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Real exchange rates and economic growth in developing countries: Is devaluation contractionary?

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Real Exchange Rates and Economic Growth
in Developing Countries

- Is Devaluation Contractionary? -

by

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I. The Failure of Economic Adjustment Programs

The principal objectives of economic adjustment programs, frequently supported by the International Monetary Fund, are to restore a viable balance-of-payments situation, to contain inflation, to remove distortions in relative prices, and thereby to enhance the overall growth prospects of Third World economies. However, recent reviews on the macroeconomic effects of IMF adjustment programs point to an only limited success in these respects. Khan [1988] summarizes the experiences of 67 developing countries with IMF programs during 1973-1986 as follows: "In the short run programs have led to an improvement in the current account, the balance of payments, and inflation, but this was accompanied by a decline in the growth rate. In the longer run the positive effects of programs on the external balance and inflation are strengthened, and the adverse growth effects reduced" (p. I). The notion of growth-oriented adjustment appears to be an euphemism if the program costs in terms of low growth rates are basically "in line with the predictions of the theoretical models that underlie the design of Fund programs" (ibid, p. 26; for the model applied, see IMF [1987]).

It is thus not surprising that IMF adjustment programs have been increasingly attacked for doing little in improving the economic malaise of many developing countries, or even worsening their situation [e.g. Killick, 1984; Taylor, 1981]. However, it remains open to question which of the principal elements of IMF programs - domestic credit restraint, public deficit reduction, and devaluation¹ - is to be blamed for the failure of growth-oriented adjustment. Most notably, it has to be clarified whether not only restrictive monetary and fiscal policies are growth-reducing in the short run, but that devaluation is contractionary as well.

¹ Besides monetary, fiscal and exchange-rate policies, IMF programs frequently call for producer price increases, trade liberalization, and the removal of distortions in factor markets. The latter measures are not considered in the following since their economic rationale and growth-enhancing effects in the longer run are hardly to be disputed.

Actually, exchange-rate policies are most controversially discussed in the literature. Since the publication of the influential paper by Krugman and Taylor [1978], the traditionally dominant view has been increasingly challenged, i.e., that the substitution effects engendered by a real devaluation are sufficiently strong to assure an expansionary net effect on output and employment.

The ongoing debate is based on a bewildering array of theoretical frameworks [for a recent overview, see Lizondo, Montiel, 1988]. Interestingly enough, the theoretical debate has induced only few empirical studies on the growth effects of real devaluation in developing countries [for a notable exception, see Edwards, 1985a]. Empirical research is all the more so required as many models leading to "'queer cases' from the view point of traditional theory" are characterized by "odd assumptions about 'substitutability' in production or consumption" [Lal, 1989, p. 291].¹ This paper is intended to narrow the gap in empirical analysis. The remainder is organized as follows. Section II summarizes the current debate on the role of exchange-rate policies in economic adjustment. Section III provides the framework for testing the economic-growth effects of real devaluation, and presents empirical results for the 1982-1987 period. Some policy conclusions are drawn in Section IV.

¹ Cline [1983] provides a compendium of strange assumptions and the evidence against them. Especially in Keynesian models relative prices play little role due to the typical assumption of little if any substitution in production and consumption. By contrast, changes in real exchange rates are ruled out in some monetarist models that take the law of one price as given and assume perfect substitution between tradables and non-tradables.

II. The Role of Exchange-Rate Policies

1. The Current Theoretical Debate

Economic adjustment programs for developing countries generally focus on reducing domestic absorption through restrictive monetary and fiscal policies, as well as on expenditure switching (i.e., increased production of tradables) through a devaluation of the domestic currency. According to traditional theory, a nominal devaluation results in higher output if there is unutilized capacity and the law of one price does not hold. Both conditions are typically met in a developing country context:

- The degree of capacity utilization is frequently below 50 per cent in Third World economies [Bautista et al., 1981]. Hence, it is highly unlikely that nominal devaluation is translated into an equiproportional increase in prices so that the real exchange rate does not change.
- The hypothesis "that arbitrage quickly equates goods prices internationally has probably been rejected more decisively by empirical evidence than any other hypothesis in the history of economics" [Williamson, 1983, p. 201]. In fact, persistent deviations of the index of international competitiveness¹ from unity are to be observed in developing countries [Balassa, 1987; Edwards, Ng, 1985]. So, devaluation leads to an increase in relative prices between tradables and non-tradables and thereby encourages expenditure switching.

However, the traditional view that devaluation-induced expenditure switching provides an important stimulus to economic growth has come under serious attack. Various theoretical arguments are advanced that point to contractionary effects of devaluations.² Earlier studies mainly refer to adverse demand effects. The re-

¹ This index is calculated by adjusting the nominal exchange-rate index for changes in the price of tradables in foreign countries vis-à-vis the domestic economy.

² The following summary draws partly on Lizondo, Montiel [1988] and Edwards [1985a].

distribution of income in favour of profits and at the expense of wages, supposed to follow a devaluation, may depress economic activity because of the higher marginal propensity to consume of wage earners [Diaz Alejandro, 1963; Krugman, Taylor, 1978]. Aggregate demand and output may also be reduced because of a negative real balance effect (Pigou effect), since devaluation is likely to result in a higher domestic price level [e.g. Guitian, 1976; Gylfason, Schmid, 1983; Hanson, 1983; Islam, 1984; Buffie, 1986a]. Assuming low price elasticities of imports and exports, devaluation may also worsen the trade balance in domestic currency, thereby generating a recessionary effect on aggregate output [Krugman, Taylor, 1978].

Moreover, aggregate demand is expected to decline if devaluation results in higher domestic interest rates [Lizondo, Montiel, 1988, pp. 24ff.].¹ The effects of an anticipated future devaluation are shown to be clearly interest-rate increasing. Contractionary effects of an unanticipated current devaluation are likely unless domestic loans and foreign assets are regarded as perfect substitutes by households: Unanticipated devaluation is expected to raise real working-capital requirements by inducing increases in nominal wages and the domestic-currency price of tradables; hence, the real excess demand for loans and domestic interest rates will rise.

Recently, Reisen [1988] has stressed the negative fiscal implications of devaluation in the presence of a large public foreign currency debt.² Rising fiscal imbalances may require (additional) expenditure cutting, induce higher inflation, thereby adding to

¹ The expected inflation component of interest rates is treated as exogenous. So, the focus is on the effects of devaluation on the nominal interest rate in the following.

² By contrast, Gylfason, Risager [1984], van Wijnbergen [1986], and Edwards [1986] treat external debt as private sector obligations. A real devaluation then increases the real value of private interest obligations and affects private wealth (of which external debt is a negative component) negatively. Both effects reduce private demand for domestic output.

the Pigou effect, or lead to (further) crowding out of private investors in domestic financial markets.

Various supply-side effects are discussed that may add to the contractionary effects of devaluation. An upward shift in the supply curve for domestically produced goods is expected from higher prices of factors of production, especially from an increase in nominal wages, higher costs for imported inputs, and higher working-capital costs. In many models, devaluation-induced wage increases result from indexation, i.e., nominal wages are assumed to be proportional to some current price index [e.g. Branson, 1986; Edwards, 1986; van Wijnbergen, 1986]. Moreover, devaluation causes the price of imported inputs to increase by the same percentage as the exchange rate. The magnitude of the increase in production costs depends on the extent to which other factor costs respond to the devaluation and on the degree of substitution between different factors of production. Contractionary effects on domestic supply may also result from a devaluation-induced increase in financing costs for labour and imported inputs [Taylor, 1981; van Wijnbergen, 1983]. Higher costs of working capital are mainly attributed to the rise in loan-interest rates that may follow a devaluation.

Notwithstanding the multitude of theoretical arguments that point to contractionary effects of a devaluation, the impact of a devaluation on real output remains ambiguous on analytical grounds. This is because most of the models referred to above are based on fairly restrictive assumptions and frequently ignore counter-vailing effects. The following shortcomings figure prominently [for a detailed analysis, see Lizondo, Montiel, 1988]:

- Substitution effects in domestic consumption due to the increase in relative prices between tradables and non-tradables are sometimes simply excluded, e.g. by assuming that consumers demand only non-tradables [Krugman, Taylor, 1978].
- Similarly, real income and demand effects of devaluation through price increases for imported inputs are no longer

strictly negative if substitution in production between labour and imported inputs is allowed for (substitution in production is ignored e.g. in Krugman, Taylor [1978]).

