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The Impact of the 1978 Exchange Rate Adjustment in Indonesia on the Non-Oil Trade Account

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I. Introduction

On November 15, 1978, the rupiah/U.S. dollar exchange rate, which had been fixed since 1971, was depreciated by 33 per cent. After this devaluation, a stable link of the rupiah to the U.S. dollar re-emerged. During the first year after the devaluation, tight fiscal and monetary policies were successful in retaining the improvement in relative prices stemming from the devaluation. Domestic inflation was reduced to international levels within six months and sustained at that level for the next six months. However, with the additional foreign resources made available by the second round of oil price increases, domestic expenditure began to outstrip domestic productive capacity and generate pressures on prices and imports. By mid-1981, relative prices of domestic to foreign goods in domestic currency had returned to the level existing prior to the 1978 devaluation; export volume began to stagnate and import volume expanded rapidly. The rupiah's close link to the U.S. dollar was broken in 1982 as the currency was depreciated by almost 8 per cent. Nevertheless, the competitive position of the non-oil sector deteriorated because of the sharp appreciation of the U.S. dollar against major currencies, and the relatively high domestic inflation. Conditions in the international oil market progressively weakened during 1982 and early 1983 and strained the balance of payments. Following the OPEC agreement in early 1983, Indonesia's oil prices were reduced and a production ceiling imposed. In response to lower oil revenue and to improve the competitive position of non-oil exports, the rupiah was depreciated by 28 per cent on March 30, 1983; this devaluation returned the real exchange rate to about the level which prevailed immediately following the devaluation of November 1978.

This paper will analyze the impact of relative prices on the non-oil trade account. The analysis will primarily focus on the effectiveness of the exchange rate adjustment of November 1978 in promoting non-oil exports and restraining imports. The importance of fiscal and monetary policies in supporting an exchange rate action is indicated by Indonesia's experience. The paper is organized as follows: the first section reviews the background to the 1978 devaluation, the developments in the immediate post-devaluation period, and the events leading to the exchange rate action of March 1983--in particular, the consequences of the second round of oil price increases for competitiveness of the non-oil sector; the next section, attempts to quantify the impact of the exchange rate adjustment on the non-oil trade account by estimating import demand and export supply equations and then simulating these equations under alternative exchange rate policies; and the final section summarizes the findings.

II. Review of Developments, 1971-1982

1. Background to the 1978 depreciation

Indonesian exports are composed almost totally of primary commodities with the major commodity being crude petroleum; net oil/LNG exports accounted for about 60 per cent of total merchandise exports during the period 1973-78. Exports of other primary commodities (i.e., timber, rubber, copper, tin, palm oil, and coffee) averaged over 90 per cent of non-oil exports. The immediate consequence of this concentration in commodity exports has been a close association between export prices and economic developments in industrial countries; changes in primary commodity prices can be explained to a substantial extent by fluctuations in economic activity of industrial countries.1/ Moreover, the volume of commodity exports is also responsive to economic conditions in industrial countries. Combining these two factors indicates that export earnings and, therefore, incomes of Indonesians employed in producing these commodities would be subject to cyclical fluctuations.

In addition to the cyclical nature of primary commodity exports, markets for these exports have generally experienced a slower secular growth rate than markets for manufactured goods. Industrial countries' imports of primary commodities grew on average by about 2 per cent in volume terms during the period 1973-78, while their imports of manufactured goods expanded by over 6 per cent per annum. For Indonesia, export volume of important commodities such as timber, rubber, and tin, virtually stagnated from 1973 to 1977. Thus, shifting the export structure toward manufactures and away from primary commodities appeared to be a strategy that would increase the potential growth of non-oil exports and stabilize both earnings and income.

With the fixed exchange rate against the U.S. dollar, domestic inflation had a major impact on the competitiveness of non-oil tradeables (i.e., export- and import-competing goods). The sixfold increase in petroleum prices during the period 1971-78 made the containment of domestic inflation a difficult task. Primarily because of rising oil earnings, real budget revenues expanded more than twofold during this period and reached nearly 18 per cent of GDP. These greater revenues provided the financial resources to intensify the development effort and to improve governmental services. Accordingly, real government expenditures doubled from 1971 to 1977 and increased its share in GDP to 18 per cent. While the bulk of the revenues was derived from external sources, expenditures were mainly on domestic goods and services. As a result, budetary operations had an expansionary impact on domestic credit. At the same time, private sector expenditures were also stimulated by rapid expansion in domestic credit. Credit to the private sector and state enterprises rose at an annual average rate of 43 per

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1/ See, for instance, Louis Goreux (1980).

cent from 1972 to 1978; liquidity grew at an average pace of 33 per cent per annum during this period and created strong inflationary pressures.

Greater expenditures by both private and public sectors were not, however, matched by expansion in the domestic productive capacity. Thus, heightened demand pressures strained domestic resources and resulted in higher prices and more imports; in particular, between 1972 and 1975, the price level more than doubled and imports of the private sector nearly tripled. Over the period 1971-78, domestic inflation averaged 19 per cent, compared with an annual average increase in export unit values of industrial countries of 12 per cent; real imports rose by nearly 13 per cent per annum. The sharp rise in domestic prices relative to export prices and import prices is shown in Chart 1. Indonesian producers of import competing goods during this period were squeezed as domestic prices rose 60 per cent faster than the domestic currency price of imports. Notwithstanding an improvement in the non-oil terms of trade during this period, the profitability of the export sector declined by 40 per cent. This deterioration in the competitive position of the traded goods sector was considered to be a major factor underlying the sluggish development of the sector--non-oil exports as a share of GDP declined from 8 per cent to 7 per cent during 1971-78. Moreover, aside from restraining growth in products already exported, the high relative cost-price structure also deterred development of a competitive manufacturing sector. Consequently, manufacturing production was concentrated in heavily protected industries.

An important consideration in the decision to stimulate the non-oil sector was the outlook for the oil sector. Over the four-year period 1971-74, net oil sector exports increased twelve-fold to US$2.6 billion. However, in the subsequent four-year period, net oil sector exports rose by only 68 per cent to US$4.4 billion. Unlike the earlier period, this expansion stemmed primarily from a volume increase of 42 per cent as prices rose by only 18 per cent. By 1978, the outlook for further large increases in export volume for petroleum was dim because rapidly rising domestic consumption was expected to cut into a stagnating or slightly declining production. In the absence of large price increases for petroleum, the oil sector did not appear to offer the same potential for financing development and stimulating growth that it had in the past. Thus, more rapid development of the non-oil sector, especially tradeable goods, was needed to supplement the growth stimulus previously provided by the oil sector and to support the balance of payments.

2. Immediate post-devaluation developments

The adjustment of the rupiah/U.S. dollar exchange rate in November 1978 raised the rupiah equivalent of a unit of foreign exchange by 51 per cent and, thereby, made production of export or import-competing goods substantially more profitable. However, by raising the domestic currency price of imports, the devaluation also caused the consumer price index to rise. As seen in Chart 2, this resulted in a burst of

inflation following the devaluation (based on a three-month moving average of annualized monthly inflation rates). With the relatively constant rupiah/U.S. dollar exchange prevailing after the devaluation, if prices for nontradeable goods were to increase pari passu with prices for tradeable goods then a more favorable relative price relationship for tradeable goods would not be established. To deter nontradeable goods prices from increasing and thus support the expenditure switching objective of exchange rate policy, tighter demand management policies were pursued. Although the overall budgetary deficit as a percentage of GDP in fiscal year 1978/79 remained virtually unchanged from the previous year, the domestic resource imbalance emanating from the budget was greatly reduced (Table 1). The domestic budgetary deficit--the difference between domestic expenditures and domestic revenues--was lowered from 6.9 per cent of GDP in 1977/78 to 5.2 per cent in 1978/79 and 1979/80. Monetary policy during 1979/80 contributed to reducing inflationary pressures by lowering the expansion in domestic credit to the private sector and state enterprises to only 14 per cent in 1979/80; with the 23 per cent inflation, domestic credit declined in real terms by 9 per cent.

As a result of tight demand management, inflation quickly abated after March 1979 and by October 1979 had dropped to below 10 per cent. During the second semester of 1979/80 (October-March) inflation averaged 11 per cent which was 3 percentage points below foreign inflation as measured by export unit values of industrial countries. Thus, demand management policies succeeded in reducing domestic inflation to below international levels within a short time (six months) after the devaluation and sustained inflation at that level for six months.

Earnings from non-oil exports rose by over 75 per cent during 1977-79; export volume increased by 35 per cent. The rise in nontraditional exports--nonprimary commodity exports such as handicrafts, rattan, and electrical appliances--was even greater as earnings from these exports more than tripled. In 1979, export volume of these items expanded by 86 per cent compared with an average increase of 20 per cent in each of the preceding years (Table 2). Consequently, their share in non-oil export earnings was increased from 7 per cent to 10 per cent even though traditional export earnings were also expanding rapidly. Thus, progress was made in shifting the composition of exports toward manufactures and away from primary commodities.1/ Imports, which had been growing at 22 per cent during 1976-78, slowed to 12 per cent in 1979 as the increase in import volume decelerated from an average of 10 per cent per annum in 1976-78 to 2 per cent in 1979.

