in the years prior to the devaluation, experiencing declines in the years following the crisis. Notice however, that the behavior of the three wage indexes is quite different, especially in the post-devaluation period suggesting that there may be important sector distributional effects associated to

FIGURE 8.1

REAL WAGE RATES

(YEAR BEFORE DEVALUATION WAGE=100)



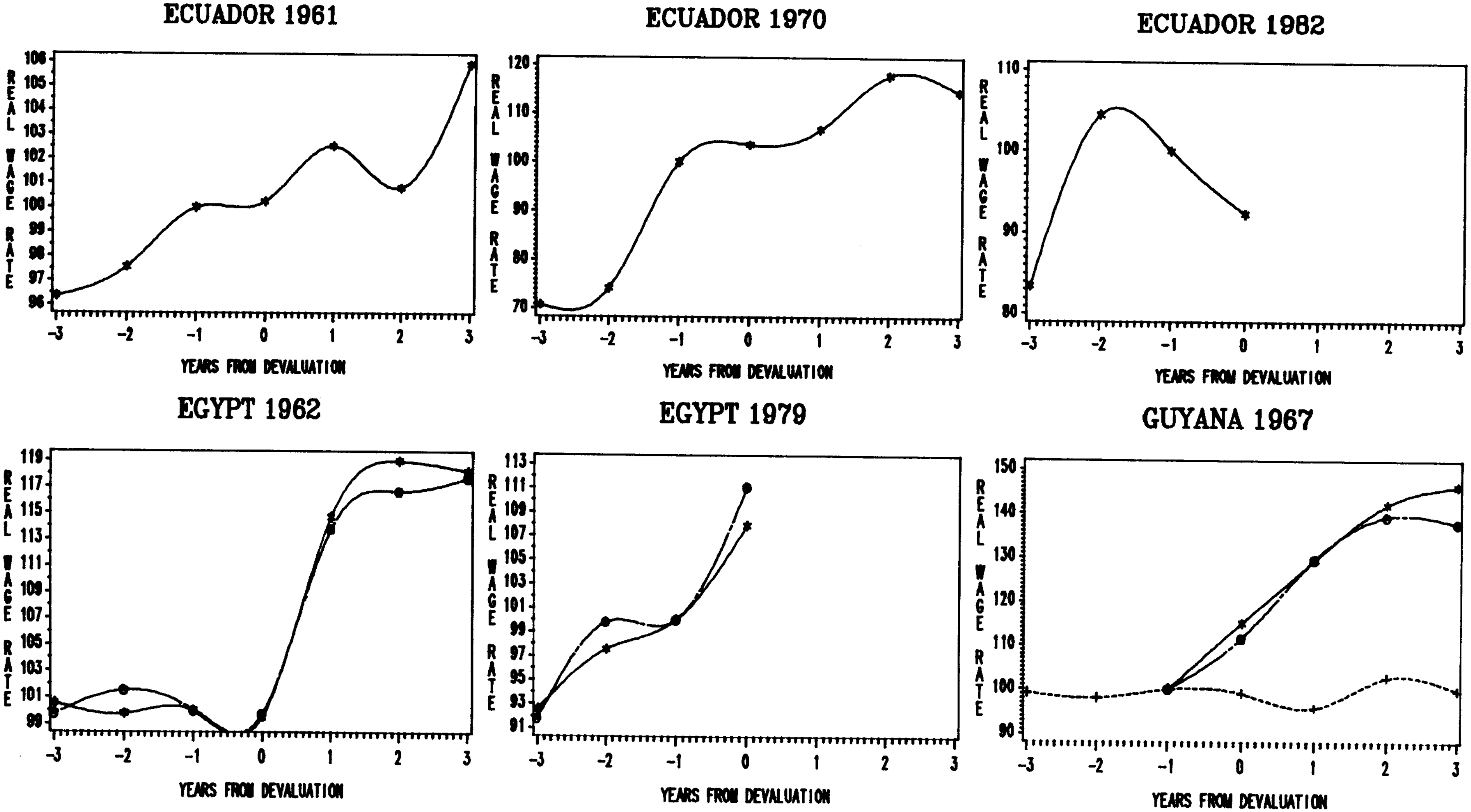
AGRICULTURAL WAGES – (+) MANUFACTURING WAGES – (*) NON–AGRICULTURAL WAGES – (O)

SOURCE: CONSTRUCTED FROM RAW DATA OBTAINED FROM THE I.F.S. AND THE I.L.O.