- The discussion on income-distribution effects is largely confined to the distribution between labour and capital. The impact on aggregate demand becomes ambiguous once the redistribution from the factors of production engaged in purely domestic industries to those engaged in export and import-competing industries is recognized [e.g. Cooper, 1971]. In a Heckscher-Ohlin context, a real devaluation raises the income share of the factors used intensively in the production of tradables and is at the expense of other factors. The overall demand effects are difficult to predict.¹
- The Tanzi effect [Tanzi, 1977] is only rarely considered in the debate on contractionary devaluations. Due to lags in tax collection or in adjusting the nominal value of specific taxes, the real tax burden may be reduced by devaluation-induced price increases. This effect may cause an expansionary impact of devaluation on aggregate demand in the short run.
- The demand-reducing Pigou effect may be outweighed by wealth-increasing effects of a devaluation, e.g. if the private sector holds foreign currency denominated assets (whose nominal value in domestic currency increases after a devaluation).
- Most models on contractionary devaluations apply a framework without capital accumulation [e.g. Krugman, Taylor, 1978]. Other authors expect that investments that require imports of capital goods are discouraged by real devaluation [Branson, 1986; Buffie, 1986b]. However, Lizondo and Montiel [1988, pp. 21ff.] show that real depreciation lowers the real supply price of capital measured in terms of output in the traded goods

¹ Edwards [1987] presents empirical evidence for 31 devaluation episodes: Income distribution did not change significantly in 15 cases; in 9 (7) cases the share of labour in GDP declined (increased).

sector. Investment is then stimulated in this sector.¹

- Lizondo and Montiel [1988] also show that the impact of devaluation on nominal wages, and thereby on the supply of domestically produced goods, can only be assessed adequately if labour markets are modelled explicitly. In the absence of perfect wage indexation, the nominal wage must not increase necessarily after a devaluation.

All in all, the theoretical debate on the economic-growth effects of devaluation is still unsettled. What is evident from the above presentation, however, is that the arguments pointing to contractionary effects of devaluation are frequently derived from rather strange assumptions. Therefore, empirical research is urgently required.

2. The Poor State of Empirical Research

In spite of the lively theoretical discussion on the growth effects of devaluation, the empirical evidence is still extremely sketchy. Moreover, most of the empirical investigations suffer from serious shortcomings. Many studies address the topic simply by portraying the economic-growth performance of developing countries after devaluations took place. Cooper [1971] considers 24 devaluation episodes during 1953-1966. The analysis of the development of major components of aggregate demand leads him to conclude that initially devaluation tended to depress economic activity. By contrast, Krueger [1978] finds that devaluations were associated with improved growth performance in most cases. The evidence presented by Edwards [1985b] is mixed: Real growth of GDP declined in 10 out of 30 cases in the period immediately

¹ An ambiguous effect on total investment also results from the change in product wages once nominal wages are flexible to some extent. Product wages decrease (increase) in the traded (non-traded) goods sector after a devaluation. Hence, investment is stimulated (discouraged) in the former (latter) sector. The likelihood that total investment increases is higher if capital is sector specific; in this case higher investment demand in the traded goods sector can only be met out of new production.

following the devaluation. Mixed results are also achieved by studies that investigate the growth performance of developing countries after devaluations were undertaken in the context of IMF adjustment programs [for an overview on the extensive literature, see Khan, 1988]. The growth impact of IMF programs that typically involve a devaluation remains ambiguous, with the studies indicating an improvement or no significant change in economic growth being balanced by those showing a deterioration in the short run.

The "before-and-after" approach applied in the above studies is subject to serious drawbacks so that the devaluation-induced growth effects cannot be assessed adequately. Most importantly, other factors that influence the growth performance are not controlled for. A decline in GDP growth may be due to external factors, e.g. worldwide recession or deteriorating terms of trade, rather than to devaluation. The evaluation of IMF programs does not yield unbiased results whenever non-program determinants of growth change between the pre-program period and the post-program period [Khan, 1988, p. 5]. Frequently, not the effects of devaluation per se are assessed, but rather the combined effects of adjustment packages which also include restrictive macroeconomic policies [Balassa, 1987, pp. 209ff.]. Moreover, lower growth rates in the period when a devaluation takes place need not be the result of devaluation, but may indicate that devaluations are undertaken when output is below the trend.¹

Other studies try to avoid these shortcomings by constructing simulation models. A decline in output following a devaluation is obtained by Gylfason and Risager [1984] for five out of eight developing countries, and by Gylfason and Radetzki [1985] for ten out of twelve least developed economies. Different results are reported from country-specific simulation exercises. Branson [1986] concludes that devaluation had a significantly negative

¹ This selectivity bias may also lead to a spurious positive correlation between devaluation and higher economic growth in the subsequent periods provided that growth would have recovered anyway [Connolly, 1983].

impact on economic growth in Kenya. By contrast, Taylor and Rosenzweig [1984] find devaluations to be growth-enhancing in Thailand. Generally, the outcome of the simulation models critically depends on the imputed parameter values. For example, a built-in bias towards contractionary devaluation may be simply due to "inadequate allowance for increases in exports and decreases in imports following a devaluation" [Balassa, 1987, p. 210], e.g. by assuming very low price elasticities for exports and low elasticities of substitution between labour and imported inputs.

Principally, it appears to be more promising to subject a reduced form equation on the growth impact of devaluation to regression analysis. Only few studies have followed this avenue, of which Edwards [1985a; 1989a] and Khan [1988] stand out. By definition this approach does not allow to establish whether there are different, i.e., contractionary and expansionary, effects of devaluation working through various channels; the coefficient of the exchange-rate variable only captures the net growth impact of devaluation. But this approach does not require arbitrary assumptions on crucially important parameter values. Moreover, it is easily possible to control for the growth impact of external factors, such as changes in the terms of trade, and of internal policy measures other than currency realignments.

In their pooled time-series cross-country analyses for 1965-1980 (Edwards)¹ and 1973-1986 (Khan) both authors account for policy variables other than exchange-rate policies as well as for external terms-of-trade shocks.² Different results are achieved for the exchange-rate variable. It turns out to be completely insignificant for the fairly large sample analysed by Khan, con-

¹ Recently, Edwards has extended the period to 1965-1984 [Edwards, 1989a, pp. 324ff.]. In the following, we refer to the earlier results if not otherwise indicated.

² Strictly speaking, the real exchange rate is not a policy variable. As argued above, however, nominal devaluations of developing countries are likely to result in real devaluations in the short run.

sisting of 67 developing countries that had upper credit tranche arrangements with the IMF.¹ By contrast, the coefficient of the contemporaneous real exchange rate is significantly negative in Edwards' analysis of twelve developing economies, while the coefficient of the once lagged real exchange-rate term is significantly positive.² The author concludes [1985a, p. 12]: "These results provide statistical support to the view that in the short run devaluations have a contractionary effect on aggregate output. Also, these findings indicate that this short-term contractionary effect is later reversed, with after one year the devaluation having an expansionary influence on output. Moreover, according to these results the contemporaneous and lagged effects of the (real) devaluation cancel themselves".³

Notwithstanding the considerable progress in terms of adequate methodology, the analyses by Edwards and Khan may be challenged on several grounds. First, problems of multicollinearity are not discussed in either of the two studies, although they may lead to seriously biased coefficient values. In Khan's analysis, the specific elements of IMF adjustment programs and the program dummy enter the regressions simultaneously. Consequently, the

¹ Among the policy variables considered (change in domestic credit, the exchange rate, and the ratio of the fiscal balance to GDP), only the latter proves to be significant in the growth equation. A program-dummy variable, which is set as "1" when an IMF program was in effect, turns out to be significantly negative.

² In contrast to our approach to be presented in Section III.1, an increase in the exchange-rate term represents a real devaluation in the definition of Edwards. As concerns the other policy variables, Edwards finds unanticipated money growth to be positively related with the level of real activity; the coefficient of the ratio of government expenditure to nominal income turns out to be significantly positive as well.

³ For the extended period of 1965-1984, the coefficients of the lagged exchange-rate variable remain insignificant, suggesting that the short-run negative effect of devaluation on real GDP is not reverted as time passes [Edwards, 1989a, pp. 327ff.]. This discrepancy between the recent and earlier results is explained by referring to the adverse effects of devaluation on the domestic currency value of huge foreign debts that had been accumulated until the mid-1980s.

dummy variable may capture the devaluation impact and thus render the coefficient of the exchange-rate variable insignificant. Edwards' results may be distorted due to the simultaneous inclusion of current and lagged values for the same variables (money surprises, terms of trade, and exchange rates) which may be highly correlated. A high partial correlation is also likely between the terms-of-trade variable¹ and the exchange-rate variable which is defined as the relative price of tradables to non-tradables.

