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DEVALUATION, EXTERNAL BALANCE, AND MACROECONOMIC PERFORMANCE: A LOOK AT THE NUMBERS

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

The relative merits of currency devaluation in developing countries have been the subject of considerable debate in recent years. Analysts at international institutions, and particularly at the International Monetary Fund, have generally maintained that devaluation plays a positive and important role in balance-of-payments stabilization, while academic research has focused mainly on newly discovered contractionary and otherwise perverse effects of exchange-rate adjustment. Yet this debate over the efficacy of currency devaluation has been largely theoretical, bolstered at times by simulation analyses or case studies of particular devaluations. In 1971, by contrast, Richard Cooper surveyed twenty-four devaluations of the preceding two decades, assessing statistically the extent of the response of the balances of trade and payments, inflation, and the elements of aggregate demand. Surprisingly, there has been little effort in recent years to deepen and update his research, and the gap between our theoretical understanding and our empirical grasp of the devaluation process has never been wider.

This study fills part of that gap. Ideally, both theoretical and empirical analyses should be directed toward answering the fundamental question: What is the impact of devaluations on external balance and macroeconomic performance in developing countries? A proper answer requires, first, the compilation of "stylized facts" about the devaluation process and, second, the formulation of a consistent theoretical model showing the response of an economy to exchange-rate change. The theoretical model is clearly central to the explanation of how devaluations work, as well as to the estimation of the magnitudes involved. But the stylized facts, that is, the characterization of how economies, on average, have behaved during devaluation episodes, are equally important, both to inform the construction of the theoretical model and to act as a continuing test of the model's explanatory power.

This study summarizes research I have conducted in order to build up those stylized facts. It focuses on a narrow set of questions: How have key indicators of macroeconomic and external performance moved before, during, and after devaluations in developing countries? What are the obvious interrelationships among their movements? What *prima facie* evidence do these findings provide concerning the applicability of currently popular views about devaluations?

To answer these questions, my research exploits data for a set of 50 to 90 devaluations (depending on data availability) out of a sample of 107 deval-

uations imposed between 1953 and 1983. These episodes were all "maxi" devaluations: discrete changes in the nominal exchange rate with respect to the U.S. dollar of at least 15 percent within a few months. For each devaluation, I calculated the movements in a variety of indicators suggested by either theoretical considerations or policy concerns: the trade and payments balances, imports, exports, net capital flows, changes in reserves, inflation, the real exchange rate, and growth in gross domestic product (GDP). I calculated these movements for periods before and after devaluation for both the devaluing country and a control group comprising all the countries in the sample.

The plan of the study is as follows. Chapter 2 reviews the findings of earlier investigations of the devaluation process. Chapter 3 defines a stylized fact and outlines the methodology applied to the data. Chapter 4 describes the results. Chapter 5 discusses some preliminary work to test different explanations for the stylized trends indentified by the statistical analysis. Chapter 6 summarizes the major findings and points out potential directions for future research.

2 WHAT HAVE PREVIOUS STUDIES SHOWN?

Two empirical approaches have been followed to determine the effects of devaluations on external balance and macroeconomic performance. One examines changes in country performance at the time of devaluation. The other applies econometric methods to time series to determine the impact of exchange-rate changes on various performance variables (for examples of the second approach, see Khan, 1974; Goldstein, 1974; Miles, 1979; and Edwards, 1985). A third, somewhat less direct, approach to the problem uses simulation models or reduced-form equations to analyze exchange-rate equations (see Gylfasen and Risager, 1984, and Gylfasen and Schmid, 1983).

The following survey implicitly sets aside this large body of empirical research devoted not to devaluations per se but to the effects of exchange rates over time on imports, exports, and other indicators. While time-series analyses of exchange-rate effects may be entirely appropriate for certain purposes, there are important reasons why they are inappropriate for characterizing devaluation episodes. First and most obviously, they do not tell us what has happened historically during devaluation episodes. Real exchange rates move more or less continuously over time; they merely show more exceptional movement during devaluations. Second, not only are devaluations typically associated with other stabilization policies, but they are large, discrete events, and their influence, particularly as regards expectations, may differ qualitatively from slower, more routine exchange-rate adjustments. Finally, and this is true of most macroeconomic time-series analysis, it is very difficult to estimate equations relating target variables to the exchange rate in the absence of information about the lengths of the response lags involved. Proper specification of the structural relationship depends upon knowledge of the dynamic relationship; conversely, identifying the dynamics of response is difficult when the basic functional relationship is not well understood. Concentrating on devaluations may circumvent this problem, since there is more reason to presume that at the time of devaluation the economy is not responding to past changes in the nominal exchange rate.