FIGURE 8.2

REAL WAGE RATES

(YEAR BEFORE DEVALUATION WAGE=100)



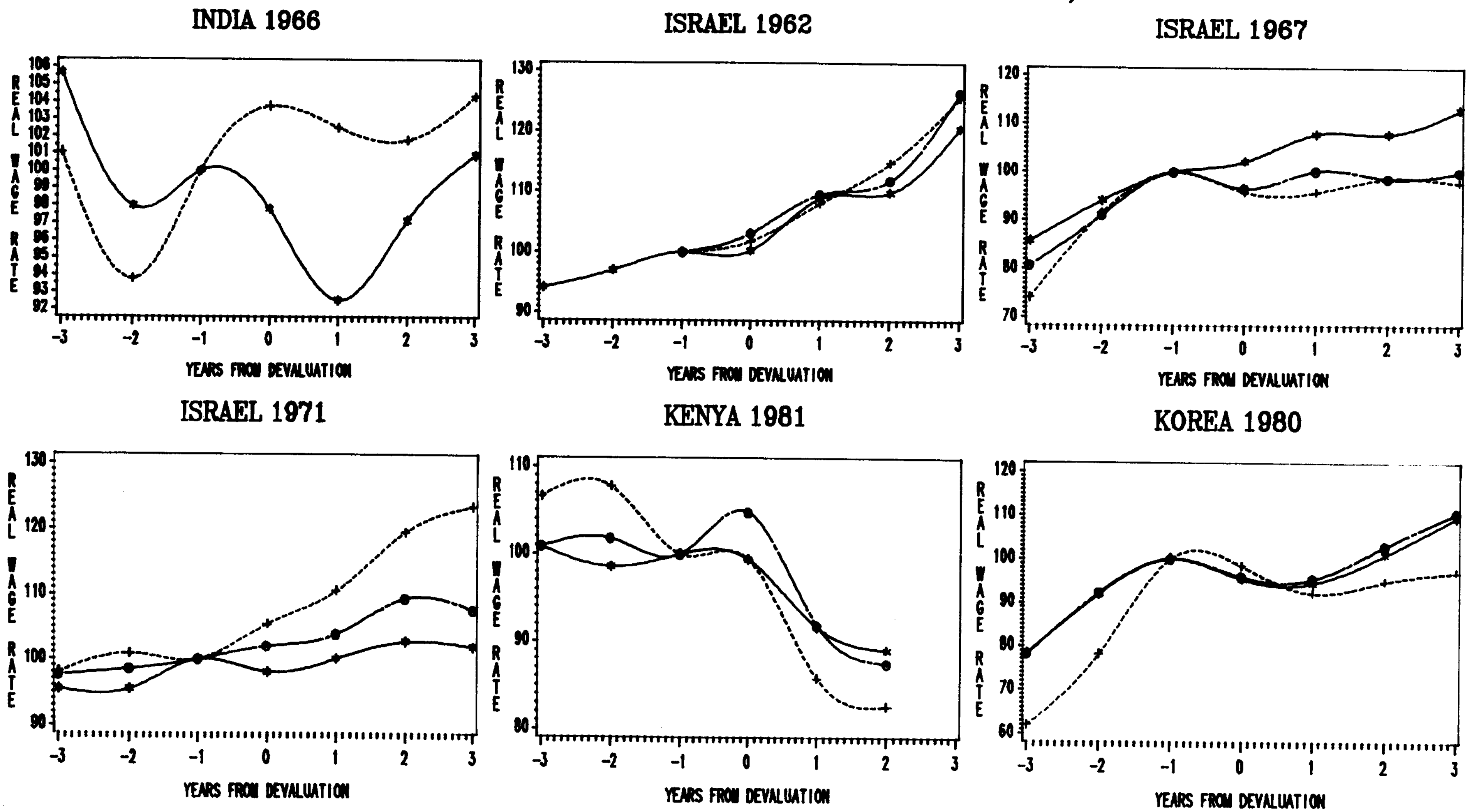
AGRICULTURAL WAGES – (+) MANUFACTURING WAGES – (*) NON–AGRICULTURAL WAGES – (O)

SOURCE: CONSTRUCTED FROM RAW DATA OBTAINED FROM THE I.F.S. AND THE I.L.O.

FIGURE 8.3

REAL WAGE RATES

(YEAR BEFORE DEVALUATION WAGE=100)