Second, the negative correlation between changes in the exchange rate and real output in the year of the devaluation may result from a selectivity bias if devaluations are undertaken in periods of low growth. The distortions which may arise from the selectivity bias are reduced in Khan's analysis by introducing a lagged growth variable on the right-hand side of the equation.

Third, the growth effects of devaluation can be expected to differ between various groups of developing countries. The large sample of 67 countries considered by Khan consists of an extremely heterogeneous set of developing economies, e.g. in terms of income level, development strategies, and production and export structures. Such structural divergencies cannot be adequately controlled for by introducing country-specific (shift) dummies which only allow for inter-country differences in the dependent growth variable. A different growth impact of devaluation between various country groups, e.g. agricultural exporters and exporters of manufactures, may cancel out and result in the insignificant coefficient of the exchange-rate variable. By contrast, the results presented by Edwards are likely to be biased, since the group of twelve countries mainly consists of fairly

¹ In both papers, the ratio of export prices to import prices is supposed to capture the growth effects of external factors that are outside the control of the devaluating country. However, the relevance of changes in the terms of trade crucially depends on the degree of openness of the country in question. Hence, external shocks should be quantified in terms of their balance-of-payments impact (see Section III.1).

advanced economies with a diversified manufactured export structure.¹ Low-income exporters of raw materials are underrepresented. The same applies to heavily indebted Latin American countries. So, the results cannot be generalized.

Fourth, the findings for the 1960s and 1970s can not necessarily be transferred to the 1980s. Exchange-rate policies may have become much more important for highly indebted developing countries to which external finance is no longer available. The reversal of international capital flows between developed and developing economies since 1982 has generated a built-in tendency towards devaluation of the latter countries' currencies. Moreover, the Bretton Woods system was still in operation during much of the period considered by Edwards. The majority of countries had pegged their currencies to the US dollar, and exchange-rate fluctuations were relatively moderate. Higher fluctuations in exchange-rate indices in the post-Bretton Woods era² may significantly affect the growth impact of devaluation. Theoretically it is well established that high uncertainty about real exchange-rate developments has negative effects on economic performance [Willett, 1986]. There is also some empirical evidence on a negative relation between real exchange-rate instability and economic growth [Edwards, 1989b, pp. 39ff.]. Hence, contractionary growth effects indicated by the coefficient of the exchange-rate variable may be attributed to higher exchange-rate fluctuations rather than devaluation per se.

All in all, the above discussion highlights the need to improve the current state of empirical research on the growth impact of devaluation. In the following, we basically apply the analytical framework suggested by Edwards [1985a] and Khan [1988]. The conceptual improvements presented in the subsequent section are

¹ The countries included are: India, Malaysia, Philippines, Sri Lanka, Thailand, Greece, Israel, Brazil, Colombia, El Salvador, South Africa, and Yugoslavia.

² In a recent paper, Edwards [1989b] shows that in 29 out of 33 developing countries the real effective exchange rate was significantly more volatile during 1972-1985 than before.

intended to overcome the still prevailing shortcomings of previous analyses, which may lead to seriously biased results. Most notably, it is hypothesized that the direction, the degree and the lag structure of the growth impact of devaluation are not the same for different developing country groups. They are supposed to depend on various structural characteristics of Third World economies, e.g. their development strategies, production and export structures, their foreign debt status, the level and development of per-capita income, and the degree of exchange-rate fluctuations.

III. The Impact of Real Exchange Rates on Economic Growth

1. The Test Format

The basic equation to be estimated below is of the form:

$$(1) Y = a + bR + cEGDP + dUOG + eTOT + fDY$$

The dependent variable Y represents annual real growth of GDP per capita, as published in UNCTAD [1988]. R denotes annual changes in the real effective exchange rate. The calculation is based on IMF data on nominal exchange rates (partner countries' currencies per unit of domestic currencies of sample countries) and consumer prices [IMF, b]¹. A negative R denotes a real devaluation. So, a positive sign of the coefficient b is to be expected if devaluation is contractionary.

The remaining variables are introduced to control for other economic policy measures (EGDP, UOG), the growth impact of external shocks (TOT), and pre-devaluation differences in economic growth (DY). The definition of these variables is as follows: EGDP represents the percentage share of government expenditure in GDP, as given in IMF [b]. If restrictive fiscal policies affect eco-

¹ Trade weights refer to the shares in world trade and are calculated from IMF [a; b]; for the formula applied and its economic justification, see Fischer, Spindler [1986, pp. 83ff.].

economic growth negatively in the short run, the coefficient c should be negative.¹ UOG indicates monetary surprise shocks. The unanticipated annual change in money supply is calculated in two steps [data from IMF, b]: (1) The expected development of money supply is derived by assuming adaptive monetary expectations; using quarterly data for the 1977-1987 period, the regression run for each sample country relates current monetary growth of broad money (M2) to the once, twice and thrice lagged values of this variable. (2) The unanticipated change in money supply is then given by the difference between the actual and the predicted growth of monetary aggregates.² If unanticipated money expansion results in short-term positive growth effects, the coefficient d should have a positive sign.

In addition to the growth impact of policy adjustments, we account for the growth effects of factors that are beyond the control of the sample countries. TOT indicates terms-of-trade shocks.³ The balance-of-payments impact in period t of changes in

¹ Alternatively, the fiscal balance relative to GDP (DGDP) is considered as an indicator of the stance of fiscal policies in the sample countries. These results are not reported here in detail. The coefficient values of the other variables are hardly affected by this modification. Moreover, replacing EGDP by DGDP gives rise to some multicollinearity problems.

² In additional calculations, the fiscal balance relative to once lagged base money is included as explaining variable in the regressions on the expected development of monetary aggregates. However, we concentrate on UOG in the following. The modification does not change significantly the results presented in the subsequent section. But the number of observations is considerably reduced because of lacking data for many sample countries if the fiscal-balance term is included.

³ Alternatively, we calculate the sum of terms-of-trade shocks and interest-rate shocks (IR). The balance-of-payments impact of the latter is given by:

$$IR_t = [(i_t - i_{t-1}) D_{t-1}] / (X_t + M_t),$$
 where i denotes the average interest rate on external debt (proxied by the percentage share of interest payments in debt disbursed and outstanding in $t-1$), and D denotes external debt outstanding and disbursed. Again the results are hardly affected by this modification so that the results are not reported due to space considerations.

the terms of trade is given by the following formula:

$$(2) \text{TOT}_t = \left[\left[(p_t^M - p_{t-1}^M) MV_t \right] - \left[(p_t^X - p_{t-1}^X) XV_t \right] \right] / (X_t + M_t),$$

where p_t^M and p_t^X denote import and export prices respectively (proxied by unit value indices as published in UNCTAD [1988]); MV and XV represent imports and exports in constant prices;¹ and M and X are imports and exports in current prices [IMF, b]. Adverse terms-of-trade shocks are indicated by positive values of TOT . Hence, the coefficient e in equation (1) should be negative if adverse external shocks are growth-reducing.

Finally, DY represents a lagged growth variable. It is calculated as the three-period moving average of the once, twice and thrice lagged values of the dependent variable Y .

Equation (1) is estimated for 48 developing countries for which the required data is available (the countries are listed in Appendix Table 1). Pooled time-series cross-country regressions are run for the 1982-1987 period by applying ordinary-least-square techniques. The focus is on the recent past since the role of exchange-rate policies has probably become more important since the international debt crisis erupted in 1982, especially for those countries to which foreign finance is no longer available. Regressions are run for various sub-groups of the overall sample. This is because we expect the growth impact of devaluations to differ between developing countries which reveal different structural characteristics in terms of income level, predominant exports, openness to world markets, exchange-rate volatility, inflation, and foreign debt status (for the classification of sample countries, see Appendix Table 1).

¹ Current import and export values are deflated by the respective unit value indices.