As suggested in the Introduction, the inspiration for this research derives from the considerably older study of Cooper (1971a). Cooper examined 24 devaluations imposed by developing countries between 1959 and 1966, focusing on the changes in trade flows from the year before to the year after each devaluation. He found the trade balance (measured in foreign cur-

rency) to improve in 15 out of 24 cases, while even more cases showed improvement in the balance of payments (reserve accumulation). The trade-balance improvements derived from both increases in exports and decreases in imports, and these effects remained when allowance was made for changes in world demand (affecting exports) and changes in domestic output (affecting imports). Cooper also showed that while prices and wages tended to rise following devaluation, they did not rise by enough to offset fully the initial change in the nominal exchange rate. Finally, there were indications of contractionary tendencies following devaluation on the part of some elements of aggregate demand. In sum, Cooper's results were consistent with the most optimistic views regarding devaluation, except for his finding of some contractionary tendencies.

While Cooper attempted to control for changes in the international and domestic environment when measuring responses to devaluation, his focus on one-year changes was highly limiting. My own work shows vividly that macroeconomic and external-balance performance may deteriorate markedly prior to the devaluation, making it unclear whether any improvement observed immediately following devaluation is merely cyclical or results from the devaluation itself. To some extent, Bhagwat and Onitsuka (1974) dealt with this problem by comparing longer-term trends in exports and imports during devaluation episodes. While they found evidence of positive long-term export responses to devaluations, they found little indication of significant import responses. Presumably, these findings represented at least partial evidence of long-term improvement in the balance of trade.

But Bhagwat and Onitsuka did not focus directly on the two "bottom line" indicators of external performance: the balances of trade and payments. Salant (1976) examined the responses of these variables to 101 devaluations in both developed and developing countries, calculating their change from three years before to three years after each exchange-rate change. He found that the balance of trade improved in only 46 cases, while the balance of payments improved in 75. This evidence supports a frequently, if informally, made argument that devaluations help countries not by causing real adjustments but by stimulating capital inflows or reducing capital outflows.

Salant, however, did not control for changes in the international environment, and many of the devaluations he studied took place in the mid-1970s, a period of deteriorating trade balances but increased capital inflows for many countries. Hence, it is not clear that the measured performance of the devaluing economies differed significantly from that of the contemporaneous nondevaluing economies. Research by Donovan (1981) is helpful here. He focused on twelve IMF-sponsored devaluations between 1970 and 1976, comparing the performance of the devaluing economies with that of all

non–oil-exporting developing countries. He found that devaluations tend to improve export growth in the long run, though not initially, a result consistent with the "J-curve" view of export response. Paradoxically, he found that import growth rose following a devaluation, though by less than the eventual rise in export growth. Finally, while he found that the inflation rate rose, meaningful reductions in GDP growth were registered only for those programs specifically aimed at import restraint.

Recently, Edwards (1987) applied techniques similar to Donovan's to 18 Latin American devaluations. Edwards found that the current account and levels of international reserves initially deteriorated following the devaluations he studied but then improved over longer (three-year) horizons. Inflation rates tended to increase, while real exchange rates generally appreciated in the years following devaluation.

Gylfason (1987) also used a comparison-group approach in his study of IMF programs implemented during 1977-79. He found that countries with IMF programs that included devaluations showed improved balance-of-payments performance relative to a reference group of nonprogram countries experiencing payments imbalances, but differences in inflation and output growth were not statistically significant. Balance-of-payments improvements were also more marked among the devaluing countries than among IMF-program countries that did not devalue, but inflation performance was poorer and differences in output growth were not statistically significant.