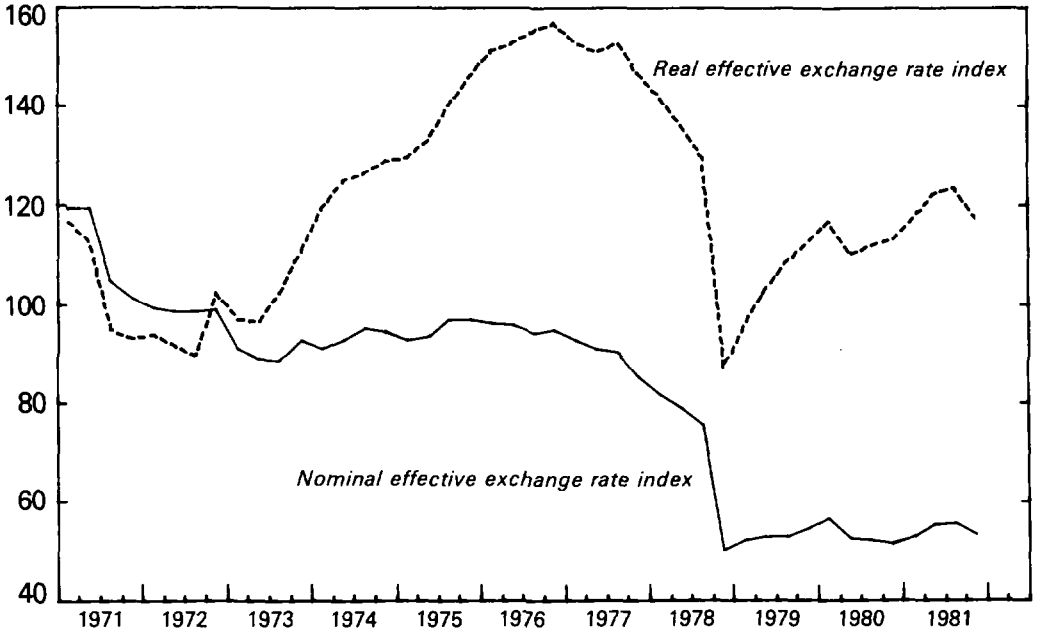
1/ The profitability of exporting manufactured items was also enhanced after the devaluation by an export certificate scheme wherein eligible exporters received a rebate of import duties.

CHART 1

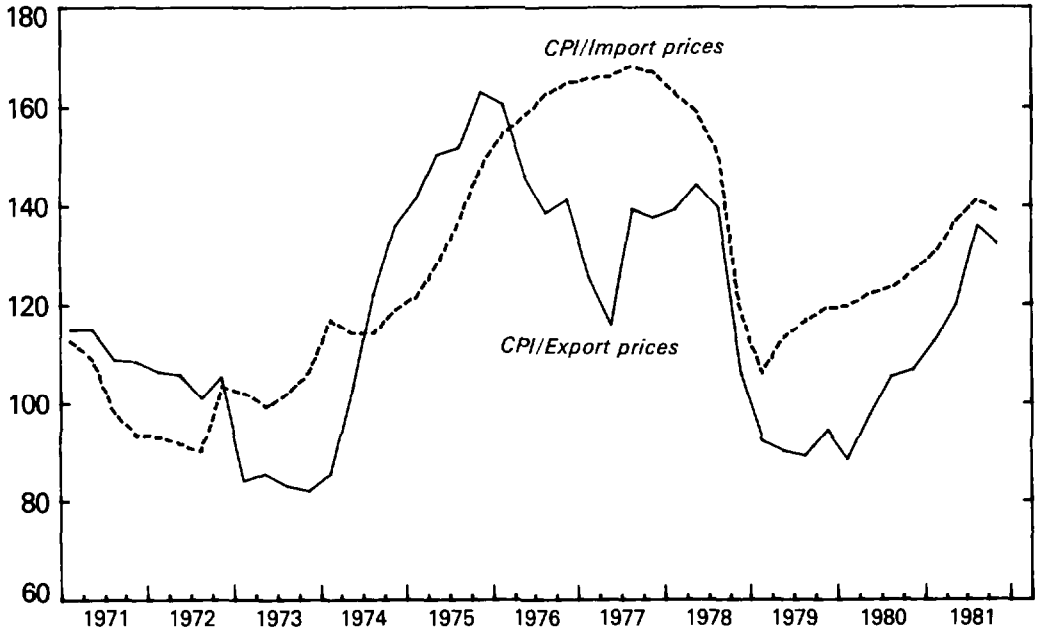
INDONESIA

INDICES OF NOMINAL AND REAL EFFECTIVE EXCHANGE RATES[1], QI 1971 TO QIV 1981

(1971-1973=100)



RATIOS OF CPI TO INDICES OF EXPORT AND IMPORT PRICES[2]



Sources: IMF, International Financial Statistics; and Fund staff estimates.

[1]Trade weighted; an increase in the index represents an appreciation.

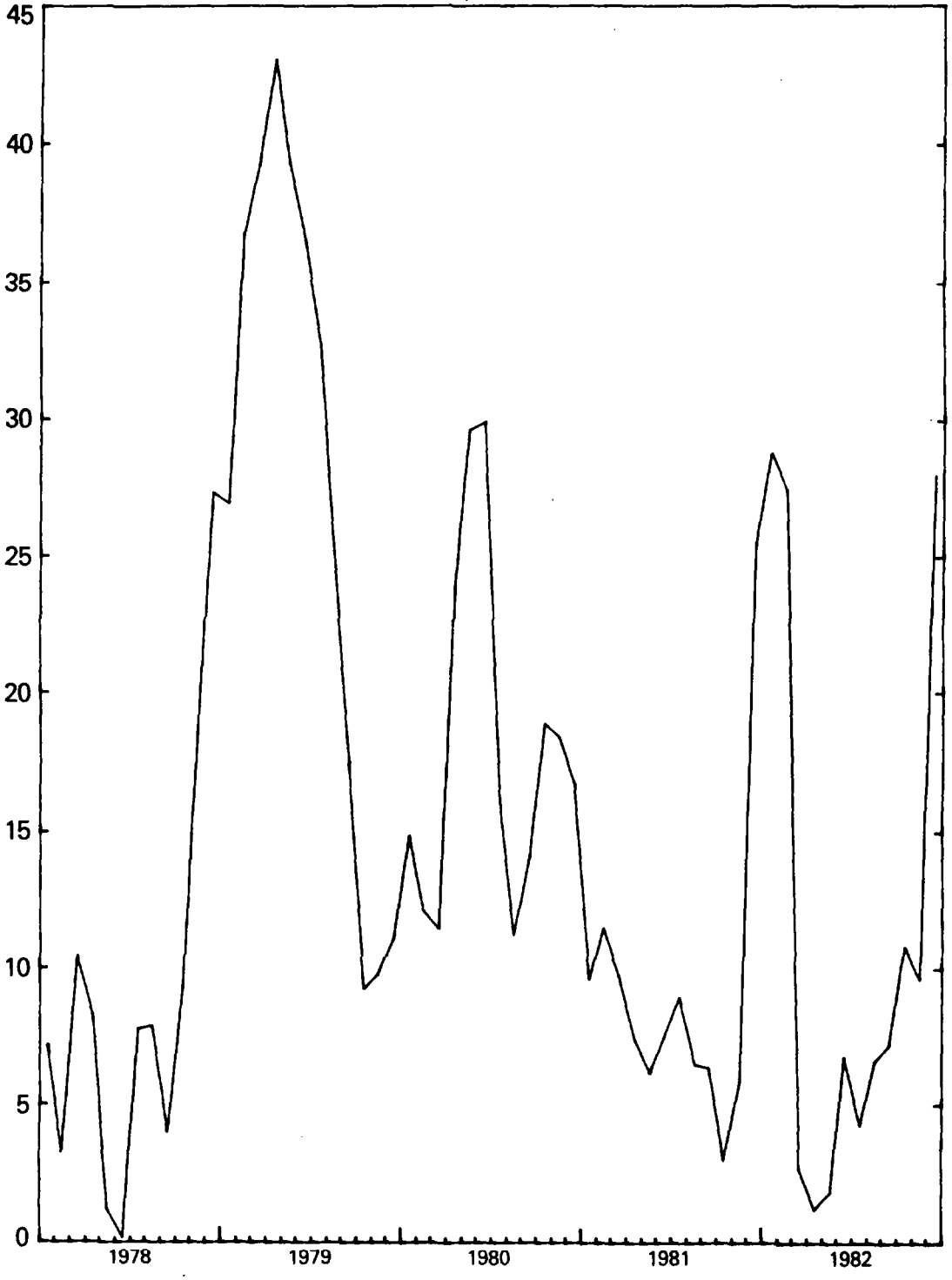
[2]Export and import prices are measured in domestic currency terms.