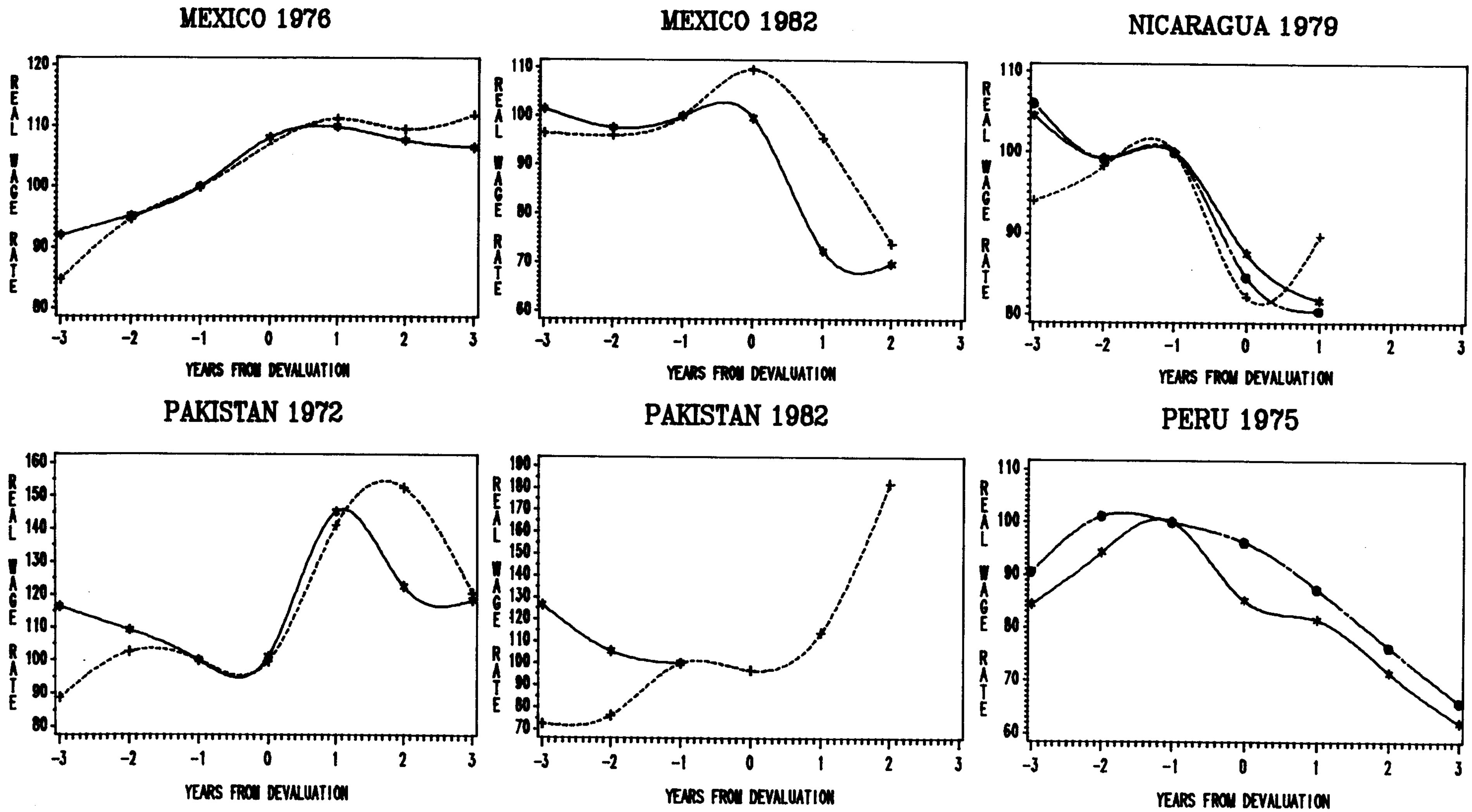
AGRICULTURAL WAGES – (+) MANUFACTURING WAGES – (*) NON–AGRICULTURAL WAGES – (O)

SOURCE: CONSTRUCTED FROM RAW DATA OBTAINED FROM THE I.F.S. AND THE I.L.O.

FIGURE 8.4

REAL WAGE RATES

(YEAR BEFORE DEVALUATION WAGE=100)