To summarize, direct evidence concerning the impact of devaluations on external balance and macroeconomic performance is mixed and incomplete (see Bird, 1983, for a more detailed and comprehensive survey). There appears to be some consensus that devaluations are followed by improvements in capital inflows and the balance of payments. Only the earliest study, Cooper (1971a), finds movements in both imports and exports in the directions predicted by conventional trade theory. While both Bhagwat and Onitsuka (1974) and Donovan (1981) find some evidence of long-term improvement in exports, neither study shows any negative import response, and Salant (1976) finds an actual deterioration in long-term trade-balance performance. Edwards (1987) confirms the possibility of initial increases in trade and payments deficits, though these are shown to narrow thereafter. The evidence on macroeconomic performance is even sketchier. While Cooper, Donovan, Edwards, and Gylfason find evidence that inflation rises following devaluation, their results differ as to the response of real GDP growth.

3 RESEARCH METHODOLOGY

Before I describe my own strategy for defining the "stylized facts" of devaluation, it will be instructive to review the limitations of a simple empirical study of these events. The initial rough cut at the evidence should have a fairly modest goal: to characterize the historical responses of economies to devaluations of their currencies. While this goal is less ambitious than estimating the structural parameters of an economy's response to devaluation, we still want to exclude any systematic effects of factors that are clearly not associated with the devaluation itself.

The movement of an economic indicator during a devaluation episode can be thought of as deriving from four factors: (a) the exchange-rate change itself, (b) other policies of the stabilization program, (c) changes in the international or external environment, and (d) changes in exogenous domestic factors.

Eventually, we want to isolate the impact of the first factor, the exchange-rate change itself. A preliminary characterization of the devaluation process, however, might satisfactorily stop at isolating the combined effects of the first two factors, the devaluation-cum-stabilization program. It is nevertheless necessary to control for influential factors in the remaining two categories that are systematically related to the timing of devaluations, lest the stylized characterization of the devaluation process be biased. For example, if a country always devalued at the trough of its commodity-price cycle, its terms of trade would systematically rise following its devaluations. In consequence, the "stylized fact" one might infer from the country's data—that the dollar value of exports tends to rise following devaluation—might lead one erroneously to connect the export rebounds to the devaluations themselves. To jump ahead somewhat, my research at least partially accounts for this type of spurious correlation by comparing the devaluing country's performance with the performance of a control group of countries. However, I could find no fully satisfactory method of controlling for exogenous domestic events.

The data on external-balance and macroeconomic-performance indicators during devaluations were analyzed in three steps. These procedures are described in detail below, followed by a discussion of the data set. Briefly, the first step was to calculate the value of each indicator for each of the seven years spanning every devaluation episode for which the requisite data were available; the values of the indicator for each year were then averaged

across all devaluation episodes to create an average time profile for that indicator. Second, an analogous profile was calculated for the average performance of that indicator for the entire country sample. Finally, a number of statistical tests were applied to discern whether the behavior of the devaluing economies differed significantly from the behavior of the entire sample during the same time periods.

Calculating the Time Profiles of Response

For each devaluation, the value of a particular indicator for the devaluing country was calculated for each of seven years, the three years preceding the devaluation and the four years following it. In general, these years did not coincide with the calendar years to which my annual data pertained. Accordingly, the indicator values were constructed as weighted averages of the appropriate calendar-year values with numbers of months as weights. For example, if a devaluation took place in July 1972, indicator values for the year immediately following (which is referred to as the "year of devaluation," or year T) were constructed by averaging the 1972 and 1973 values with weights of five-twelfths and seven-twelfths, respectively; values for the three years preceding and three years following that year were constructed analogously. The value of the indicator for each year was then averaged (unweighted) with the corresponding values for every other devaluation episode in the sample. The result is the average, or stylized, time profile for that indicator over the course of the typical devaluation episode. In aggregating across devaluations, both mean and median averages were calculated. In general, these moved together, though often at very different levels.

Averaging "raw" dollar figures for trade balances, imports, exports, and other variables would produce results unduly influenced by the performance of the largest economies. Therefore, level values of such variables were scaled, or divided by the value of nominal GDP during the year of the country's devaluation, before they were averaged with those of other countries. This procedure corrects for differences in economy size without allowing changes in the scaling factor to influence movements in the performance indicator. Growth rates and other key ratios were already scaled and therefore received no further processing.

