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ABSTRACT

The paper attempts to account for the differential growth performance of the industrial countries and the middle income developing countries in the 1970s in terms of economic theory and some international cross-section comparisons. The theory of adjustment to supply price shocks in an individual country is coupled with the world equilibrium determination of capital flows and interest rates. The supply shocks suffered by the industrial countries during the first oil shock were compounded by relative real wage rigidity and contractionary macro-economic response. The middle-income countries, at least initially, showed greater real wage flexibility and also followed a much more expansionary policy by borrowing the equivalent of the large OPEC surplus at very low or negative real interest rates. Their faster growth in output and productivity was attained at higher current account deficits and more accelerated inflation.

At the time of the second oil shock this differential strategy could no longer be pursued by many of the middle income countries as the real cost of foreign borrowing as well as that of domestic labour increased substantially.

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PETRODOLLARS AND THE DIFFERENTIAL GROWTH PERFORMANCE OF INDUSTRIAL AND MIDDLE-INCOME COUNTRIES IN THE 1970s

The limits to growth and structural change imposed by the ability to borrow occupied much of the attention of the trade and development literature in the great 1960s development decade.[1] A popular strand of analysis was the two-gap approach to the current account and the associated dual role of foreign borrowing. One aspect of foreign borrowing is the financing of the *ex ante* gap between potential export proceeds and the imports required as a major input into production. Alternatively it could be looked upon as the foreign supplement to domestic savings in the finance of long-term investment. In the one case the main role of foreign borrowing is to smooth economic activity in the short-run; in the other the emphasis is on accumulation and output growth in the medium and long runs. In retrospect the actual input-output models within which these trade-offs were measured may look somewhat rigid and simplistic but the basic theoretical insight remains relevant and could be reformulated in the language of a modern disequilibrium approach.

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[1] Some of the earlier studies and a recent restatement of the issues are given in Chenery (1979).

A closely related branch of the trade and development literature dealt with the extension of the static investment-savings balance into an intertemporal, dynamic, view of the balance of payments, raising the question of optimal borrowing and resource allocation over time. Oddly enough, this model, which usually entailed free capital mobility, was first applied in a world of highly restricted capital markets. Given the changed world of capital mobility in the 1970s it is perhaps no wonder that the intertemporal view of the balance of payments was 'rediscovered' by open-economy macro-economists whose own concern had for many years centred exclusively on short-run balance-of-payments adjustment problems with overriding emphasis on imports and exports rather than on long-term saving and investment. Some of these ideas will be applied here to the post-1973 world development scenario in which long-term structural change and short-term macro-economic response have become very closely intertwined. I turn first to some aspects of the oil shock and the recycling of petrodollars.

In the early days after the first oil price shock the main issue discussed by economists and policy makers was the difficulty that might be posed by the recycling of petrodollars. This involved at least one basic misconception and one error of judgement. The misconception concerned the view of the contraction and unemployment in the industrial countries as a pure demand-insufficiency phenomenon. If only OPEC recycled their oil proceeds quickly enough into the commodity markets of the industrial countries (ICs), so the conventional Keynesian wisdom said, normal economic activity and growth would be resumed. It took some time to be grasped that at least part of the contraction in the industrial countries had to do with aggregate supply shifts due to a rise in input

prices and that the oil and raw-material price increase could cause a direct profit and productivity squeeze, which would be aggravated by a failure of real wages to adjust downwards. Under such circumstances excessive expansion of demand would accelerate inflation but would not solve the unemployment problem.[2] To that must be added the long-term implications of the profit squeeze on capital accumulation and economic growth.

If recycling is not primarily a commodity market problem--what is it? Obviously it has a capital flow side to it, whose consequences turned out to be somewhat different from what was thought at the time. This is where the error of judgement comes in. It was thought that the world would have great difficulty in intermediating the enormous flows of petrodollars through the financial system from OPEC to the large oil users. The ease with which the system intermediated between the unprecedented surpluses and deficits in balances of payments was truly remarkable. Moreover, no one at the time thought that the OPEC surplus would by and large be confined to the financing of an increasing debt of the middle-income countries (MICs), instead of financing the deficit of the large oil-importing industrial countries. One of the interesting by-products in the aftermath of the first oil price shock was the sharp fall in real interest rates in the major financial markets, a phenomenon that can be analysed in terms of shifts in world investment and savings schedules.[3]

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[2] Unemployment, however, was not entirely classical in nature. Both in 1975 and in 1981 a good part of it was conventional (partly self-imposed) Keynesian unemployment.