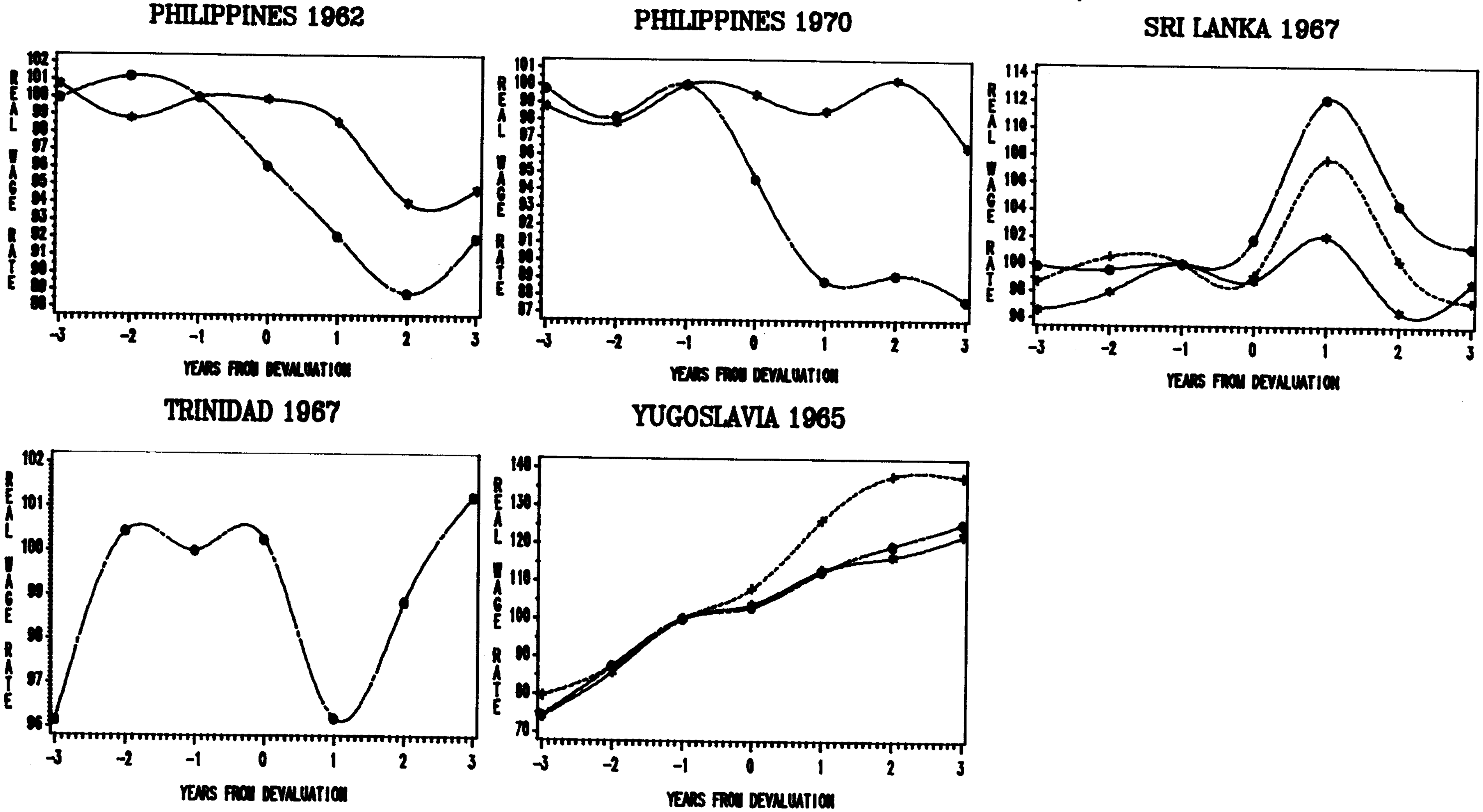
AGRICULTURAL WAGES – (+)   MANUFACTURING WAGES – (*)   NON–AGRICULTURAL WAGES – (O)

SOURCE: CONSTRUCTED FROM RAW DATA OBTAINED FROM THE I.F.S. AND THE I.L.O.

FIGURE 8.5

REAL WAGE RATES

(YEAR BEFORE DEVALUATION WAGE=100)



AGRICULTURAL WAGES – (+) MANUFACTURING WAGES – (*) NON–AGRICULTURAL WAGES – (O)

SOURCE: CONSTRUCTED FROM RAW DATA OBTAINED FROM THE I.F.S. AND THE I.L.O.

devaluations and adjustment packages. The general tendency is for real agricultural wages to decline in a larger number of post-episodes than real manufacturing wages. This dissimilar behavior may be capturing important institutional differences across sectors. While in many countries manufacturing wages tend to be indexed, agricultural wages are usually set in a freer way, being able then, to absorb negative (real) disturbances. Unfortunately there are no cross country data on the extent of wage indexation. This makes the analysis of wage rate behavior somewhat incomplete.

The data on Tables 8.6 through 8.8 are quite revealing. Let's first focus on those countries with large real wage rate increases in the period prior to the crisis. Five out of the 25 countries with available data experienced rates of growth of real manufacturing wages that exceeded 10% per annum during the three years prior to the devaluation -- Chile (12.1% per year), Ecuador, 1970 (12.3%), Ecuador 1982 (11.4%), Korea (15.8%), Peru 1975 (10.8%). All of these countries suffered substantial real appreciations (see Chapter 6, Table 6.2). In the case of Chile, the rapid growth of real wages prior to the devaluation reflected the economic "boom" of the late 1970s; Ecuador's wage rate behavior in the late 1970s and early 1980s was seen as a consequence of the oil-driven growth; the Korean wages responded, at least partially, to productivity increases, while the Peruvian rapid wage evolution was the result of the policies of the populist military government.