In addition to equation (1) which uses current values of all explaining variables, pooled time-series cross-country calculations are performed where once lagged or twice lagged values of the explaining variables enter the regression.¹ Furthermore, a first test of the hypothesis of contractionary devaluation is performed on a cross-country basis by estimating equations (3) and (4):²

$$(3) Y = a + bR + cEGDP + dUOG + eTOT + fGLAG$$

$$(4) Y = a + bR + cEGDP + dUOG + eTOT + fGLAG + gRVAR$$

All variables are defined as in equation (1) except that they represent period averages of 1982-1987.³ The signs of the coefficients b, c, d, and e expected in equation (1) should thus also hold in equations (3) and (4). The lagged growth variable DY in equation (1) is replaced by GLAG in equations (3) and (4); GLAG denotes the average per-capita growth rate in 1978-1981, i.e., the three years preceding the period considered in our calculations. Equation (4) additionally considers the fluctuation in real effective exchange rates as explaining variable; RVAR denotes the standard deviation of the residuals calculated from trend estimates of the real effective exchange rate in 1978-1987. A negative sign is to be expected for RVAR if higher uncertainty about exchange-rate developments involves costs in terms of lower economic growth.

¹ Current and lagged values of the explaining variables do not enter the regressions simultaneously because this gives rise to multicollinearity problems.

² In a modified version of equations (3) and (4), EGDP is replaced by DGDP, i.e., the fiscal balance relative to GDP.

³ Equations (3) and (4) are run for a reduced set of 42 countries. Argentina, Ghana, Indonesia, Kuwait, Nicaragua and Nigeria are excluded from the overall sample. This is because in these cases the calculation of period averages for 1982-1987 is heavily distorted by exceptional values of the explaining variables in one specific period. This applies especially to the real exchange-rate variable.

2. Empirical Results

The results of the first cross-country test of the hypothesis of contractionary devaluation are presented in Table 1. They strongly underline the above mentioned pitfalls of a simplistic "before-and-after" approach in analysing the growth effects of exchange-rate changes. The summary statistics reveal that (1) the 42 developing countries considered experienced an average annual devaluation of the real effective exchange rate of 4 per cent in 1982-1987, and (2) suffered from a decline in annual per-capita GDP growth at the same time. Nevertheless the exchange-rate variable (R) remains completely insignificant in all four equations of Table 1. This is consistent with the results of Khan [1988] who does not find evidence for contractionary effects of devaluations undertaken in the context of IMF adjustment programs. In sharp contrast to R, the degree of exchange-rate fluctuations observed in 1978-1987 (RVAR) exhibits a significantly negative impact on economic growth. This supports the view that uncertainty about exchange-rate policies involves considerable costs in terms of forgone growth.

However, the hypothesis of contractionary devaluation cannot be rejected simply on these grounds. In the cross-country regressions for 1982-1987, neither the monetary (UOG) and fiscal policy variables (EGDP, DGDP) nor the external-shock variable (TOT) have a significant impact on economic growth, as is the case for R. This is probably because of several shortcomings of the regressions presented in Table 1. First, it should be noted that the results reflect the longer-term effects on economic growth because of the calculation of period averages over six years for all variables. Actually it cannot be expected, for example, that monetary surprise shocks have a significant impact on growth in the medium and longer run. The same applies to fiscal policies and terms-of-trade shocks. Annual changes in the explaining variables average out to a considerable degree. So, the short-term growth effects may be severely blurred.

Second, different lags for the various explaining variables are not allowed for. Third, a disaggregated analysis for different

Table 1 - Cross-Country Regression Results for 42 Developing Countries (a)

	Const.	R	RVAR	EGDP	DGDP	TOT	UOG	GLAG	R ² (R ²)	F (Degrees of freedom)
1)	0.54 (0.45)	0.084 (1.20)		0.005 (0.13)		-0.31 (-1.59)	-0.003 (-0.04)	0.20* (1.90)	0.20 (0.09)	1.85 (36)
2)	2.31* (1.70)	0.073 (1.09)	-0.12** (-2.31)	-0.004 (-0.10)		-0.25 (-1.35)	0.006 (0.09)	0.17 (1.64)	0.31 (0.19)	2.62 (35)
3)	0.61 (0.89)	0.086 (1.27)			-0.014 (-0.15)	-0.30 (-1.63)	-0.005 (-0.07)	0.20* (1.90)	0.20 (0.09)	1.85 (36)
4)	2.05** (2.31)	0.068 (1.07)	-0.12** (-2.35)		-0.037 (-0.41)	-0.26 (-1.47)	0.010 (0.15)	0.17 (1.68)	0.31 (0.20)	2.66 (35)

Summary statistics:

	Mean	Std.dev.	Correlation matrix							
			GR	R	RVAR	EGDP	DGDP	TOT	UOG	GLAG
GR	0.5	2.5	1	0.22	-0.43	0.01	-0.05	-0.28	-0.19	0.30
R	-4.0	5.6		1	-0.14	0.30	-0.09	-0.11	-0.20	-0.02
RVAR	13.0	6.9			1	-0.11	-0.08	0.14	0.18	-0.17
EGDP	24.8	10.5				1	-0.62	0.21	-0.25	-0.08
DGDP	-4.8	3.9					1	-0.02	0.08	-0.04
TOT	0.7	2.0						1	0.20	-0.02
UOG	0.6	5.6							1	-0.30
GLAG	2.0	3.7								1

(a) For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; ** denotes significance at the 5 per cent level of confidence; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

country groups is rendered impossible by the limited number of observations. The hypothesis that the growth impact of devaluation depends on structural characteristics of the sample countries can only be tested by applying a pooled time-series cross-country framework.

The pooled regression results are presented in Tables 2 - 7 (for the summary statistics, see Appendix Table 2).¹ For the overall sample of 48 developing countries and for all country groups considered, three separate regressions are run with contemporaneous, once lagged, and twice lagged values of the explaining variables respectively. Due to space considerations, the lagged equations are given in the subsequent tables only if at least one of the policy variables (R, EGDP, UOG) is significant at the 10 per cent level or better. The results for all 48 sample countries clearly point to the limitations of the reduced form equation that underlies the estimates (Table 2).² Even by cross-country standards, the overall explanatory power is fairly low.³ This may be partly attributed to the fairly heterogeneous set of countries included. Moreover, we do not aim at a complete specification of the growth equation because the focus is on short-term adjustment policies. An extended specification would have required, for example, to include the investment ratio and world-market per-

¹ The correlation coefficients for the explaining variables presented in Appendix Table 2 show that multicollinearity problems do not exist.

² Additional regressions were run for the 39 non-oil developing countries of our sample. The results hardly differ from those presented in Table 2, except that the negative growth impact of terms-of-trade shocks is somewhat stronger and significant at the 5 per cent level or better.

³ This contrasts sharply with the extremely high R^2 s achieved by Edwards which are consistently close to unity [1985a; 1989a]. Probably, the latter result is simply due to the inclusion of country-specific trend variables. These are highly significant because the period underlying the estimates is fairly long (1965-1980 and 1965-1984 respectively). Khan [1988] does not reveal any information on the explanatory power of his estimates.

formance as important determinants of economic growth in the longer run.

Not surprisingly, the lagged growth variable (DY) is positively correlated with current economic growth. The negative sign of the

Table 2 - Pooled Time-Series Cross-Country Regression Results for 48 Developing Countries (a), 1982-1987

lag	Const.	R	EGDP	TOT	UOG	DY	$\frac{R^2}{(R^2)}$	F (Degrees of freedom)
0	-0.22 (-0.31)	-0.020* (-1.92)	0.020 (0.74)	-0.04 (-0.73)	0.02* (1.71)	0.38*** (5.34)	0.13 (0.11)	6.53 (218)
1	0.30 (0.46)	-0.018* (-1.96)	0.004 (0.17)	-0.08* (-1.78)	0.00 (0.20)	0.30*** (4.59)	0.10 (0.09)	5.89 (252)
2	0.15 (0.24)	-0.022** (-2.18)	-0.002 (-0.09)	-0.00 (-0.07)	0.01 (0.71)	0.31*** (4.50)	0.09 (0.08)	5.46 (266)

(a) For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

external-shock variable (TOT) was also to be expected, though it is significant only in the once lagged variant. Fiscal policies, as reflected in changes of the share of government expenditure in GDP (EGDP), remain completely insignificant; while unanticipated money creation (UOG) shows a small expansionary effect on economic growth in the current period. Most notably, the hypothesis of contractionary devaluation is unambiguously rejected. The significantly negative coefficients of R point to expansionary, though not very strong, effects of devaluations in the period when they were undertaken and in the two subsequent periods.