CHART 2

INDONESIA

THREE-MONTH MOVING AVERAGE OF ANNUALIZED MONTHLY INFLATION RATES, JANUARY 1978 TO DECEMBER 1982

(In per cent)



Sources: IMF, International Financial Statistics; and staff estimates.

Table 1. Indonesia: Government Budget, 1977/78-1982/83

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
			(In trillions of rupiahs)			
Revenues	3.5	4.3	6.7	10.2	12.2	12.4
Foreign sources 1/	(1.9)	(2.3)	(4.3)	(7.0)	(8.6)	(8.2)
Domestic sources 2/	(1.6)	(2.0)	(2.4)	(3.2)	(3.6)	(4.2)
Expenditures	3.9	4.7	6.6	9.6	13.3	14.8
Foreign expenditures 3/	(0.9)	(1.4)	(2.3)	(2.9)	(3.4)	(3.7)
Domestic expenditures	(2.9)	(3.3)	(4.3)	(6.7)	(9.9)	(11.1)
Overall balance	-0.4	-0.4	0.1	0.6	-1.1	-2.4
Foreign balance	(1.0)	(0.9)	(2.0)	(4.1)	(5.2)	(4.5)
Domestic balance	(1.4)	(-1.3)	(-1.9)	(-3.5)	(-6.3)	(-6.9)
			(In per cent of GDP)			
Overall balance	-1.9	-1.8	0.3	1.3	-2.1	-3.9
Foreign balance	(5.0)	(3.4)	(5.6)	(8.6)	(9.4)	(7.3)
Domestic balance	(-6.9)	(-5.2)	(-5.3)	(-7.3)	(-11.5)	(-11.2)

Sources: Data supplied by the Indonesian authorities; and staff estimates.

1/ Includes in-kind petroleum payments, and earnings from foreign oil companies.

2/ Includes domestic income tax, indirect tax, nontax revenue, and earnings from Pertamina.

3/ Includes petroleum subsidies and direct foreign expenditures.

Table 2. Indonesia: Selected Non-Oil Export Volume, 1976-81

(1978 = 100)

	1976	1977	1978	1979	1980	1981
Handicrafts	61.7	86.2	100.0	292.6	258.5	286.2
Rattan	89.3	109.7	100.0	152.8	112.2	110.6
Electrical appliances	66.0	65.8	100.0	147.2	107.5	116.6
Other 1/	66.5	80.4	100.0	192.0	217.8	155.5
Total	69.5	82.7	100.0	185.9	185.5	151.9

Sources: Data provided by Bank Indonesia; and staff estimates.
1/ Value data deflated by export unit value of industrial countries.

3. Impact of the second round of oil price increases

With the more than twofold increase in petroleum prices during 1979-80, Indonesia's external terms of trade improved sharply. Consequently, real gross national income grew twice as fast as real GDP during 1979-81. The greater imbalance between purchasing power and domestically produced goods fueled inflation and an import boom. Underlying this expansion in expenditures was the stance of fiscal and monetary policy during 1980/81 and 1981/82. The budgetary domestic deficit more than doubled rising from 5 per cent of GDP in 1979/80 to an average of 11 per cent during 1981/82 and 1982/83. The higher domestic budgetary deficits placed greater pressure on domestic resources.1/ In addition, private sector demand was stimulated by a

1/ In 1980/81, the greater domestic budgetary deficit was more than offset by the increase in the foreign budgetary surplus; thus a larger overall budget surplus resulted. In 1981/82, however, the increase in the foreign budgetary surplus fell substantially short of the expansion in the domestic deficit and the overall fiscal position turned to deficit. The swing of 3.4 percentage points in the overall fiscal position was equivalent to about half of the change in the external current account between 1980/81 and 1981/82. The decline in the foreign surplus in 1982/83 was not offset by a similar contraction in the domestic deficit; consequently, the overall deficit expanded by almost 2 per cent of GDP which once again was equivalent to about half of the deterioration in the external current account.

higher growth rate for credit to the private sector and state enterprises which nearly doubled to an annual average of 27 per cent for the period 1980/81-1982/83. Liquidity expansion also increased and averaged 40 per cent per annum during 1980/81 and 1981/82, before slowing to 10 per cent in 1982/83.

With the increase in budgetary and aggregate demand pressures, inflation accelerated to an average of about 18 per cent in 1980. Foreign inflation slowed from 12 per cent during 1980 to 2 per cent during 1981 and contributed to the reduction in domestic inflation to about 8 per cent during 1981. The higher average inflation in Indonesia than in industrial countries during the period 1980-82, combined with a decline in foreign export prices produced a deterioration in the cost-price structure for the traded sectors. By late 1980, higher domestic inflation raised the relative price of Indonesian to foreign goods to 20 per cent above the level prevailing after the devaluation; by late 1981 the relative price structure deteriorated further and the ratio of domestic to foreign prices was 30 per cent higher. Thus, by mid-1981, the relative price of domestic goods to imported goods or exports had returned to the relationship existing prior to the 1978 devaluation. Associated with this erosion in external competitiveness was stagnation and then a decline in exports. In particular, export volume of nontraditional exports was unchanged in 1980 and fell by 18 per cent in 1981.

III. Quantitative Impact of Exchange Rate Adjustment on the Non-Oil Trade Account

The competitive position of tradeable goods was improved by the exchange rate adjustment of November 1978 for a relatively short time. Moreover, other developments make it difficult to distinguish the impact of the change in relative prices on non-oil trade flows from other factors. To disentangle the impact of these various factors on the non-oil trade account, the import demand and export supply functions were econometrically estimated and employed to simulate imports and exports under alternative exchange rate scenarios. The technical issues and estimation procedures are described in the next sub-section. However, the reader may wish to proceed immediately to the results presented in sub-section 2.

1. Specification and estimation of Import and Export Equations 1/2/

a. Demand for imports

In Indonesia, as with most developing countries, the foreign price of imports can be treated as exogenous because the country is small

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1/ Due to data availability, the import and export equations were estimated only through 1981.

2/ For an extremely useful presentation of the empirical issues related to estimating export and import functions, see M. Goldstein and M.S. Khan (1982 b.).

relative to the global market. Indonesian imports accounted for only about 0.6 per cent of global imports during the period 1971-81. It can, therefore, be assumed that imports are demand determined. Demand for real imports (M^d) is a function of the domestic income (RI), relative price of foreign to domestic goods (RP), and the excess supply of liquidity, L^s. This function was specified in a log-linear form to permit direct estimation of elasticities:

$$\log M^d = a_0 + a_1 \log RI - a_2 \log RP + a_3 (\log L^s - a_4 \log RI); \; a_1, a_2, a_3, a_4 > 0 \quad (1)$$

As is standard for demand curves, the income variable has a positive impact and the price term a negative effect.1/ An excess supply of money increases domestic prices relative to foreign prices for a given exchange rate and thereby shifts demand to foreign goods. The relative price term incorporates this indirect impact of excess liquidity on imports. However, excess liquidity also directly increases imports by raising the demand for all goods--foreign and domestic. This mechanism is emphasized by the monetary approach to the balance of payments. Until recently, import demand functions have not attempted to measure this direct impact. The positive impact of excess liquidity on imports is measured by actual liquidity less the demand for liquidity which is a function of real income.

To account for importers' behavior when they are off their long-run demand curve, a partial adjustment mechanism was introduced relating the change in imports at time t to the difference between import demand in that period and actual imports in the previous period:

$$\Delta \log M_t = k [\log M_t^d - \log M_{t-1}] \quad (2)$$

where $\Delta \log M_t = \log M_t - \log M_{t-1}$ and k is the coefficient of adjustment ($0 \leq k \leq 1$). A theoretical rationale for equation (2) is provided by the existence of adjustment costs, delivery delays, recognition lags, and contracts extending beyond the frequency of the data (i.e., three months). All these factors would reduce, in the short run, the speed at which importers adjust to changes in relative price or real income. This framework permits estimation of the mean time lag in the adjustment of actual imports to import demand.

1/ A variable representing abrupt changes in relative prices was also included when the equation was estimated. This variable attempts to measure the impact of large changes in relative prices; some economists have argued that the relative price elasticity would be larger for large price changes than for small price changes.

Substituting of equation (1) into equation (2), and solving for imports in period t results in:

$$\log M_t = ka_o + k(a_1 - a_3 a_4) \log RI - k a_2 \log RP + \\ + k a_4 \log Ls + (1 - k) \log M_{t-1} \qquad (3)$$

where the coefficients on real income, relative prices, and liquidity represent short run, or impact, elasticities. The coefficient on real income is indeterminate because higher real income increases money demand, and, thereby, reduces pressure on import demand.

Data on non-oil imports is available for three categories: imports under government programs, which are primarily food items; imports of capital goods imports, which are largely related to implementation of government projects; and imports by the private sector--nonprogram imports. Because government policy determines imports in the first two categories,1/ the import demand equation was estimated only for nonprogram imports. Real imports were obtained by deflating nonprogram imports by a foreign price deflator calculated as a weighted average of trading partners' export prices. Equation (3) was estimated using ordinary least squares; the period of estimation was the first quarter of 1971 through the fourth quarter of 1981 and the data were seasonally adjusted. In addition, the more traditional specification of an import demand equation--without the direct effect of excess liquidity ($a_4 = 0$)--was also estimated. The results are shown in Table 3 with the t-values provided in the parentheses below the estimated coefficient.