[3] For a lucid description of the main financial developments of the 1970s in the wake of the oil shocks, see *World Development Report, 1981*,

The main object of the present paper relates to an apparent puzzle. How is it that the industrial countries performed so miserably after the first oil shock while the middle-income oil importing countries seem to have flourished? While GDP growth approximately halved it hardly fell for the MICs. Although part of the increased expenditure went into public consumption one of the most marked differences between the two groups of countries is in the relative investment performance (to a considerable degree financed by external debt in the MICs).[3a] Taking the manufacturing sector by itself, how does one explain the fact that the MICs accounted for one quarter of the increase in manufacturing output of the world's market economies between 1970 and 1978 (double the base level of 1970)? As the last column of Table 1 shows, this is of the same order of magnitude as the marginal share of the United States or of Japan and Germany combined and more than that of all other OECD countries taken together, all of which (with the exception of Japan) have reduced their average share in the total during this period.

The present paper attempts to account for this differential performance in terms of the theory of adjustment to supply price shocks in an individual country and the world equilibrium determination of capital flows and interest rates. It is argued that the supply shocks suffered by the industrial countries were compounded by relative real wage rigidity and contractionary macro-economic response, while the middle-income countries, at least initially, showed greater real wage flexibility and also followed

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Chapter 5. For a theoretical and empirical discussion of the implications for investments, savings, and current accounts of countries see Sachs (1981, 1982). Also relevant are the theoretical papers by Marion and Svensson (1981), Schmid (1980), and Dixit (1981).

[3a] Detailed data are given in Tables 3-5 below.

Table 1. Shares in World Manufacturing Output--Market Economies: 1970 and 1978

	Value added ($ billions, 1975 prices)		Percentage growth 1970-78	Percent of total		
	1970	1978		1970	1978	Increment 1970-78
Low income countries	*18.5*	*27.5*	48.3	*1.7*	*1.9*	*2.2*
Middle income countries	*127.6*	*229.3*	79.7	*12.0*	*15.6*	*25.1*
Oil exporters	30.9	54.8	77.3	2.9	3.7	5.9
Oil importers	96.7	174.5	80.4	9.1	11.9	19.4
Industrial market economies	*914.2*	*1206.5*	31.9	*86.1*	*82.2*	*72.1*
United States	331.5	434.4	31.0	31.2	29.6	25.4
Germany and Japan	264.5	366.1	38.4	24.9	24.9	25.1
Other OECD	318.2	406.0	27.6	30.0	27.7	21.6
Capital-surplus oil exporters[a/]	*2.4*	*4.8*	100.0	*0.2*	*0.3*	*0.6*
Total	*1,062.7*	*1,468.1*	37.9	*100.0*	*100.0*	*100.0*

a/ Iraq, Kuwait, Libya, Saudi-Arabia, Qatar, and the United Arab Emirates.

Source: Estimated on the basis of *World Development Report 1981*, Table 6 (annex) corrected (by 5 percent on average) for missing data on basis of 1979 relative population levels, Table 1 (annex).

a much more expansionary policy by borrowing the equivalent of the large OPEC surplus at very low or negative real interest rates. Faster growth in output and productivity was attained at higher current account deficits and more accelerated inflation.

Section I describes a fairly standard two-period model of tradable goods production, with raw materials. Particularly relevant to the present topic is the combined welfare effect of a rise in raw-material prices on a net importer (exporter) of materials and the effect of a fall in the real interest rate on a net debtor (creditor). Section II extends the model to a world with many countries, and states the general conditions under which the world aggregate savings schedule would be upward sloping and how a material (oil) price increase might shift it either way. The possible reasons for the difference in real interest behaviour after the two oil shocks are also discussed. Section III takes up the issue of differential performance in terms of short-run real-wage flexibility and the long-run response to the changing conditions in the capital market. Section IV provides an international comparison of samples of OECD countries and MICs. Comparative productivity, employment, and real wage data are briefly analyzed. It is also shown that a clear trade-off existed between the current account and the productivity performance, due to both long-term investment finance and short-term demand smoothing. The middle-income countries utilized this trade-off to their advantage in the period between the two oil shocks. Towards the end of the 1970s this differential strategy could no longer be pursued as the real cost of borrowing as well as that of labour increased substantially. Section V concludes with a few open questions.

I. PRODUCTION, INVESTMENT, AND THE BALANCE OF PAYMENTS

Let us start off with a single-country, one-final-good, three-factor framework which is the simplest model appropriate for the problem discussed here. The country produces one tradable final good (of quantity Q and price P) and uses a material (e.g., oil) input, N, whose relative price ($\Pi_n = P_n/P$) is given, in production, $Q = Q(L, K, N)$, together with labour, L, and capital, K. Linear homogeneity and factor complementarity (positive cross derivatives) are assumed. The final good can be traded (net exports = X) and is used for domestic private (C) and public (G) consumption as well as for investment, I, in future capacity.