The latter result supports our supposition that the contractionary effects of contemporaneous devaluation found by Edwards [1985a; 1989a] cannot be generalized. Edwards' sample is heavily biased towards fairly advanced developing countries with a diversified and manufactured export base, while low income exporters of raw materials are hardly taken into account. Hence, we differentiate the overall sample of 48 countries with regard to predominant exports and the level of economic development in the next step. In this way, we provide a more rigorous test of the hypothesis that contractionary effects of devaluation, if any, are restricted to specific country groups.

The classification of different income groups is based on World Bank data on per-capita income (for details, see Appendix Table 1). The regression results support our proposition that the degree and lag structure of exchange-rate effects on economic growth differs between various country groups (Table 3). The mean of annual devaluations in the 1982-1987 period was highest for low income countries, with the standard deviation of R being exceptionally high (Appendix Table 2). This may explain that the negative coefficient of R is relatively small. But in contrast to countries with higher income, the expansionary effects of devaluation materialized in the same period when devaluations were undertaken.¹ Also for the more advanced developing countries, there is no evidence pointing to contractionary devaluation; the positive coefficients of the contemporaneous exchange-rate variable are insignificant. But the expansionary effects were somewhat delayed, especially in the lower-middle income group.

In all three income groups, current growth was strongly influenced by the growth performance in the preceding periods. The effects of external shocks and monetary and fiscal policies were negligible, except for the lower-middle income group. It is interesting to note that the latter countries experienced the

¹ For low income countries, the coefficient of R remains completely insignificant in the lagged equations. The same applies to the other policy variables.

Table 3 - Regression Results for Developing Countries of Different Income Level (a), 1982-1987

Coun- try group	lag	Const.	R	EGDP	TOT	UOG	DY	R ² (R ²)	F (Degrees of freedom)
13 low income coun- tries	0	0.51 (0.41)	-0.033*** (-3.60)	-0.027 (-0.51)	-0.02 (-0.27)	-0.02 (-0.70)	0.56*** (4.36)	0.32 (0.26)	5.25 (57)
22 coun- tries with lower- middle income	0	-2.10* (-1.90)	0.015 (0.53)	0.077* (1.96)	-0.22** (-2.45)	0.05 (1.34)	0.37*** (3.22)	0.20 (0.16)	4.61 (92)
	1	-1.59 (-1.66)	-0.035 (-1.47)	0.067* (1.94)	-0.24*** (-3.24)	0.02 (0.71)	0.22** (2.19)	0.18 (0.15)	4.89 (108)
	2	-1.36 (-1.41)	-0.096*** (-3.38)	0.048 (1.39)	0.01 (0.13)	0.00 (0.10)	0.22** (2.12)	0.16 (0.12)	4.33 (115)
9 coun- tries with upper- middle income	0	2.02 (1.15)	0.024 (0.63)	-0.051 (-0.76)	0.01 (0.08)	0.02 (0.90)	0.49** (2.29)	0.16 (0.05)	1.43 (38)
	1	1.79 (1.19)	-0.075** (-2.20)	-0.060 (-1.03)	-0.02 (-0.28)	0.01 (0.61)	0.42** (2.31)	0.19 (0.11)	2.20 (46)
	2	2.09 (1.30)	-0.074** (-2.12)	-0.084 (-1.33)	-0.06 (-0.64)	0.02 (1.05)	0.31 (1.61)	0.19 (0.11)	2.29 (48)

(a) Classification based on World Bank data on per-capita income; for details, see Appendix Table 1. For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

steepest reduction in economic growth in 1982-1987 (Appendix Table 2). At the same time, the average degree of devaluation was relatively small, and the share of government expenditure in GDP exceptionally high. So, this country group faced relatively strong fiscal adjustment needs. Not surprisingly, fiscal adjustment had short-term costs in terms of lower economic growth. According to the results of Table 3 it would be grossly misleading to blame exchange-rate policies for this temporary decline in growth (to which also adverse terms-of-trade shocks contributed significantly).

The differences between specific country groups become even more pronounced if the sample economies are classified according to their predominant exports. Table 4 reveals that not only the degree and lag structure of exchange-rate effects on economic growth differed in the 1980s, but also their direction. The most remarkable differences are to be observed if exporters of manufactures and agricultural exporters are compared.¹ Most notably, the results presented by Edwards in his earlier paper [1985a] are confirmed for the group of exporters of manufactures in Table 4. This was to be expected since Edwards' sample consists mainly of developing countries for which manufactured exports figured prominently. The contractionary effects of devaluation indicated by

¹ Separate estimates were also performed for mineral exporters, and exporters of services and recipients of private transfers. These results are not presented here in detail. Because of the extremely small number of mineral exporters in our sample the degrees of freedom are reduced to about ten in the respective equations. Nevertheless the following results may be noteworthy: (1) For this group there is evidence that devaluations were undertaken when growth was below the trend. The coefficient of the lagged growth variable is significantly negative in the growth equation with contemporaneous values of the other explaining variables, while the coefficient of R is insignificant. A simplistic "before-and-after" approach may thus lead to the wrong conclusion of contractionary devaluation. (2) The expansionary effects of devaluation were particularly strong for mineral exporters, though they materialized with a considerable lag of two periods. Extremely poor results were achieved for the heterogeneous group of exporters of services and recipients of private transfers (Barbados, Egypt, Jamaica, Pakistan, Panama, Tanzania, and Upper Volta). With one exception (DY), all variables remain insignificant.

Table 4 - Regression Results for Groups of Developing Countries with Different Export Base (a), 1982-1987

Coun- try group	lag	Const.	R	EGDP	TOT	UOG	DY	R ² (R ²)	F (Degrees of freedom)
9 export- ers of manu- fac- tures	0	2.29** (2.29)	0.148*** (2.77)	-0.021 (-0.96)	-0.24* (-1.98)	0.11** (2.68)	0.72*** (3.67)	0.48 (0.42)	6.96 (37)
	1	0.79 (0.83)	-0.128** (-2.66)	-0.015 (-0.71)	0.08 (0.70)	0.10** (2.66)	0.89*** (4.60)	0.44 (0.37)	6.56 (42)
	2	1.47 (1.36)	-0.012 (-0.24)	-0.006 (-0.27)	0.03 (0.32)	0.01 (0.16)	0.63*** (2.88)	0.19 (0.10)	2.13 (45)
11 agri- cul- tural ex- por- ters	0	-5.21*** (-3.38)	-0.066** (-2.25)	0.177*** (2.96)	-0.22* (-1.87)	-0.01 (-0.16)	-0.07 (-0.42)	0.24 (0.16)	3.09 (49)
	1	-3.24** (-2.48)	-0.019 (-0.75)	0.124** (2.37)	-0.30*** (-3.19)	-0.00 (-0.05)	-0.00 (-0.01)	0.22 (0.15)	3.25 (57)
	2	-3.58** (-2.53)	-0.037 (-1.11)	0.139** (2.44)	-0.12 (-1.32)	0.00 (0.05)	-0.02 (-0.15)	0.14 (0.06)	1.84 (57)
6 coun- tries with diver- sified export base	0	-4.75** (-2.75)	0.036 (0.49)	0.239*** (3.15)	-0.15 (-0.83)	0.17** (2.56)	-0.45 (-1.36)	0.40 (0.26)	2.90 (22)

(a) Classified according to IMF information on predominant exports; for details, see Appendix Table 1. For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

the contemporaneous exchange-rate variable are matched by similarly strong expansionary effects in the subsequent period. Arguably the degree of capacity utilization is relatively high in countries with a favourable performance in exporting manufactured goods. Contractionary effects of rising import prices are more likely than in countries with a lower capacity utilization in the production of tradables. Furthermore, international price linkages may be relatively strong for manufactures. Consequently, devaluation results in price effects in the first place, while positive supply effects are delayed. Finally, exchange-rate volatility is extremely low for this country group. As argued below, low exchange-rate fluctuations add to the stability in economic growth. Therefore, real devaluation is neutral in the medium run. Also similar to Edwards, money surprises had a significant impact on economic growth in countries whose exports were concentrated on manufactures. On the other hand, fiscal policies which Edwards found to be significant remain completely insignificant in Table 4.¹ Adverse terms-of-trade shocks affected economic growth negatively in the short run.²

Apart from the negative growth effects of adverse terms-of-trade shocks, the regressions run for agricultural exporters show a considerably different pattern of coefficient values.³ Money

¹ By contrast, both monetary and fiscal policies show the expected positive - and highly significant - coefficient values for countries with a diversified export base. Exchange-rate policies were of minor importance for this group. According to Appendix Table 2, the average degree of devaluation in 1982-1987 was considerably smaller than in the other country groups.