The coefficient for relative prices has the expected sign and is significantly different from zero at the 5 per cent level in both equations. A dummy variable which was introduced for measuring the quantum effect of the 1978 devaluation on relative prices also has the anticipated sign and is statistically different from zero at 10 per cent level of confidence. These coefficients are virtually identical between the two equations indicating that these values are fairly robust to this change in specification. As expected the coefficient on real income is positive and smaller in the equation with real money balances than in the equation without real money balances; both coefficients are significant at the 1 per cent level of confidence. The coefficient on real money balances has the anticipated sign and is statistically different from zero at the 10 per cent confidence level. The coefficient on lagged imports is significant at the 1 per cent level. The fit of these two equations, as evidenced by the R^2 and Charts 3 and 4, is very good. The hypothesis of serially correlated error terms, which also is an indication of a misspecified equation, can be rejected by the near zero value of the H-statistic.

1/ Capital imports associated with government projects average about 75 per cent of capital goods imports. Moreover, through the Board of Investment, the government regulates foreign and domestic investment which account for the remaining 25 per cent.

Table 3. Indonesia: Import and Export Equations 1/

Equation	Constant	Relative Prices	Real Gross National Income	Dummy	Real Money	Lagged Dependent	R^2	H-Statistic 2/	S.E.E.
Demand									
Real nonprogram imports	-3.74	-0.18	0.61	-0.01 3/	0.20	0.34	0.98	-0.15	0.06
	(-2.60)	(-2.31)	(2.85)	(-1.87)	(1.47)	(2.87)			
Real nonprogram imports	-5.18	-0.18	0.83	-0.01 3/	--	0.36	0.98	0.79	0.06
	(-4.83)	(-2.29)	(5.41)	(-1.79)	--	(2.96)			
Supply									
Real non-oil exports, excl. timber	-5.51	0.61	0.53 4/	-0.09 5/	--	0.90	0.91	-1.29	0.18
	(-2.38)	(3.30)	(2.11)	(-0.86) 5/	--	(8.41)			

1/ t-values are shown in parentheses below coefficient.

2/ H-statistic is employed in place of the Durbin-Watson statistic because of the use of a lagged dependent variable. If the absolute value of H is greater than 1.645 then the hypothesis that autocorrelation is absent would be rejected.

3/ Dummy variable for large changes in relative price attendant on the devaluation and is zero everywhere except the fourth quarter of 1978 and first quarter of 1979 where it has the logarithmic value of relative prices.

4/ Represents proxy for capacity.

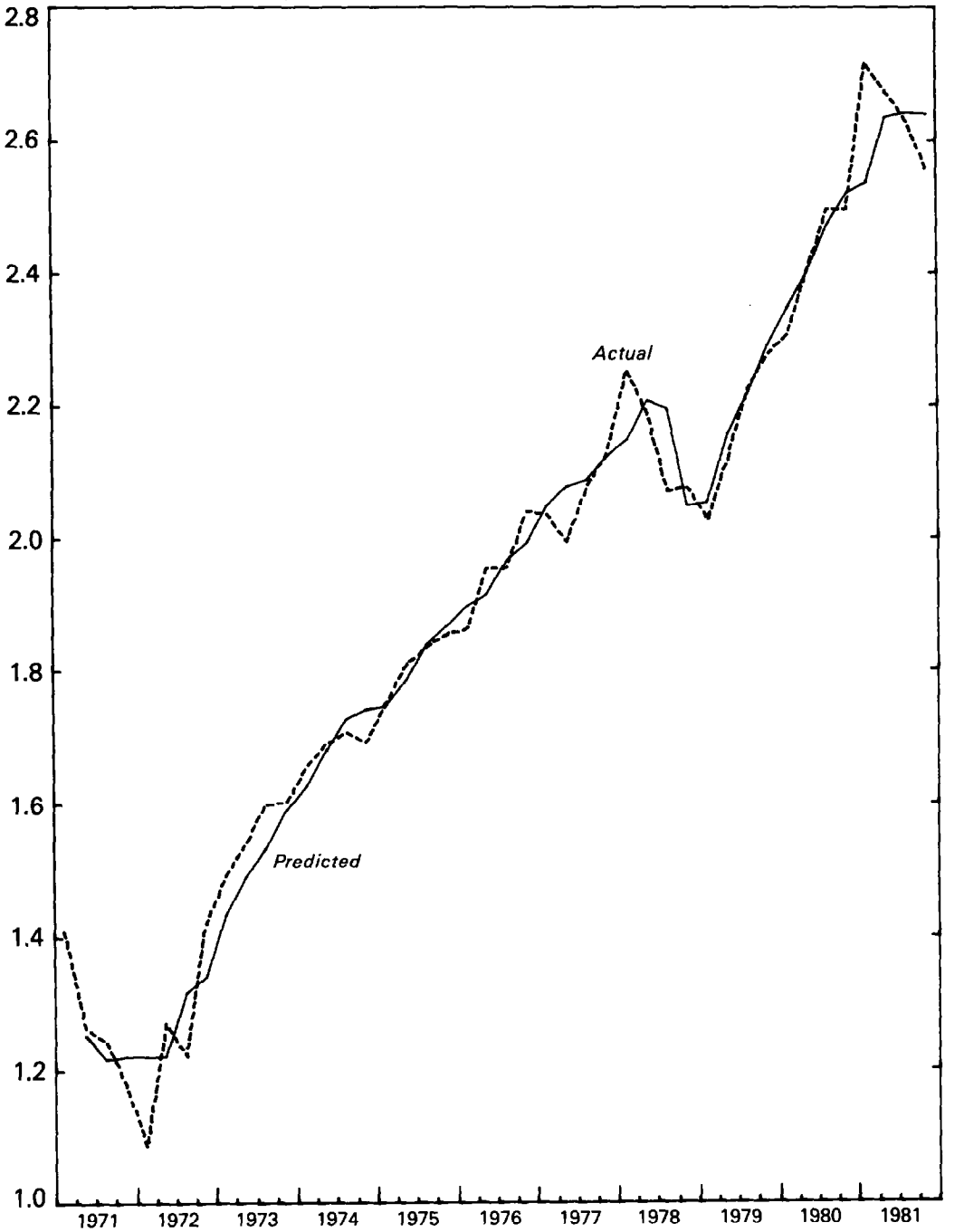
5/ Dummy variable for large changes in relative prices attendant on the devaluation. This valuable is zero everywhere except from the fourth quarter of 1978 to the second quarter of 1979 where it has the logarithmic value of relative prices.

CHART 3

INDONESIA

REAL NONPROGRAM IMPORTS—ACTUAL AND PREDICTED[1] Q I 1971 TO Q IV 1981

(Logarithmic value in millions of 1975 U.S. dollars)



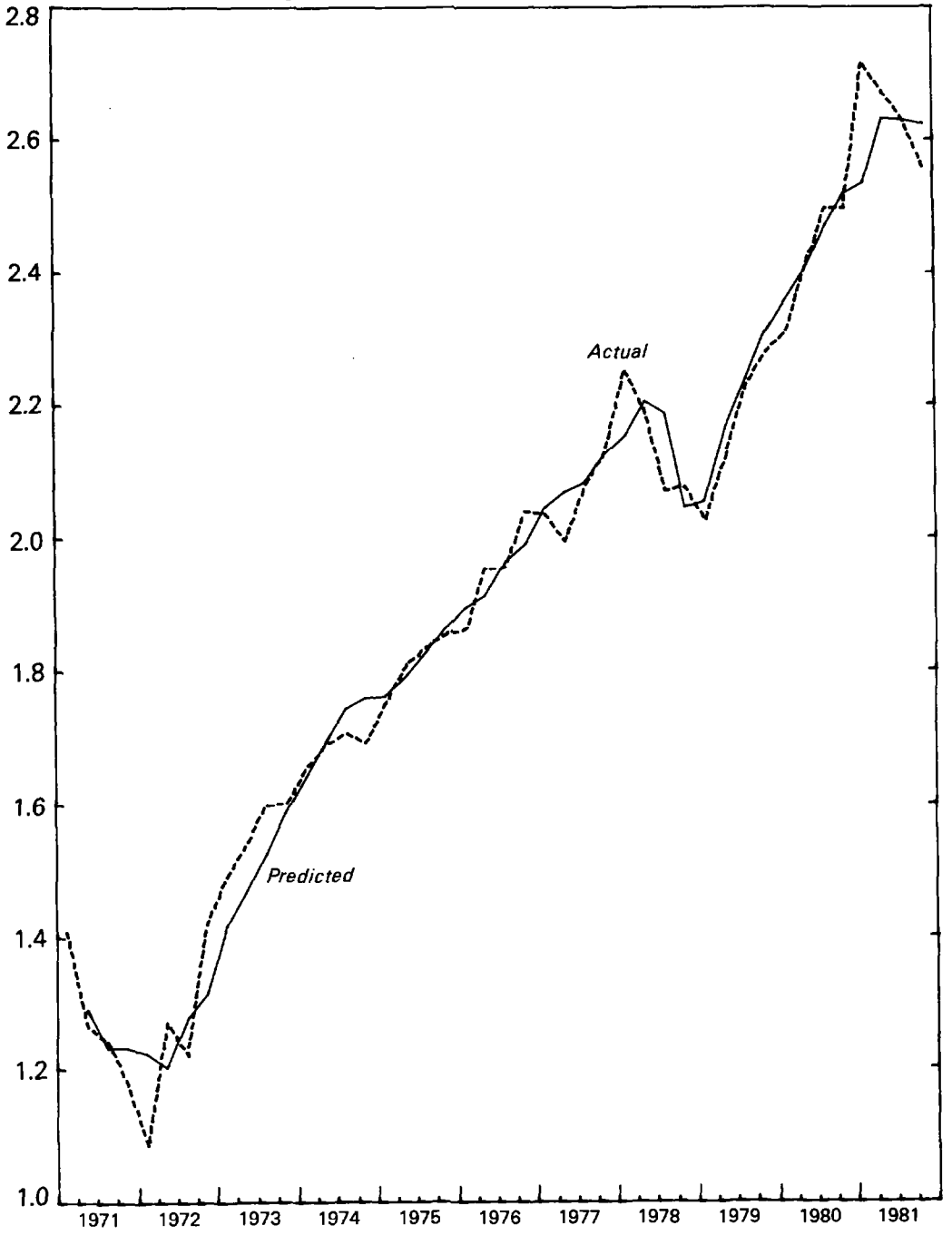
[1] Based on equation with real money balances.