A common procedure, to be followed here, is to confine the discussion to a two-period horizon.[4] Superscripts denote the period ($t = 1, 2$). Period 1, the short run, is characterized by the fact that the capital stock is fixed ($K = \bar{K}$). By period 2, the expected long run, the capital stock may be augmented or contracted by the amount of investment or disinvestment[5] carried out in period 1 ($K^2 = \bar{K} + I^1$). Zero depreciation and no investment is assumed in period 2, since K^2 stays on for posterity.

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[4] For recent closely related work see Sachs (1981), Svensson (1981), Razin (1980), and Bruno (1981b).

[5] Under a raw material price shock capital may have to be adjusted downwards. If one adds the realistic assumption of population growth or independent labour-augmenting technical progress the interpretation is that capital should be lower relative to its previous trend growth, not necessarily that it should actually be reduced in absolute size. Depreciation could also be introduced. These modifications are ignored here only to keep the analysis to its essentials. Negative investment should be interpreted in this light.

Labour supply in both periods is assumed to be given and labour-augmenting technical change is allowed for by measuring labour in intensity units (L^t).

The commodity balance in the two periods takes the form

$$C^t + G^t + I^t + X^t = Q^t \quad (1)$$

where $t = 1, 2$ and, by assumption, $I^2 = 0$. All these magnitudes are measured in real output units.

While a single-sector specification for production of final goods is maintained, the model is extended by introducing domestic production of the raw material N. Its production will be assumed fixed at the quantity H^t in both periods and will have the exogenous nominal market price P_n^t (and *relative* price Π_n^t). Since the production of H is held fixed in this country, the input of factors into it can be ignored and it is only taken into account in the calculation of real income (Y^t) and the trade balance (F^t). Total real income will be $Y^t = Q^t - \Pi_n^t N^t + \Pi_n^t H^t = Q^t + \Pi_n^t(H^t - N^t)$. It can be expressed as a value-added (or revenue) function:

$$Y^t = Y^t(L^t, K^t; \Pi_n^t, H^t) \quad (2)$$

where $\partial Y^t/\partial L^t = \partial Q^t/\partial L^t$, $\partial Y^t/\partial K^t = \partial Q^t/\partial K^t$, $\partial Y^t/\partial \Pi_n^t = H^t - N^t$, and $\partial Y^t/\partial H^t = \Pi_n^t$.

Note that $(H^t - N^t)$ is net exports of the material (negative for a net importer). The trade balance in traded-goods units (F^t) can be written as

$$\begin{aligned} F^t &= X^t + \Pi_n^t(H^t - N^t) \\ &= X^t + Y^t - Q^t = S^t - I^t \quad (3) \end{aligned}$$

where $S^t = Y^t - C^t - G^t$ = domestic savings.

Assume now that the country's residents are free to borrow or lend between the two periods at a given interest factor R or (real) rate of interest $(R - 1)$ (this particular 'small-economy' assumption will be relaxed later). This implies the intertemporal borrowing or lending constraint

$$F^1 + F^2/R = 0 \ . \tag{4}$$

Another way of stating this equation is to say, for the case of borrowing, that the second period's current account surplus, $F^2 + (R - 1)F^1$, which consists of the trade surplus corrected for net interest payments, must exactly match first period's deficit, $-F^1$.

Using equation (3), the intertemporal borrowing constraint can alternatively be stated as a household budget constraint,

$$C^1 + C^2/R = Y^1 + Y^2/R - T - I^1 = \Omega \ , \tag{5}$$

where $T = G^1 + G^2/R$ = total government budget (taxes).

This again states the well-known property that the present value of the consumption flow must equal the present value of the income stream minus the change in physical wealth, which is net household wealth, Ω. Alternatively, if firm investment is financed by selling financial assets to households (which must bear the same rate of interest, $R - 1$), equation (5) states that the total consumption flow of households plus total incremental investment in the asset must equal total income accruing to households.

Firm behaviour

Before returning to household behaviour let us digress for a moment to

consider the firm's investment behaviour. It is assumed, along with much of the optimum investment literature, that firms in the Q industry choose I^1 so as to maximize their discounted cash flow:

$$[Q^1(\bar{K}, L^1, N^1) - W^1L^1 - \Pi_n^1N^1] - I^1 + [(Q^2(\bar{K} + K^1, L^2, N^2) - W^2L^2 - \Pi_n^2N^2]/R$$

subject to the labour and production constraints.