² The terms-of-trade variable remains insignificant in Edwards' analysis. As argued above, the growth impact of external shocks cannot be assessed adequately simply by accounting for changes in the terms of trade. So, the balance-of-payments effects of terms-of-trade changes are considered here.

³ The results presented in Table 4 are based on data for 11 out of the 14 agricultural exporters included in our sample. Argentina, Ghana and Nicaragua are excluded in order to reduce the extremely high volatility in real exchange rates observed for the group of 14 countries. However, the major results remain largely unaffected by this modification. Not surprisingly, the absolute size of the coefficient of R declines for the extended sample (-0.027), as the contractionary effects of high exchange-rate volatility are captured by R . But the negative coefficient of R is still highly significant.

surprises were negligible on average, as indicated by the extremely low mean of UOG in Appendix Table 2. By contrast, fiscal policies had a strong impact on economic growth. Contractionary effects of devaluation are not to be observed; devaluation was rather growth-enhancing in the short run. This indicates that the widespread export pessimism of agricultural exporters is not justified.¹ Adjustment costs in terms of lower growth are mainly to be attributed to temporary recessionary effects of restrictive fiscal policies.

Devaluation cannot be blamed for the poor growth performance of developing countries with foreign debt problems either. In none of the equations reported in Table 5, the exchange-rate variable turns out to be positive. Actually, expansionary effects of devaluation were stronger in developing countries that encountered debt problems in the 1980s than in countries without reschedulings. But especially for the 14 heavily indebted countries these effects materialized with considerable delay only. From the negative coefficient of the lagged growth variable (DY) it may be concluded that devaluations were undertaken in this group when economic growth was below the trend. With only one exception, short-term fiscal and monetary policies had no significant impact on economic growth in the two problem debtor groups. This indicates that temporary adjustment measures are of little help to restore economic growth in these countries, unless such measures are an integrated part of comprehensive and consistent structural reform packages.

A major aim of such structural reform packages must be to reduce uncertainty of producers and investors, and thereby strengthen the supply responsiveness towards changes in relative prices. Uncertainty is for example created by high exchange-rate volatility and high inflation. The relevance of structural differences in these respects in determining the growth impact of de-

¹ On the role of exchange-rate policies for the recovery of the agricultural sector in developing countries, see e.g. Bond [1983]; Gulhati et al. [1986]; Chhibber [1988].

Table 5 - Regression Results for Developing Countries with and without Debt Problems (a), 1982-1987

Coun- try group	lag	Const.	R	EGDP	TOT	UOG	DY	R ² (R ²)	F (Degrees of freedom)
29 coun- tries with debt pro- blems	0	-1.40 (-1.29)	-0.003 (-0.14)	0.047 (1.25)	-0.07 (-0.96)	0.02 (1.34)	0.20* (1.75)	0.06 (0.02)	1.57 (121)
	1	-0.78 (-0.86)	-0.040** (-2.05)	0.027 (0.84)	-0.12* (-1.94)	0.00 (0.28)	0.14 (1.37)	0.06 (0.03)	1.96 (144)
	2	-1.24 (-1.42)	-0.089*** (-4.21)	0.031 (1.00)	-0.03 (-0.50)	0.01 (0.87)	0.15 (1.46)	0.12 (0.09)	4.34 (155)
14 heavi- ly in- debted coun- tries	0	-0.02 (-0.02)	-0.013 (-0.46)	-0.112* (-1.78)	-0.09 (-1.14)	0.00 (0.27)	-0.47** (-2.43)	0.16 (0.08)	2.19 (59)
	2	-0.98 (-0.85)	-0.085*** (-3.47)	-0.027 (-0.52)	0.03 (0.32)	0.02 (1.59)	-0.23 (-1.31)	0.19 (0.13)	3.52 (76)
19 coun- tries without debt pro- blems	0	0.30 (0.28)	-0.027** (-2.42)	0.018 (0.43)	0.01 (0.20)	0.04 (0.81)	0.49*** (5.17)	0.25 (0.21)	6.06 (91)

(a) Classification according to World Bank information on re-schedulings; for details, see Appendix Table 1. For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

valuation is shortly discussed in the following.¹ Table 6 supports the proposition that high exchange-rate fluctuations reduce the growth-enhancing effects of devaluation considerably. Notwithstanding extremely volatile real exchange rates, a weak expansionary effect of devaluations is to be observed in the period when they were undertaken. However, the coefficients of R remain completely insignificant in the once and twice lagged growth equations for the 15 countries with high exchange-rate fluctuations.² By contrast, the countries with less volatile exchange-rate policies benefited from a by far more pronounced rise in economic growth in the two periods following a devaluation. A similar picture emerges when the sample countries are classified according to the average degree of inflation in 1982-1987.³ The coefficient of R is insignificant in five out of six equations run for countries with annual inflation rates of 8 - 30 per cent and more than 30 per cent respectively.⁴ On the other hand, a fairly strong expansionary impact of devaluation is estimated for countries with inflation rates of less than 8 per cent; the coefficient of R amounts to -0.133 (significant at the 5 per cent level) in the once lagged growth equation.

The revision of external trade policies would be another important element of structural reform packages in problem-ridden

¹ Due to space limitations, only some of the empirical estimates performed are presented here. Detailed results are available from the authors upon request.

² Also for the 13 countries with very low exchange-rate fluctuations no significant effects of R on economic growth are revealed by the regressions (the results are not presented here). This does not of course imply that exchange-rate policies were irrelevant for the favourable growth performance of these countries [see also Khan, 1988, p. 19]. On the contrary, because of stability-oriented exchange-rate policies they could do without large real devaluations. Actually, not only the volatility of exchange rates, but also the average degree of real devaluation was considerably smaller than in other sample countries (Appendix Table 2).

³ The detailed results are not presented here.

⁴ The exception is the significantly negative coefficient of R for the 12 countries with high inflation in the twice lagged growth equation. But the coefficient value remains fairly small in absolute terms (-0.024).

Table 6 - Regression Results for Developing Countries with Medium and High Exchange-Rate Fluctuations (a), 1982-1987

Coun- try group	lag	Const.	R	EGDP	TOT	UOG	DY	R ² (R ²)	F (Degrees of freedom)
20 coun- tries with medium ex- change- rate fluctu- ations	0	0.20 (0.16)	-0.002 (-0.05)	-0.001 (-0.01)	-0.03 (-0.39)	0.13*** (3.10)	0.15 (1.08)	0.11 (0.06)	2.13 (85)
	1	0.09 (0.09)	-0.083*** (-2.78)	0.000 (0.00)	-0.07 (-0.93)	0.06 (1.65)	0.05 (0.42)	0.11 (0.07)	2.62 (102)
	2	0.29 (0.27)	-0.121*** (-3.69)	-0.010 (-0.25)	0.01 (0.20)	-0.06 (-1.65)	0.03 (0.24)	0.12 (0.08)	3.00 (109)
15 coun- tries with high ex- change- rate fluctu- ations	0	-3.89*** (-3.29)	-0.024** (-2.43)	0.127*** (2.87)	-0.13* (-1.72)	0.01 (0.64)	0.21 (1.60)	0.26 (0.20)	4.45 (63)
	1	-2.38** (-2.17)	-0.010 (-1.11)	0.075* (1.77)	-0.11 (-1.66)	-0.01 (-0.63)	0.09 (0.70)	0.12 (0.06)	1.96 (74)
	2	-2.17** (-2.03)	-0.015 (-1.56)	0.048 (1.15)	0.05 (0.67)	0.02 (1.55)	0.22* (1.71)	0.13 (0.07)	2.29 (77)

(a) Classified according to the standard deviation of the residuals of the real effective exchange rate, based on trend estimates for 1978-1987; for details, see Appendix Table 1. For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

developing countries.¹ Openness towards world markets improves the chances that changes in relative prices are transmitted into supply responses. Consequently, the growth effects of devaluation are expected to depend on the overall development approach of the countries in question. Table 7 shows that this was indeed the case to some extent.² Though somewhat delayed, relatively strong effects of devaluation on economic growth are estimated for moderately open developing countries. The growth impact of exchange-rate policies was small and limited to the current period in closed economies. However, negative growth effects - as hypothesized by the extensive literature on contractionary devaluation - did not materialize in either of the country groups considered.