CHART 4

INDONESIA

REAL NONPROGRAM IMPORTS—ACTUAL AND PREDICTED[1] Q I 1971 TO Q IV 1981

(Logarithmic value in millions of 1975 U.S. dollars)



[1]Based on equation without real money balances.

The estimation results provide little to distinguish which of the two specifications is better. However, econometric theory indicates that omitting a relevant variable, such as real balances, would bias the coefficients of the remaining variables--in this case the bias on the income coefficient would be upward but it is not clear in what direction the coefficient on relative prices would be biased. In this connection, it is interesting to recall that the income elasticity in the equation without real money balances is larger than in the equation with real money balances. Moreover, if the proper specification is the equation with real money balances, then the income coefficient in the equation without real balances would be larger by the income elasticity of real money. The income elasticity for real money derived from these two equations is 1.23 which is consistent with direct estimates of the income elasticity for real balances.1/ This is indirect support for the specification with real balances.2/

b. Supply of exports

Like importers, exporters in Indonesia are also assumed to be price-takers on the world market. For most commodities, this assumption presents no problem as Indonesia has a negligible share of the world market. Even in those commodities where Indonesian exports are not trivial, these exports were a small share of the relevant market, during this period.3/ Export supply is specified as a function of profitability and domestic capacity. Export profitability, and, thus export supply, rise as the relative price of exports (in domestic currency terms) to domestic price increases; the relative price terms

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1/ One example is the paper by B.B. Aghevli, M.S. Khan, P.R. Narvekar, and B.K. Short (December 1979). In that paper, real income was defined as real gross national product whereas in this paper it is defined as real gross national income (GNY), which includes the gains from the improvement in the terms of trade. During the period 1971-81 gross national income grew on average 50 per cent faster than real GDP. Consequently, it would be expected that the long-run income elasticity for real money balances reported using real GDP would be 50 per cent higher than using real GNY. In fact, the reported elasticity in their paper was 1.85 or 50 per cent higher than the value given in the text.

2/ In simulation exercise only the results using the real balance equation are presented; however, both equations were simulated and the results were nearly identical. This is not surprising given that the relative price coefficients are the same and the close relationship described in the text between income and real balances.

3/ Indonesia's share in world production of coffee and tin was only 5 per cent and 10 per cent, respectively. For rubber, Indonesia's share of the natural rubber market was more substantial--averaging 25 per cent--during the period 1971-81. However, the share of natural rubber in the market for natural and synthetic rubbers was only about 32 per cent; therefore, Indonesia's share of the larger market was limited to 8 per cent.

(RPD) was measured as the ratio of the weighted average of Indonesia's major export commodities to domestic CPI. The ability of exporters to supply the foreign market is constrained by the country's productive capacity. For Indonesia, real gross domestic product (RGDP) serves as a proxy for capacity. As with the previous equation, the export supply equation is specified as a log-linear function:

$$\log X^s = c_0 + c_1 \log RPD + c_2 \log RGDP \; ; \quad c_1, c_2 > 0 \qquad (4)$$

This equilibrium supply equation can be transformed to accommodate sluggish supply response by employing a partial adjustment mechanism similar to equation (2):

$$\Delta \log X_t = j \, [\log X_t^s - \log X_{t-1}]; \; 0 \leq j \leq 1 \qquad (5)$$

Substituting of equation (4) into equation (5), and solving for exports in period t, yields:

$$\log X_t = jc_0 + jc_1 \log RPD + jc_2 \log RGDP + (1 - j) \log X_{t-1} \qquad (6)$$

Timber exports, which averaged 30 per cent of non-oil exports during the 1970s, were restricted in 1980 and 1981 by the Government for conservation reasons and to promote the domestic processing of logs. Existing capacity for processing timber limited exports of plywood and other sawn-wood products; consequently, earnings from timber exports declined by 43 per cent from its peak of $1,917 million in 1979 to $1,095 million in 1981, as export volume fell by 45 per cent. To segregate the impact of this policy from the impact of relative prices, non-oil exports were estimated excluding timber. Seasonally adjusted data from the second quarter of 1971 to the fourth quarter of 1981 was employed.

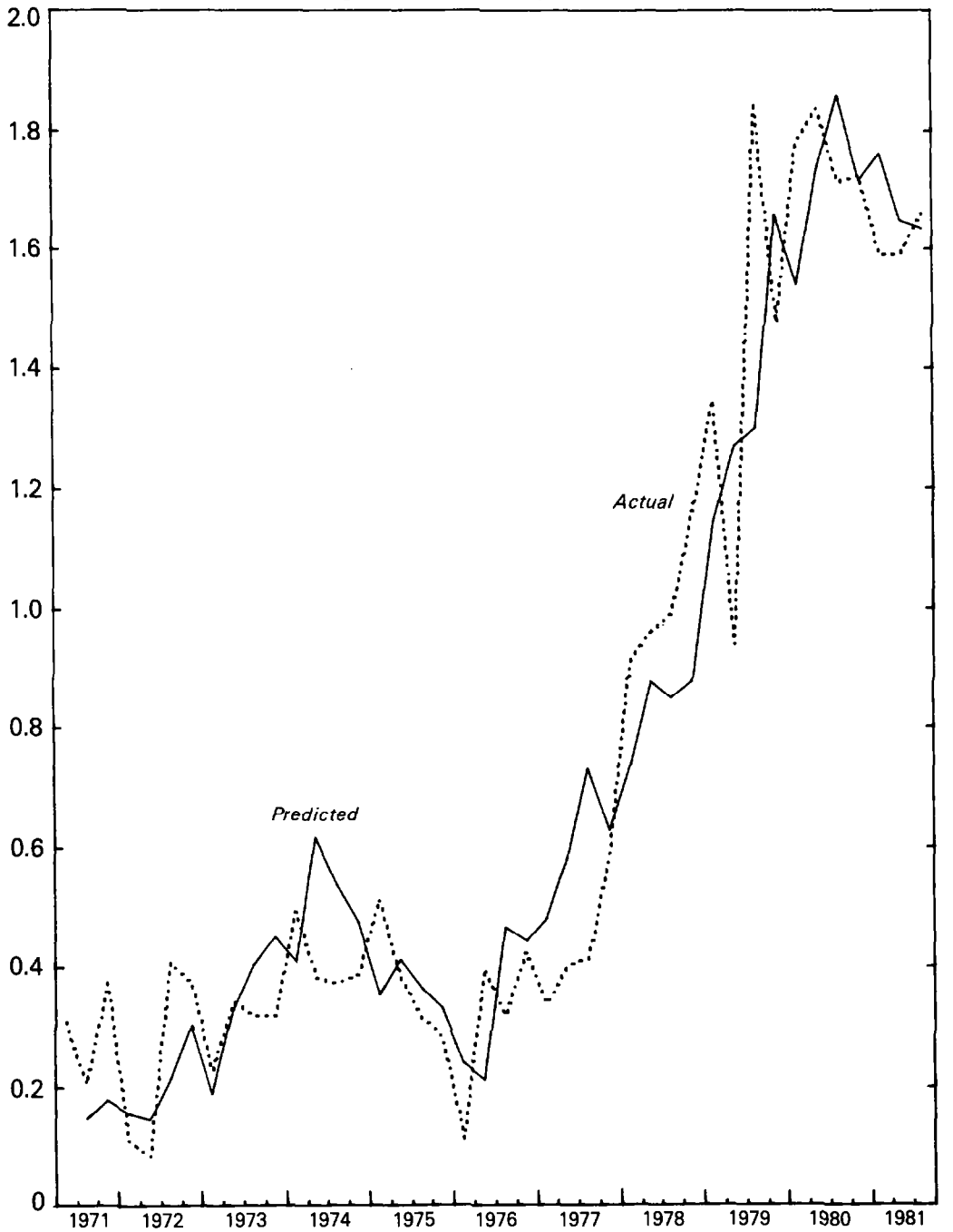
The estimation results for equation (6) are provided in Table 3. The coefficient on relative prices and the coefficient on lagged exports have the expected positive sign and are significantly different from zero at the 1 per cent level. The coefficient on the capacity variable (RGDP) is positive, as anticipated, and significant at the 5 per cent confidence level. The coefficient on the dummy variable, which was introduced to measure the quantum effect of the devaluation on relative prices, is not significantly different from zero. Although this equation does not fit as well as the other equations in Table 3, it, nevertheless, performs reasonably well as indicated by the high R^2 and as shown in Chart 5. The H-statistic is substantially below the critical