In 9 out of the 24 episodes that have data, the manufacturing real wage rate dropped after the crisis below its value in the year before the devaluation. In the case of the non-agricultural sector there was a decline in real wages in 8 out of 15 episodes, whereas for agriculture wages in 10 out of the 20 episodes with data, real wages dropped.

TABLE 8.6

Manufacturing Real Wage Rate Indexes in Devaluing Countries

(Year Prior to Devaluation = 100)

Country	Year	-3 Yrs.	-2 Yrs.	-1 Yr.	Year of Dev.	+1 Yr.	+2 Yrs.	+3 Yrs.
Colombia	1962	n.a.	94.2	100	112.0	117.9	114.1	122.3
Colombia	1965	98.1	103.3	100	107.1	101.6	103.7	108.1
Cyprus	1967	80.5	86.5	100	96.2	98.6	107.9	113.7
Ecuador	1961	96.3	97.5	100	100.2	102.5	100.8	105.8
Ecuador	1970	70.8	74.2	100	103.5	106.7	117.9	114.4
Egypt	1962	100.5	99.7	100	99.5	114.6	118.9	118.1
Egypt	1979	92.5	97.5	100	107.8	n.a.	n.a.	n.a.
Guyana	1967	n.a.	n.a.	100	114.9	129.4	141.9	146.2
India	1966	105.6	97.9	100	97.7	92.5	97.1	100.9
Israel	1962	94.1	96.9	100	100.2	108.9	109.8	120.5
Israel	1967	85.7	94.0	100	102.1	107.8	107.8	112.9
Israel	1971	95.5	95.4	100	98.0	100.1	102.7	101.9
Nicaragua	1979	104.4	99.2	100	87.5	81.7	n.a.	n.a.
Pakistan	1972	116.3	109.2	100	101.2	145.2	122.5	118.4
Philippines	1962	100.7	98.7	100	99.8	98.6	93.9	94.7
Philippines	1970	98.7	97.7	100	99.4	98.5	100.2	96.4
Sri Lanka	1967	96.5	97.9	100	98.8	102.0	96.5	98.6
Yugoslavia	1965	74.0	85.8	100	103.7	112.8	116.5	122.1
Average		94.4	95.7	100	101.7	107.1	109.6	112.2
Chile	1982	78.5	89.1	100	100.4	106.3	103.1	n.a.
Colombia	1967	98.3	105.3	100	102.0	106.3	105.7	115.7

Table 8.6 (cont.)

Country	Year	-3 Yrs.	-2 Yrs.	-1 Yr.	Year of Dev.	+1 Yr.	+2 Yrs.	+3 Yrs.
Ecuador	1982	83.3	104.4	100	92.2	n.a.	n.a.	n.a.
Kenya	1981	100.8	98.5	100	99.4	91.6	88.9	n.a.
Korea	1980	78.3	91.9	100	95.3	94.4	101.0	109.6
Mexico	1976	91.9	95.2	100	108.0	109.8	107.6	106.5
Mexico	1982	101.5	97.5	100	99.5	72.4	69.8	n.a.
Pakistan	1982	126.4	105.5	100	n.a.	n.a.	n.a.	n.a.
Peru	1975	84.3	94.2	100	85.1	81.5	71.5	62.0
Average		93.7	98.0	100	97.8	94.7	92.6	98.5

Source: Constructed from data obtained from the International Labor Office and the International Monetary Fund.

TABLE 8.7

Agricultural Real Wage Rate Indexes in Devaluing Countries

(Year Prior to Devaluation = 100)

Country	Year	-3 Yrs.	-2 Yrs.	-1 Yr.	Year of Dev.	+1 Yr.	+2 Yrs.	+3 Yrs.
Colombia	1962	89.4	95.7	100	109.2	107.4	109.4	109.8
Colombia	1965	99.7	98.1	100	100.3	99.9	95.6	95.2
Costa Rica	1974	95.5	105.1	100	99.2	94.3	108.4	117.6
Cyprus	1967	78.6	65.9	100	117.9	124.0	127.1	139.7
Guyana	1967	99.2	98.0	100	99.0	95.8	102.7	99.8
India	1966	101.0	93.7	100	103.7	102.5	101.7	104.3
Israel	1962	n.a.	n.a.	100	101.8	108.0	114.7	125.5
Israel	1967	74.1	91.5	100	95.8	95.8	98.6	97.7
Israel	1971	98.0	100.9	100	105.3	110.4	119.4	123.3
Nicaragua	1979	93.9	98.2	100	82.2	89.6	n.a.	n.a.
Pakistan	1972	88.6	102.5	100	99.6	141.0	152.5	120.5
Sri Lanka	1967	98.6	100.5	100	99.1	107.7	100.2	97.2
Yugoslavia	1965	79.5	87.3	100	108.0	126.2	137.9	137.5
Average		91.4	94.8	100	101.7	107.9	114.1	114.1
Chile	1982	82.5	83.4	100	101.2	81.4	69.6	n.a.
Colombia	1967	100.0	100.4	100	95.6	95.2	105.7	100.4
Kenya	1981	106.5	107.7	100	99.4	85.8	82.6	n.a.
Korea	1980	61.8	78.0	100	98.3	92.1	94.8	97.0
Mexico	1976	84.7	94.6	100	n.a.	111.2	109.4	111.8
Mexico	1982	96.5	95.9	100	109.5	95.5	73.9	n.a.
Pakistan	1982	72.5	76.3	100	96.8	114.0	181.8	n.a.
Average		86.4	90.9	100	100.2	96.5	102.3	103.1