IV. Summary and Conclusions

Various channels have been identified in the literature through which devaluations may cause contractionary effects on economic growth in developing countries. The bewildering array of theoretical frameworks on contractionary devaluation has increasingly challenged the view that the devaluation-induced substitution

¹ It is no longer to be disputed that a world market-oriented development approach is better suited to improve the growth performance of Third World economies than persistent and comprehensive import substitution policies. For the substantial body of research on this issue, see e.g. Krueger [1978]; Donges, Müller-Ohlsen [1978]; Tyler [1981]; Balassa [1984].

² However, the differences in the growth effects of devaluation are not as pronounced as one might have expected. This may be partly due to the shortcomings of the indicator applied to classify the sample countries into closed, moderately open and open economies. The ratio of exports plus imports over GDP is heavily influenced by the overall size of the economies. This bias may also contribute to the extremely poor explanatory power of most equations in Table 7. Moreover, the fact that the coefficients of R remain insignificant for the group of 14 open economies (not included in Table 7) may be explained in a similar way as in the case of countries with low exchange-rate fluctuations. Appendix Table 2 shows that also in open economies both the average degree of devaluation and exchange-rate volatility were far below the figures calculated for other country groups.

Table 7 - Regression Results for Developing Countries with Different Degrees of Openness towards World Markets (a), 1982-1987

Coun- try group	lag	Const.	R	EGDP	TOT	UOG	DY	R ² (R ²)	F (Degrees of freedom)
15 closed econo- mies	0	-0.92 (-0.91)	-0.025** (-2.53)	0.026 (0.52)	-0.19* (-2.00)	0.01 (1.12)	0.43*** (3.34)	0.26 (0.20)	4.33 (62)
19 moder- ately open econo- mies	0	-1.15 (-0.93)	-0.003 (-0.10)	0.039 (0.86)	0.00 (0.01)	0.02 (0.44)	0.18 (1.39)	0.04 (-0.01)	0.74 (87)
	1	-0.91 (-0.88)	-0.046* (-1.98)	0.036 (0.93)	-0.06 (-1.09)	0.06* (1.78)	0.18 (1.56)	0.12 (0.08)	2.76 (100)
	2	-1.31 (-1.23)	-0.064** (-2.46)	0.053 (1.29)	0.04 (0.53)	0.01 (0.28)	0.11 (0.94)	0.09 (0.04)	1.98 (104)

(a) Classification according to the sum of exports and imports over GDP; for details, see Appendix Table 1. For the definition of variables, data sources, and calculation procedures, see the text; t-values in parentheses; *** denotes significance at the 1 per cent level of confidence; ** 5 per cent level; * 10 per cent level (two-tailed t-test).

Source: Own calculations.

effects on both the demand and supply side are sufficiently strong to assure an expansionary net effect on aggregate production and employment. The theoretical debate has added to the widespread export pessimism of Third World economies and to their reluctance to use exchange-rate policies as an expenditure switching device in economic adjustment programs. This pessimism has also been fed by empirical studies that found devaluations to be associated with lower growth and pointed to the failure of IMF adjustment programs in restoring economic growth.

In this paper, however, it is argued that the pessimism about the growth effects of real devaluation is not justified. Many argu-

ments in the ongoing theoretical debate on contractionary devaluation are based on questionable assumptions. In some models, growth-enhancing substitution effects of a devaluation are simply assumed away. The empirical evidence is still extremely sketchy. Especially the "before-and-after" approach applied in many studies suffers from serious shortcomings. Typically, not the growth impact of devaluation per se is assessed, but rather the combined effects of external factors and of adjustment packages which also include restrictive macroeconomic policies.

To overcome major conceptual weaknesses in previous empirical research, we have subjected a reduced form equation on the growth impact of devaluation to regression analysis. First, this approach does not require arbitrary assumptions on crucially important parameter values. Second, it is possible to control for external factors and internal policy measures other than currency realignments. Third, the pooled time-series cross-country analysis for 1982-1987 allows to differentiate between various country groups, and thereby to test the hypothesis that the growth impact of real devaluation depends on structural characteristics of the economies considered.

The empirical results can be summarized as follows. In a cross-country context, we do not find evidence for contractionary effects of devaluation for a set of 42 developing countries. But the degree of exchange-rate volatility exhibits a significantly negative impact on economic growth. This supports the view that uncertainty about exchange-rate policies involves considerable costs in terms of forgone growth. The hypothesis of contractionary devaluation is also rejected in the pooled regressions run for the overall sample.

The group-specific estimates support the proposition that the direction, the degree and the lag structure of the growth effects of devaluation depend on structural characteristics of the economies:

- Contractionary effects of devaluation are only observed for exporters of manufactures in the period when devaluations took place. This negative growth impact was matched by similarly strong expansionary effects in the subsequent period.
- Devaluation was growth-enhancing in the short run for agricultural exporters. This indicates that the widespread pessimism about agricultural supply responsiveness to changes in relative prices is not justified.
- Devaluation cannot be blamed for the poor growth performance of developing countries with foreign debt problems either. But especially for heavily indebted countries the expansionary effects of devaluation materialized with considerable delay only.

Generally, the decline in economic growth experienced by many developing countries in the 1980s cannot be attributed to real devaluation. It was rather due to restrictive monetary and fiscal policies, and to adverse world market developments in some instances. Especially fiscal adjustment had short-term costs in terms of lower economic growth in several country groups, as was to be expected. Developing countries would thus be ill-advised to stick to overvalued domestic currencies. The adjustment costs are likely to increase unless the required revision of fiscal and monetary policies is complemented by real devaluation.

However, the estimates indicate as well that short-term adjustment measures are not sufficient to restore economic growth in today's problem-ridden developing countries. The expansionary effects of real devaluation remain weak for countries with high inflation and extremely volatile exchange-rate policies. Hence, structural reform packages should aim at reducing uncertainty of producers and investors about the course of monetary and exchange-rate policies. This would help to strengthen the supply responsiveness to changes in relative prices. Similarly, openness towards world markets improves the prospects that devaluation-induced changes in relative prices are transmitted into supply

responses. A critical review of external trade policies should thus be a major element of structural reform programs. Especially for many developing countries with severe foreign debt problems it is crucially important to overcome persistent and comprehensive import substitution policies, and thereby improve the chances for expansionary devaluation.

Appendix Table 1 - Classification of the 48 Sample Countries

	Growth perform- ance(a)	Income status (b)	Major exports (c)	World market orienta- tion(d)	Exchange rate fluctu- ation(e)	Foreign debt status (f)	In- fla- tion(g)
Argentina	decl	umid	agr	clo	high	prob, hic	high
Bangladesh	stag	low	div	clo	low	non	med
Barbados	stag	n.a.	serv	open	med	non	low
Brazil	pos	umid	man	clo	med	prob, hic	high
Cameroon	pos	lmid	oil	clo	med	non	med
Chile	stag	lmid	min	mod	med	prob, hic	med
Colombia	stag	lmid	agr	clo	med	prob, hic	med
Congo	stag	lmid	oil	open	low	prob	low
Costa Rica	stag	lmid	agr	open	high	prob, hic	med
Ecuador	decl	lmid	oil	mod	med	prob, hic	high
Egypt	pos	lmid	serv	mod	high	prob	med
El Salvador	decl	lmid	agr	mod	high	non	med
Gabon	decl	umid	oil	open	med	prob	low
Gambia	pos	n.a.	agr	open	med	prob	med
Ghana	decl	low	agr	clo	high	non	high
Greece	stag	umid	man	mod	low	non	med
Guatemala	decl	lmid	agr	clo	high	non	med
Honduras	decl	lmid	agr	mod	med	prob	low
India	pos	low	man	clo	low	non	med
Indonesia	pos	low	oil	mod	high	non	med
Jamaica	stag	lmid	serv	open	med	prob, hic	med
Kenya	stag	low	agr	mod	low	non	med
Kuwait	decl	high	oil	open	low	non	low
Malawi	stag	low	agr	mod	low	prob	med
Malaysia	pos	lmid	div	open	med	non	low
Mexico	decl	lmid	oil	clo	high	prob, hic	high
Morocco	stag	lmid	div	mod	low	prob	low
Nicaragua	decl	lmid	agr	clo	high	prob	high
Nigeria	decl	low	oil	clo	high	prob, hic	med
Pakistan	pos	low	serv	clo	med	prob	low
Panama	stag	umid	serv	mod	med	prob	low
Paraguay	decl	lmid	agr	clo	high	non	med
Peru	stag	lmid	min	mod	high	prob, hic	high
Philippines	decl	lmid	div	mod	med	prob, hic	med
Senegal	pos	lmid	div	open	med	prob	low
Sierra Leone	decl	low	div	clo	high	prob	high
South Korea	pos	umid	man	open	low	non	low
Sri Lanka	pos	low	agr	open	high	non	med
Taiwan	pos	n.a.	man	open	low	non	low
Tanzania	decl	low	serv	clo	high	prob	high
Thailand	pos	lmid	man	mod	low	non	low
Togo	decl	low	min	open	med	prob	low
Tunisia	stag	lmid	man	open	low	non	low
Turkey	pos	lmid	man	mod	med	prob	high
Upper Volta	stag	low	serv	mod	low	non	low
Uruguay	decl	umid	agr	mod	med	prob, hic	high
Venezuela	decl	umid	oil	mod	med	prob, hic	med
Yugoslavia	stag	umid	man	mod	med	prob, hic	high

Appendix Table 1 continued

n.a. = not available

(a) Based on average annual growth of GDP per capita in constant prices in 1982-1987 [UNCTAD, 1988]; "pos" for 14 countries with per-capita income growth (w) of more than 1.5 per cent; "stag" for 16 countries with $1.5 > w > -1.0$; "decl" for 18 countries with $w < -1.0$.