CHART 5

INDONESIA

SUPPLY OF REAL NON-OIL EXPORTS EXCLUDING TIMBER-- PREDICTED AND ACTUAL, QII 1971-QIII 1981

(Logarithmic value of export volume)



value; thus, serial correlation is not present. More than the usual caution applies to these estimation results because the coefficient of lagged exports is so near its upper limit, which implies relatively sluggish adjustment. In addition, small changes in this coefficient have a large impact on the derived long-run elasticities.

2. Estimation results

The econometric results of the previous section indicate that the estimated equations for import demand and export supply are well specified according to standard measures. The estimated elasticities and the adjustment lags, obtained from these regressions are presented in Table 4. The mean adjustment lag for import demand is shorter than for export supply. It is not surprising that production lags constrain short-run increases in export supply more than delivery lags constrain imports. These adjustment lags also imply that short-run elasticities for exports are substantially smaller than the long-run elasticities.

The short- and long-run elasticities for import demand are within the range reported for other developing countries. The relative price elasticities are small, both in the short run and in the long run, and are on the inelastic portion of the demand curve. These elasticities are, nevertheless, significantly different from zero, indicating that relative prices do have an influence on import demand even in the short run. The short lag in adjustment of import demand to changes in income and relative price movements is to be expected given the relatively free exchange system in Indonesia.

Turning to the export supply equation, the results indicate that the supply-price elasticity is moderate in the short run and rises to a long-run value of about 6. (Price elasticities of export supply have generally been estimated for industrial countries and have ranged between one and seven, with values as high as fifteen reported.) A high-supply price elasticity could reasonably be expected in countries with a relatively small export sector since it is easier to increase exports when there is large domestic productive capacity to draw upon; during the 1970s, non-oil exports, excluding timber, averaged about 6 per cent of GDP. The small share of the non-oil export sector in total GDP would also explain the high coefficient for the capacity variable (i.e., real GDP). The mean lag time for the adjustment of export supply is nine quarters which is not surprising given that the major export commodities (tin, rubber, coffee) have a long lead time between investment and incremental output.1/

It should be recalled that the mean adjustment lag and the estimated long-run elasticities (i.e., the estimated coefficient divided by the adjustment coefficient) are only known with limited

1/ The World Bank has estimated that the adjustment of tin, rubber, and coffee supply to higher prices requires 3, 7, and 7 years, respectively, which accords with this result.

Table 4. Indonesia: Short-run and Long-run Elasticities and Average Adjustment Lag

	Price Elasticities		Income Elasticities		Excess Liquidity		Mean Adjustment Lag (In months)
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	
Import demand equations							
Without real money	-0.20 1/	-0.31	0.83	1.30	--	--	2
With real money	-0.20 1/	-0.30	0.61	0.93	0.196	0.299	2
Export supply equations							
Real non-oil exports excl. timber	0.61	6.00	0.53 2/	5.19 2/	--	--	26

1/ Includes dummy variable.
2/ Represents proxy variable for capacity.

precision--defined by the standard error of the coefficient. This caveat is especially important as the adjustment coefficient nears its upper bound because the same imprecision is introduced into the derived long-run elasticities; for example, if the adjustment coefficient was smaller by one standard deviation then the long-run elasticities would have only half their reported value.1/

3. Simulation exercises

Using the specification of import demand and export supply functions, the impact of the 1978 devaluation on non-oil trade account was analyzed by simulating hypothetical exchange rate scenarios. Real imports were simulated under two alternative scenarios. Scenario I assumes that the structure of relative prices prevailing prior to the depreciation (i.e., third quarter of 1978) continued unchanged for the remainder of the simulation period. This scenario is termed no real devaluation. Scenario II, on the other hand, assumes that the more favorable relative prices created after the exchange rate adjustment were maintained--specifically those established in the first quarter of 1979. This scenario is referred to as the maintained real devaluation. The impact of the actual path of relative price on import volume is compared with the paths under the two assumed exchange rates assumptions in Chart 6. As can be seen, the actual relative price developments kept import volume below the level simulated by the no devaluation scenario, until 1981. However, as the relative price structures under Scenario I converged with actual developments, the import volumes became less disparate; and by 1981, when the relative prices had become virtually identical, import volumes were the same. Under Scenario II, import volume would have grown much slower and would have been over 20 per cent lower in 1981. The full implication of these alternative scenarios on foreign resources are summarized in Chart 7, where the cumulative differences between simulated imports and actual imports are presented. According to the simulation, if no real devaluation had taken place, higher imports would have resulted in lower international reserves by about $1 billion. Even more interesting is the simulation result under a maintained real devaluation; imports over the three post-devaluation years would have been $3.5 billion less than actual imports. Thus, the total savings from reduced imports under the two alternative scenarios would have been over $4.5 billion or 5.3 per cent of GDP in 1981.

As with imports, the impact of the actual path of relative prices on real export supply is compared with the paths under two alternative relative price assumptions (Chart 8). Scenario I has no exchange rate adjustment in November 1978 and consequently relative prices are less

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1/ A reduction in the adjustment coefficient for the import equation of the same absolute amount would only change the long-run elasticities by 15 per cent because its adjustment coefficient is much further from the upper bound.

favorable for exporters. In Scenario II the improved cost-price structure existing after the depreciation is maintained for the remainder of the period--specifically the relative prices in the second quarter of 1979 were used.1/ Export volumes, under the alternative exchange rate scenarios and the actual exchange rate policy, were multiplied by actual export prices to obtain export earnings. As previously noted, export prices may be affected by changes in export volume but the impact is likely to be small; consequently, this feedback in prices was ignored in these calculations. The cumulative differences between simulated export earnings and actual earnings are presented in Chart 9. According to these calculations, reduced exports under scenario I would have resulted in lower international reserves by about $0.8 billion, in late 1981. However under scenario II, the simulation results indicate that international reserves would have been almost $0.9 billion above their actual level. Thus, the difference in export earnings under the two alternative scenarios would have been about $1.7 billion or 2.0 per cent of GDP in 1981. The gains from exports are less than the savings reported from imports because nonprogram imports were nearly triple the size of non-oil exports (excluding timber).

The use of import and export equations to simulate alternative scenarios is subject to a number of caveats. First, in simulating the scenarios the point value of the estimated coefficients was employed. The results are, therefore, subject to a margin of error because the coefficients are only known with limited precision. Second, even though relative prices are substantially different under the alternative scenarios, this is assumed not to have any impact on the performance of the economy other than import and export volume. Thus the actual data and the estimated coefficients for real national income, real balances, and real capacity were utilized in the simulations. Moreover, the additional export volume was assumed not to change the world prices for Indonesia's exports.2/

1/ The simulation for maintained real devaluation scenario begins in the third quarter of 1979 because until then the relative price of exports was improving. Consequently, export supply under scenario II and under actual relative price developments are the same from the fourth quarter of 1978 to third quarter of 1979. This, also explains the absence in chart 9 of any additional export earnings until the fourth quarter of 1979.