Source: Constructed from raw data obtained from the International Labor Office and the International Monetary Fund.

TABLE 8.8

Non-Agriculture Real Wage Rate Indexes in Devaluing Countries

(Year Prior to Devaluation = 100)

Country	Year	-3 Yrs.	-2 Yrs.	-1 Yr.	Year of Dev.	+1 Yr.	+2 Yrs.	+3 Yrs.
Cyprus	1967	95.4	96.3	100	103.4	106.3	116.9	126.7
Egypt	1962	99.7	101.5	100	99.7	113.7	116.6	117.6
Egypt	1979	91.7	99.8	100	111.0	n.a.	n.a.	n.a.
Guyana	1967	n.a.	n.a.	100	111.6	129.5	139.2	137.7
Israel	1962	n.a.	n.a.	100	103.1	109.5	111.8	126.4
Israel	1967	80.7	91.1	100	96.5	100.2	98.6	100.1
Israel	1971	97.5	98.5	100	102.0	103.8	109.3	107.5
Nicaragua	1979	106.0	99.2	100	84.6	80.5	n.a.	n.a.
Philippines	1962	99.9	101.1	100	96.0	92.0	88.8	91.9
Philippines	1970	99.7	98.1	100	94.6	88.8	89.1	87.6
Sri Lanka	1967	99.8	99.5	100	101.8	112.1	104.4	101.3
Trinidad	1967	96.1	100.4	100	100.2	96.2	98.8	101.2
Yugoslavia	1965	74.4	87.4	100	103.1	112.5	119.5	125.2
Average		94.7	97.6	100	100.6	103.8	108.5	111.2
Kenya	1981	100.8	101.7	100	104.7	91.8	87.4	n.a.
Korea	1980	78.1	92.1	100	95.8	95.4	102.9	110.5
Peru	1975	90.5	101.1	100	96.2	87.3	76.3	65.8
Average		89.1	98.4	100	98.9	91.5	88.9	88.2

Source: Constructed from data obtained from the International Labor Office and the International Monetary Fund.

Some countries experienced both a decline in real GDP and a reduction in at least some of the indexes of real wages in the period following the devaluation and stabilization programs: Chile 1982, Ecuador 1982, Korea 1980, Mexico 1982, and Nicaragua 1979.

Although the data in these tables and figures do not provide conclusive evidence, they do suggest quite strongly that stabilization packages that include large devaluations as one of their components have been historically associated with fairly generalized declines in real wages. In many ways this is not too surprising given the observed increase in real wages prior to the devaluation and the close relation between real exchange rate movements and real wages established in equations (8.28) and (8.29).

It should be noticed, however, that the historical evidence indicates that reductions in real wages do not appear to be either a necessary nor sufficient condition for a successful devaluation. For example, one of the most unsuccessful episodes, Peru 1975, was followed by a massive drop in real wages. On the other hand the Pakistan devaluation of 1972, a successful episode, was followed by an important increase in wages in the short run. In spite of these exceptions, the evidence reported in these tables is consistent with the hypothesis that successful devaluations require in the short run restraint in wage behavior. There is no doubt, however, that a full understanding of the important question of the effects of devaluations on real wages requires additional empirical research, including (and perhaps more importantly) generating the appropriate data.