Note that both very large and relatively small devaluations were averaged together in the statistical sample. Since large devaluations might be more influential than small ones, it would eventually be desirable to take their size into account. For this initial cut at the data, however, it was important to determine the broadest stylized characterization of economic performance during devaluation episodes. Such a characterization could be mislead-

ing if the smaller devaluations were of the more routine, crawling-peg variety, and the 15 percent cutoff used to select the devaluations was intended to exclude them.

Controlling for Sources of Spurious Correlation

As stated above, the time path of an indicator during a devaluation may be viewed as a response to four factors: the exchange-rate change itself, associated stabilization policies, exogenous international events, and exogenous domestic events. At the moment, I know of no straightforward, fully satisfactory way of controlling for the influence of exogenous domestic events systematically associated with the timing of devaluations. For example, countries may regularly devalue when near the bottom of a business cycle. As in the case of the commodity-price cycle discussed above, GDP growth would then tend systematically to improve after devaluations. There is no way to correct the resultant time profile of GDP growth for this spurious effect without a fully developed model explaining output growth. At the very least, however, inspection of the year-by-year time path of output would help to identify the problem; if such a pattern existed, it would show up as a fall in output growth in the period prior to devaluation. In fact, such deteriorations were evident for a number of indicators studied.

Fortunately, there are more promising ways to control for the influence of external or international factors systematically related to the timing of devaluations. Some authors (Bhagwat and Onitsuka, 1974, and Cooper, 1971a and 1971b) have attempted to control for fluctuations in international conditions by estimating the impact of these fluctuations on the devaluing country's exports; such effects were then removed from or compared with actual export changes. This approach depends excessively on the appropriateness of the prediction model used. Given our relative ignorance about the behavior of most key variables during devaluation episodes, confidence in such models, especially as applied to diverse countries, would appear optimistic at best.

Preferring to remain more agnostic about the causes of country external performance, I followed Donovan's (1981) lead and compared the performance of the devaluing country to the average performance of the entire sample during the time period corresponding to the devaluation episode. Hence, for a devaluation taking place, say, in Chile in 1971, median averages of indicator values for all countries in the sample were calculated for all (weighted averaged) years between 1968 and 1974. Chile's own performance profile during that period could then be compared with that of the comparison group to assess Chile's relative performance over the course of its devaluation episode. After the seven-year vectors of comparison-group averages were calculated, they were averaged across all devaluation epi-

sodes to construct control "time profiles" of performance indicators. That is, the median comparison-group averages corresponding to the first year of the seven-year devaluation period were averaged across all devaluations, the averages corresponding to the second year were averaged together, and so on. The resultant sets of seven cross-devaluation averages represent the stylized profiles of performance by the entire sample over the course of the devaluing country's devaluation episode. The deviations of the devaluing countries' profiles from the control-group profiles represent a stylized measure of the impact of the devaluations on the economies of the countries undergoing the experience.

Presumably, most swings in world demand, terms of trade, and international financing would be reflected in the experience and performance of the comparison group; no specific model of trade and payments determination is needed to control for international fluctuations. Note that the comparison group will always contain one or more devaluing countries. This feature was dictated by computational considerations, but it does not prejudice the results; rather, it imposes a conservative bias against identifying the results of devaluations because it makes the "treatment" and control groups more similar.

Tests for Statistical Significance

Tests for the significance of changes over time were conducted for each indicator for both the devaluing country's performance and the comparison group's performance, and for the difference between the two. In addition to testing for year-to-year changes in indicator values, three measures of longer-term change were tested. The basic long-run effect of devaluation was defined as the difference in the averages of indicator values between the first two years and the final three years of the devaluation episode. This excludes the years immediately preceding and immediately following the devaluation because my findings indicated that these years often differed markedly in character from the more stable ones before and after them. This longer-run measure was then decomposed into the difference between the preceding long-run period and the devaluation year (specifically, the twelve-month period following the month of devaluation) and the difference between the devaluation year and the average of the following three years.

Three different tests of the significance of performance changes over time were calculated. The first was a standard t-test of the mean of the differences in performance indicators (and longer-run averages) over time. (Note that this is not a test of the difference in mean averages for two periods, but rather a test to see if the mean of the sample of devaluation-specific changes between two periods is different from zero.) This test depends upon the normality of the vector of differences in data values, a condition not always