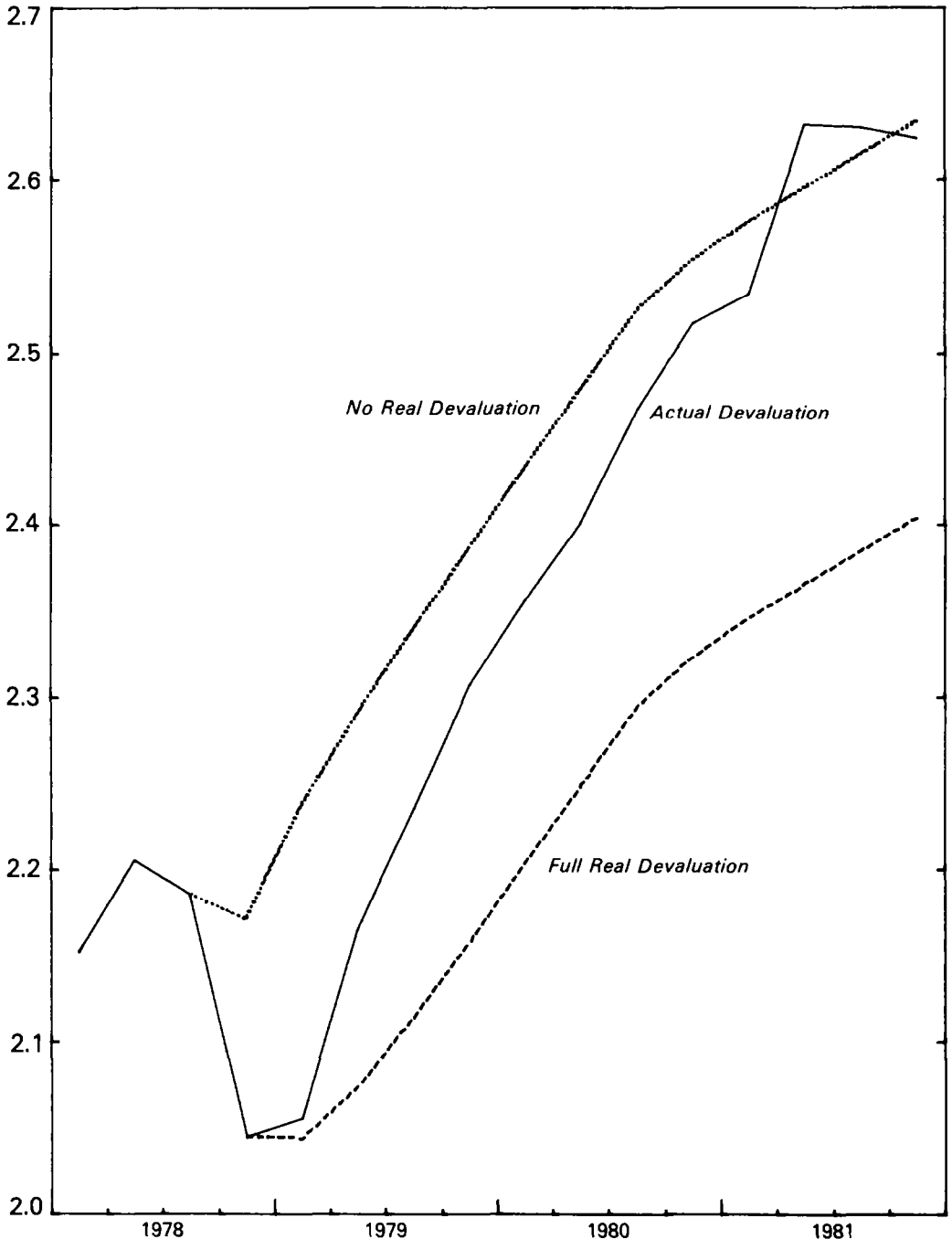
2/ To quantify the impact of Indonesia's export supply on its export prices, a price elasticity for export demand was calculated as a weighted average of price elasticities for each commodity. This elasticity indicates that a 10 per cent increase in export volume would reduce export prices by between 1/2 to 1 per cent. Thus, as a first approximation, maintaining export prices constant appears workable for simulation purposes. Although the results would be somewhat overstated.

CHART 6

INDONESIA

SIMULATION OF IMPORT DEMAND[1]

(Logarithmic value in millions of 1975 U.S. dollars)



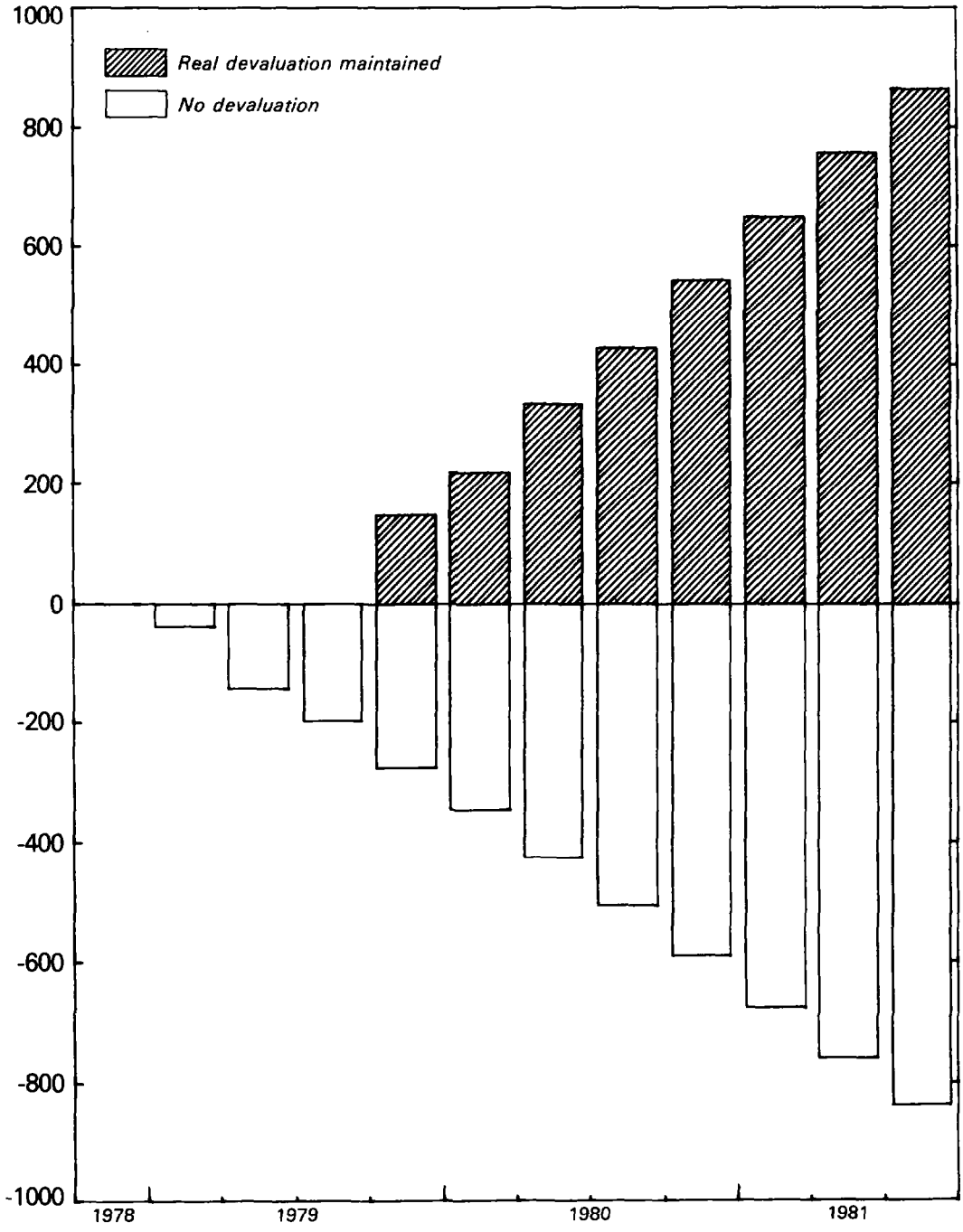
[1]Volume of nonprogram imports.

CHART 7

INDONESIA

CUMULATIVE DIFFERENCE IN EXPORT EARNINGS UNDER ALTERNATIVE EXCHANGE RATE SCENARIOS[1]

(In millions of dollars)