(b) 13 low income countries ("low"), 22 countries with lower-middle income ("lmid"), 9 countries with upper-middle income ("umid"), and 1 high income country ("high") classified according to World Bank [1989, Appendix Table 1]; no comparable data available for Barbados, Gambia, and Taiwan.

(c) Countries classified by predominant exports as in IMF [1989, pp. 118ff.]: 9 oil exporters ("oil"); 9 exporters of manufactures ("man"); 14 agricultural exporters ("agr"); 3 mineral exporters ("min"); 6 countries with diversified export base ("div"); 7 exporters of services and recipients of private transfers ("serv").

(d) Calculated as sum of exports and imports over GDP [data from IMF, b]; "clo" for 15 closed economies with an average share of less than 30 per cent in 1982-1987; "mod" for 19 economies with a share of between 30 and 50 per cent; "open" for 14 economies with a share of more than 50 per cent.

(e) Standard deviation of the residuals calculated from trend estimates of the real effective exchange rate for 1978-1987; "low" for 13 countries with a standard deviation of less than 8; "med" for 20 countries with a standard deviation of between 8 and 20; "high" for 15 countries with a standard deviation of more than 20.

(f) The 29 countries for which the World Bank [1988] reports reschedulings with official or private creditors are regarded as borrowers with debt problems ("prob"); "non" for 19 countries without reschedulings; "hic" denotes 14 heavily indebted countries as defined in the same source.

(g) Average annual change of consumer prices in 1982-1987 [IMF, b]; "low" for 16 countries with price increases of less than 8 per cent; "med" for 20 countries with price increases of between 8 and 30 per cent; "high" for 12 countries with price increases of more than 30 per cent.

Source: IMF [b]; IMF [1989]; UNCTAD [1988]; World Bank [1988; 1989].

Appendix Table 2 - Pooled Time-Series Cross-Country Regressions:
Summary Statistics (a)

		All 48 devel- oping coun- tries	13 low income coun- tries	22 coun- tries with lower- middle income	9 coun- tries with upper- middle income	9 expor- ters of manu- factures	11 agri- cultural expor- ters	6 countries with diver- sified export base
Y	mean	0.4	0.3	-0.1	0.7	3.2	-0.8	0.3
	std.dev.	4.7	3.8	4.7	4.6	3.4	3.9	4.2
R	mean	-4.5	-7.7	-3.0	-4.5	-4.0	-2.4	-1.8
	std.dev.	28.9	48.1	15.9	18.8	8.1	17.6	11.3
EGDP	mean	24.8	21.8	26.1	23.2	26.3	23.5	22.3
	std.dev.	11.4	8.1	12.0	10.4	22.9	8.7	10.6
TOT	mean	1.1	0.4	0.5	1.9	-0.5	-0.1	-0.0
	std.dev.	6.2	5.2	4.9	7.2	3.5	4.3	4.1
UOG	mean	1.0	-1.2	1.1	4.3	1.3	0.4	0.7
	std.dev.	22.1	12.1	12.3	44.3	11.0	14.8	10.9
DY	mean	0.1	0.2	0.4	-0.2	2.6	-1.3	0.8
	std.dev.	4.2	3.4	4.1	3.6	2.4	3.4	2.6

partial correlation coefficients between explaining variables:

R/EGDP	0.11	0.12	0.16	0.13	-0.20	0.01	-0.10
R/TOT	-0.02	0.07	-0.09	-0.13	0.23	0.04	-0.22
R/UOG	0.05	0.03	-0.13	0.24	-0.19	-0.24	0.20
R/DY	0.09	0.27	0.00	0.02	0.10	-0.17	0.41
EGDP/TOT	0.22	0.11	0.17	0.08	0.06	0.28	0.26
EGDP/UOG	-0.07	-0.06	-0.03	-0.11	0.47	-0.09	-0.09
EGDP/DY	-0.01	0.07	0.29	0.04	-0.51	0.24	0.37
TOT/UOG	-0.10	-0.12	-0.00	-0.20	-0.03	-0.06	0.17
TOT/DY	-0.06	0.06	0.16	-0.27	-0.09	0.13	0.10
UOG/DY	-0.12	0.05	-0.22	-0.27	-0.35	-0.23	0.15

Appendix Table 2 continued

		29 coun- tries with debt problems	14 heav- ily in- debted countries	19 coun- tries without debt problems	15 coun- tries with high exchange rate fluc- tuation	20 coun- tries with medium exchange rate fluc- tuation	13 coun- tries with low exchange rate fluc- tuation	15 closed economies	19 moder- ately open econo- mies	14 open economies
Y	mean	-0.3	-1.6	1.2	-1.1	0.2	2.2	-0.3	-0.2	1.9
	std.dev.	4.6	4.6	4.6	4.3	4.5	4.7	4.1	4.1	5.6
R	mean	-3.9	-6.3	-5.4	-5.4	-4.6	-3.5	-8.9	-2.3	-3.1
	std.dev.	17.4	20.1	39.2	49.6	13.4	6.2	47.6	16.7	10.7
EGDP	mean	26.3	20.5	23.0	23.3	25.5	25.7	17.9	25.2	31.8
	std.dev.	11.4	9.0	11.2	12.1	10.4	12.1	9.3	10.1	11.0
TOT	mean	1.1	1.6	1.1	1.3	1.1	0.8	0.2	1.4	1.5
	std.dev.	5.7	7.1	6.7	6.2	5.9	6.6	5.1	6.3	6.9
UOG	mean	2.6	4.7	-1.1	2.6	0.5	-0.2	3.0	0.9	-1.2
	std.dev.	28.2	37.6	9.4	36.5	11.5	10.2	36.9	12.2	8.1
DY	mean	-0.5	-1.7	0.8	-0.9	-0.1	1.3	-0.1	-0.3	0.7
	std.dev.	3.6	3.0	4.7	4.2	3.3	5.0	3.7	3.5	5.4

partial correlation coefficients between explaining variables:

R/EGDP	0.13	-0.10	0.10	0.19	0.04	-0.05	0.14	0.13	-0.14
R/TOT	-0.17	-0.17	0.05	-0.01	-0.04	-0.06	0.02	-0.08	-0.17
R/UOG	0.12	0.18	-0.03	0.07	-0.17	0.07	0.10	-0.22	0.11
R/DY	0.01	-0.16	0.14	0.17	0.08	-0.22	0.19	0.12	-0.13
EGDP/TOT	0.09	0.15	0.37	0.12	0.10	0.46	0.18	0.03	0.44
EGDP/UOG	-0.08	-0.05	-0.16	-0.07	-0.13	-0.03	-0.04	-0.06	-0.09
EGDP/DY	0.23	-0.06	-0.22	0.47	-0.06	-0.45	0.08	0.30	-0.44
TOT/UOG	-0.13	-0.16	-0.08	-0.18	-0.02	-0.05	-0.20	-0.08	0.06
TOT/DY	0.02	-0.04	-0.13	0.12	-0.06	-0.19	-0.08	0.02	-0.13
UOG/DY	-0.15	-0.22	-0.05	-0.17	-0.19	0.03	-0.17	-0.19	-0.04

(a) For the definition of variables and data sources, see the text. None of the correlation coefficients is significant at the 5 per cent level of confidence.

Source: Own calculations.

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