Labor Share of GDP

Table 8.9 contains the evolution of labor's share in GDP in the period surrounding the crises for those episodes that have the appropriate data. These figures provide another useful piece of information in our attempt to

TABLE 8.9

Devaluations and Income Distribution

(percentage of compensation to employees with respect to GDP)

	Year of Devaluation	-4	-3	-2	-1	Dev. Yr. 0	+1	+2	+3
Argentina	1970	40	41	40	40	41	42	39	43
Bolivia	1972	37	37	34	36	35	32	30	33
	1979	33	34	35	35	36	36	n.a.	n.a.
	1982	35	36	36	n.a	n.a.	n.a.	n.a.	n.a.
Chile	1982	39	36	38	40	n.a.	n.a.	n.a.	n.a.
Colombia	1962	n.a.	n.a.	34	36	38	38	36	37
	1965	36	38	38	36	37	36	37	36
	1967	38	36	37	36	37	36	38	38
Costa Rica	1974	47	48	48	45	45	46	47	45
Cyprus[1]	1967	87	87	88	87	88	88	88	88
Ecuador	1961	n.a.	n.a.	n.a.	28	29	29	29	28
	1970	27	27	28	28	29	30	28	26
	1982	28	28	32	30	29	n.a.	n.a.	n.a.
Egypt[2]	1962	n.a.	n.a.	39	41	42	42	40	41
	1979	46	39	38	37	33	34	n.a.	n.a.
Guyana	1967	47	47	48	49	49	49	48	49
India	1966	73	72	74	72	74	77	75	74
Indonesia[1]	1978	89	89	89	89	89	89	90	90
Israel	1962	n.a.	n.a.	44	44	44	44	45	48
	1967	44	45	48	50	50	46	44	47
	1971	50	46	44	47	46	43	45	43
Jamaica	1967	50	50	50	46	47	48	49	50
	1978	54	56	57	56	52	51	51	53
Kenya	1981	32	34	35	35	n.a.	n.a.	n.a.	n.a.
Korea	1980	32	33	37	36	37	35	38	
Malta	1967	49	50	49	47	47	47	47	50

Table 8.9 (cont.)

	Year	-4	-3	-2	-1	Dev. Yr. 0	+1	+2	+3
Mexico	1976	37	36	37	38	40	39	38	38
	1982	38	38	36	37	36	n.a.	n.a.	n.a.
Nicaragua	1979	54	55	54	56	n.a.	n.a.	n.a.	n.a.
Pakistan[1]	1972	87	81	84	85	85	86	88	86
	1982	86	84	83	84	84	n.a.	n.a.	n.a.
Peru	1975	36	38	39	37	37	37	37	32
Philippines[1]	1962	n.a.	n.a.	88	87	87	86	86	86
	1970	86	86	86	86	84	83	83	82
Sri Lanka	1967	45	41	43	42	41	41	39	36
Venezuela	1964	45	45	42	43	43	43	44	45

[1](Compensation to employees + operating surplus)/GDP.

[2]Year beginning July 1.

Source: United Nations, Yearbook of National Accounts Statistics.

solve the jigsaw puzzle of devaluations and income distribution. The main characteristic that emerges from these data is that for most countries labor shares move very slowly through time, making the analysis of the effects of devaluations in factoral distribution of income rather difficult. For this reason in this section we compare the average for the four years prior to the crisis with the four years average comprised by the year of the devaluation and the three years that follow. In this comparison we have arbitrarily defined a significant change in the labor share as any movement that exceeds, either up or down, 1.5 percentage points.

Using this criterion the data from Table 8.9 show that in 15 out of 31 episodes there were no significant changes in income distribution in the period surrounding the devaluations; in 9 out of 31 cases there is a worsening in income distribution -- Bolivia 1972, Egypt 1979, Israel 1971, Jamaica 1967, Jamaica 1978, Peru 1975, Philippines 1962 and 1970, and Sri Lanka 1961; and in 7 out of the 31 episodes there were significant gains in the labor share of GDP -- Bolivia 1979, Colombia 1962, Egypt 1962, India 1966, Korea 1980, Mexico 1976, Pakistan 1972.

These findings are remarkably inconclusive, indicating that, from a historical point of view, and given the available information, it is not possible to make sweeping statements regarding the relation between devaluations and income distribution. Again, this analysis clearly suggests that an improvement of our knowledge on these important matters will not only require additional analysis but, more importantly, the construction of appropriate data.

An important loose end refers to making these findings regarding labor shares consistent with the previous results related to real wages and real output behavior. The share of labor on GDP (s) is defined as: $s = wL/y$, where w is real wage, L employment and y real GDP. Percentage changes in the labor share are then equal to $\hat{s} = \hat{w} + \hat{L} - \hat{y}$, where as before the $(\hat{\ })$ operators denotes percentage change. Once we recognize that changes in employment $(\hat{L})$ -- which we have not analyzed -- play a very crucial role in the adjustment, all our previous analysis -- which dealt with $\hat{s}$, $\hat{w}$ and $\hat{y}$ -- can be perfectly consistent.

APPENDIX 8-A

Real Output: Was defined as real GDP, and the data were taken from line 99b.p of the IFS.

Nominal Money: A broad definition (M2) of money was used. Average yearly values constructed from data obtained from IFS were used.

Fiscal Deficit: Data from line 80 of IFS were used.

Terms of Trade: Defined as the relative price of exports to imports; taken from the IFS supplement on international trade statistics.