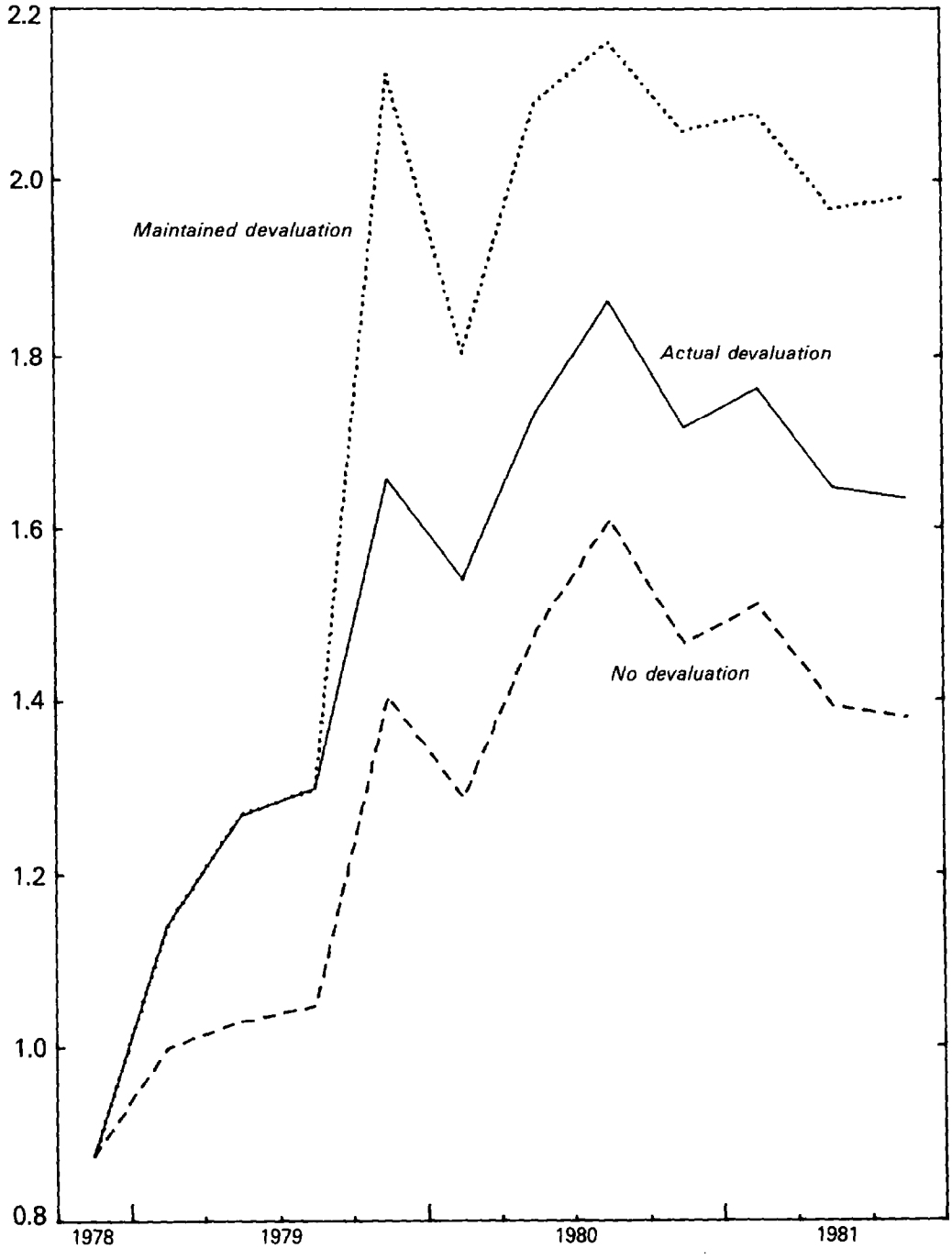
[1]Predicted exports under alternative scenarios less actual exports.

CHART 8

INDONESIA

SIMULATION OF EXPORT SUPPLY[1]

(Logarithmic value of export volume)



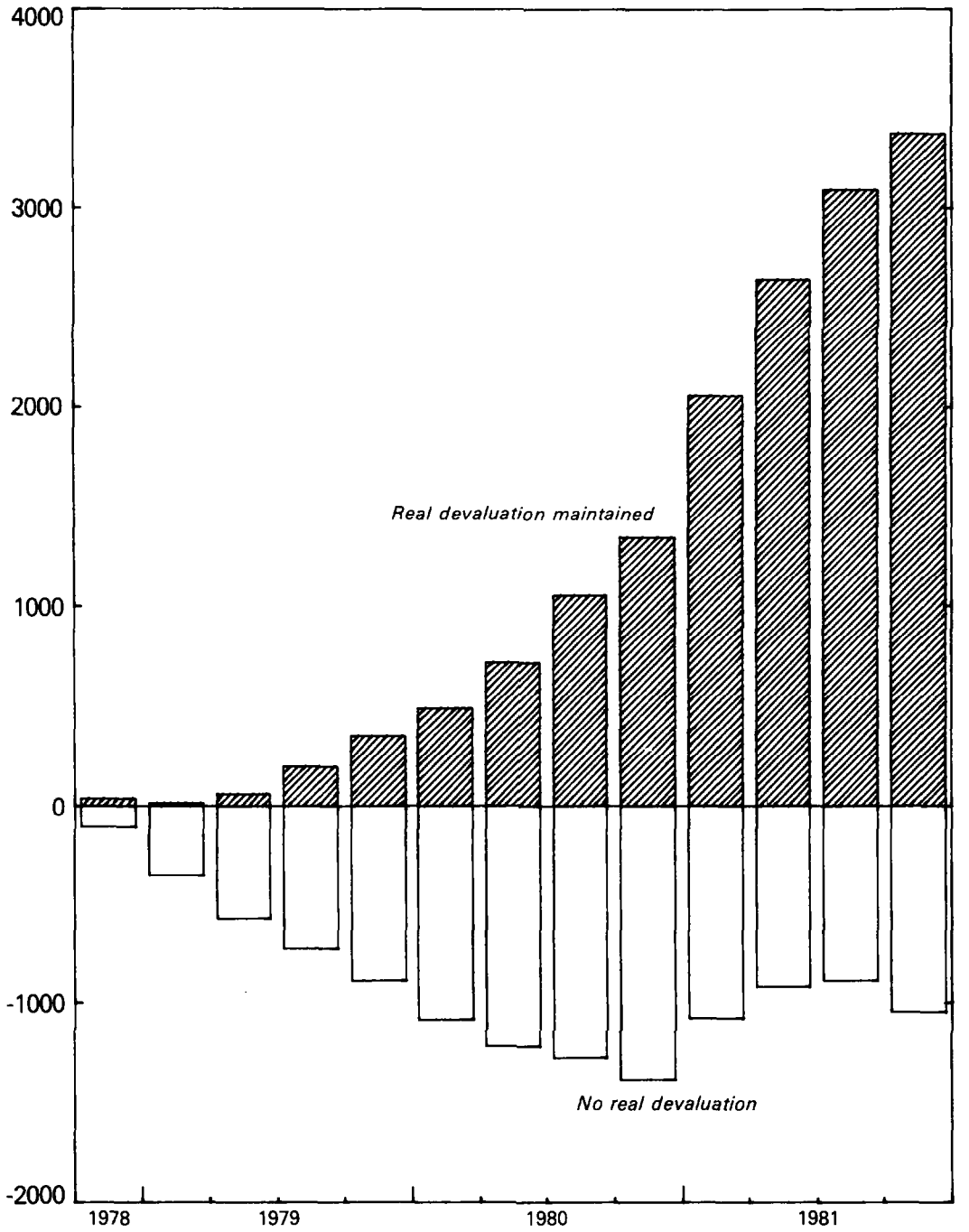
[1]Volume of non-oil exports, excluding timber.

CHART 9

INDONESIA

CUMULATIVE DIFFERENCE IN IMPORT PAYMENTS UNDER EXCHANGE RATE SCENARIOS[1]

(In millions of U.S. dollars)



[1]Predicted imports under alternative scenarios less actual imports.

IV. Conclusions

An exchange rate adjustment can successfully redirect resources into export and import-competing activities only if the more favorable cost-price relationship established after the adjustment is not subsequently reversed by domestic price increases. The exchange rate adjustment of November 1978 raised the prices of tradeable goods by 50 per cent and resulted in a burst of inflation in early 1979. Inflation was quickly reduced to international levels by appropriate demand management policies. The competitiveness of the traded sector was thus, significantly improved. In 1979, private sector import growth slowed while, earnings from non-oil exports grew more rapidly. These developments reflected adjustment policies as well as a better external environment.

With the sharp increase in oil revenues in 1979-80, the balance of payments constraint which had prompted the exchange rate adjustment, was removed. The subsequent expansion of government expenditure and domestic liquidity led to a rapid growth in aggregate demand and thereby to greater inflation. As a result of the resurgence in inflation, the improvement in the competitiveness of the non-oil trade sector was reversed. Given the short duration of the enhanced competitiveness, the favorable effect of relative prices on the non-oil trade account was quickly dissipated. To isolate the impact of exchange rate on non-oil trade account, import demand and export supply equations were specified and estimated; these estimates were then employed to simulate the impact on the non-oil trade account under alternative exchange rate scenarios. While the results of both these exercises should be interpreted with due caution, they nevertheless indicate that the non-oil trade account was strongly influenced by the relationships of domestic prices to domestic currency prices for exports and imports.

Data Definitions and Sources

All data are quarterly, seasonally adjusted, for the period 1971-81 and taken from four sources:

1. International Monetary Fund, International Financial Statistics, various issues.

2. Central Bureau of Statistics, Monthly Statistical Bulletin, various issues.

3. Bank Indonesia, Weekly Report, various issues.

4. World Bank, Indonesia-Financial Resources and Human Development in the 1980s.

NM = value of nonprogram imports in U.S. dollars, Source 3.

M = volume of nonprogram imports obtained by deflating nominal imports (NM) by foreign prices (FP).

X = volume of exports, Source 2.

PX = unit value of exports, derived from value and volume data, Source 2.

FD = foreign demand, expressed as an index with 1975 = 100. This series is constructed as the export weighted sum of trading partners, real gross national product, Source 1.

FP = foreign price, expressed as an index with 1975 = 100. This series was constructed as the import-weighted sum of trading partners' export unit value or export prices, Source 1.

RI = real gross national income defined as real gross national product plus terms of trade effect. This is an annual time series that was transformed into a quarterly basis using an interpolation method, Source 4.

CPI = Indonesia's consumer price index, 1975 = 100, Source 1.

L = real liquidity defined as money plus quasi-money divided by CPI, Source 1.

RP = relative price foreign price (FP) divided by consumer price index (CPI).

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