Real Exchange Rate: Defined as the relative price of tradables to nontradables. This variable was proxied by a real exchange rate index constructed as the nominal exchange rate with respect to the U.S. dollar times the ratio of the U.S. WPI index to the domestic CPI index.

Government Expenditure: Defined as current government expenditure and taken from line 91f of the IFS.

Footnotes

[1]The developing countries' reluctance to devalue their currencies even when facing major external disequilibria has been documented many times. See, for example, Krueger (1978). See also The Economist (1986).

[2]However, a problem with Cooper's analysis is that he doesn't give any information on what happened to the Finance Ministers of those countries that did not devalue!

[3]This proposition has come to be known as the "contractionary devaluation" problem. See Diaz Alejandro (1965), van Wijnbergen (1986) and Edwards (1986).

[4]Sachs (1988) has argued that there has been little interest on behalf of the multilateral agencies, and in particular the IMF, to deal with the income distribution ramifications of devaluations.

[5]It should be noted that the model developed here has some limitations when compared to that of Chapter 3. First the current model is not dynamic, and second, it has a much simplified financial sector.

[6]Adding imported intermediate inputs to the importables and exportables production process would complicate the algebra without adding much substance to the analysis.

[7]As usual, the stability condition is found by analyzing the behavior of an expression for the dynamics of the price of home goods, $\dot{P}_N = b(N^d - N^s)$.

[8]After log differentiating (10) and plugging in the expressions for $\hat{N}$, $\hat{X}$ and $\hat{M}$ an equation for $\hat{g}$ is derived. The integration of this expression yields equation (8.20), where constant combines all the constants of integration.

[9]See, for example, Barro (1977), Hanson (1980) and Edwards (1983). Barro (1977) discusses the assumptions implicit in the use of residuals as proxies for money growth surprises.

[10]For each individual country, the following money creation equation was estimated:

$$\Delta \log M_t = a_o + a_1 \Delta \log M_{t-1} + a_2 \Delta \log M_{t-2} + a_o \Delta \log M_{t-3} + a_4 DEH_t + \mu_t$$

where M_t is broadly defined (M2) nominal money, DEH_t is the fiscal deficit term and μ_t is a white noise term. In all cases the fits were quite good. In 10 of the 12 cases the coefficients of the fiscal deficit term DEH_t are positive as expected. However, in only four cases -- Greece, Israel, Brazil and Colombia -- this coefficient is significant at conventional levels. The approach followed here has well-known shortcomings, including the fact that by using data on all the sample to generate the money creation equation parameters too much information is being considered (Barro, 1977). In the present case, however, the lack of long enough data series makes the use of rolling regressions or similar procedures impossible. As in much of this literature, the equations reported here are subject to the problems stemming from using generated regressors (see Pagan (1984, 1986)).

[11]Since the number of time series observations were not the same for each country, it was not possible to estimate these equations using a random coefficient procedure. However, when some observations were dropped and the Fuller-Batesse (1974) procedure was used, results very similar to those reported here were obtained.

[12]The instruments used included: DEH; logGCGDP, logGCGDP_{t-1}, logGCGDP_{t-2}; lagged, twice lagged and three times lagged real exchange rate;

EXCRE, $EXCRE_{t-1}$; nominal devaluation, lagged, twice lagged and three times lagged nominal devaluations; money surprises, lagged, twice and three times lagged money surprises; country specific dummy variables; country specific time; growth in domestic credit, lagged, twice, and three times lagged growth in domestic credit; logTOT, $logTOT_{t-1}$, $logTOT_{t-2}$, $logTOT_{t-3}$; lagged, twice and three times lagged capital flows ratio; lagged and twice lagged real GDP; lagged parallel market premium; lagged and twice lagged parallel market nominal exchange rate. As in Chapter 5 a test was performed to analyze whether it was appropriate to pool these 12 countries. The results obtained suggest that indeed the two groups described in Chapter 5 can be pooled for the estimation of these output equations. The F-statistics ranged from 1.55 to 2.35.

[13]This contrasts with Edwards (1986a) who found that a short run contractionary effect was fully reverted after one year. A possible explanation for this discrepancy that in the current study we are using a much longer data set that covers up to the mid-1980s, and thus captures the effects of devaluations on the domestic currency (real) value of the foreign debt.

[14]This is a much more controversial statement than what it may appear at first. In fact, it is not that easy to generate that kind of result with standard neoclassical equilibrium growth models. The problem, of course, relates to the difference between <u>levels</u> and <u>rates of growth</u>. See Lucas (1987).

[15]Since BMPR is only a proxy for our ideal distortions index it was treated as a variable measured with errors and the instruments listed in footnote 12 were used in our two stages regressions.