Such intertemporal optimization leads to two kinds of conditions. One is the usual set of static first-order conditions for the marginal products of the two variable factors in each period separately,

$$\begin{aligned} &\partial Q^t/\partial L^t = W^t \quad \text{(product wage)} \\ &\partial Q^t/\partial N^t = \Pi_n^t \ . \end{aligned} \tag{6}$$

The second, intertemporal, condition comes from maximization with respect to investment in the first period, i.e., choice of the capital stock K in the second period. This gives

$$\partial Q^2/\partial K^2 = R, \qquad I^1 = L^2\kappa(\Pi_n^2, R) - \bar{K}, \tag{7}$$

where κ is the capital-labour ratio at relative prices Π_n^2 and R.

What (7) implies is that while the marginal product of capital may shift in the short run (fixed capital), in the long run (second period) the capital stock must be adjusted[6] so that its marginal product equals the long-run external interest factor, R. With constant returns to scale the product wage in period 2 (W^2) is thus also determined exogenously. We

[6] The present analysis amounts to assuming investment behaviour under perfect foresight (or rational expectations), without having to introduce costs of adjustment (or Tobin's q) explicitly, since the adjustment takes place in one period.

shall make considerable use of these simplifying properties.

Having stated the equilibrium conditions for firm behaviour, one can now deduce some simple properties of the net wealth (Ω) concept introduced in equation (5). Using (2) and (5) and the fact that $K^2 = \bar{K} + I^1$ one can write

$$\begin{aligned} \Omega &= Y^1 + Y^2/R - T - I^1 \\ &= \Omega(\Pi_n^1, \Pi_n^2, R, \bar{K}, H^t, L^t; I^1) \ . \end{aligned} \tag{5'}$$

For optimum investment (7) we have: $\Omega = \Omega^*(\Pi_n^1, \Pi_n^2, R, \bar{K}, H^t, L^t)$ which is net wealth optimized with respect to investment. Differentiating with respect to I^1, one gets $\partial\Omega/\partial I^1 = [\partial Y^2/\partial K^2]/R - 1 = 0$. Therefore, Ω and Ω^* must have the same response to the exogenous variables.

The response of net wealth to changes in the price of the raw material is

$$\begin{aligned} \partial\Omega^*/\partial\Pi_n^1 &= \partial\Omega/\partial\Pi_n^1 = \partial Y^1/\partial\Pi_n^1 = H^1 - N^1 \\ \partial\Omega^*/\partial\Pi_n^2 &= \partial\Omega/\partial\Pi_n^2 = (\partial Y^2/\partial\Pi_n^2)/R = (H^2 - N^2)/R \ . \end{aligned} \tag{8}$$

This is a simple and intuitively plausible result. It says that an increase in the price of raw materials in either period increases or decreases net wealth by the net export of the material input $(H - N)$, properly discounted. A net exporter gains in net wealth and a net importer loses. The welfare implications of such changes and responses to changes in R will be discussed later. Let us first turn to consumption and savings behaviour.

Household consumption and savings behaviour

Suppose now that household behaviour can be represented as maximization,

by a representative household, of a concave intertemporal utility function $U(C^1, C^2)$ subject to given net wealth, Ω. The consumption goods of the two periods are assumed to be gross substitutes $(U_{12} \geq 0)$, implying that both consumption goods are normal with respect to increases in wealth. The consumption function is

$$C^t = C^t(\underset{+}{\Omega}, \underset{-}{R}) \ . \tag{9}$$

As is well known from Fisherian theory, an increase in the rate of interest will in general lead to ambiguous effects on present consumption since the substitution and wealth effects of an interest-rate change work in opposite directions. Only for a net borrower (or initial balance) can we make unambiguous statements. This also applies to the present model.

Differentiating equation (5) and the first-order condition for utility maximization $(u_1 = Ru_2$, where $u_i = \partial U/\partial C^i)$ with respect to R, one gets

$$\partial C^1/\partial R = -u_2/A + (\partial C^1/\partial \Omega)F^1/R \ , \tag{10}$$

where A is the (positive) Hessian determinant of U and the related first term in (10) is the pure compensated substitution effect. Thus $\partial S^1/\partial R = -\partial C^1/\partial R > 0$ if $F^1 \leq 0$.

Since investment is negatively related to the rate of interest it follows that $\partial F^1/\partial R = \partial S^1/\partial R - \partial I^1/\partial R > 0$ for $F^1 \leq 0$. Thus *a net borrower will borrow more (less) when the interest rate falls (rises).*

Welfare analysis

One can summarize the effects of changes in relative prices by looking at the components of welfare change in terms of the utility function.

Again making use of equation (5) and the first-order condition, and remembering that changes in I^1 do not affect the value of Ω, we get

$$\begin{aligned} dU &= u_1 dC^1 + u_2 dC^2 = \\ &= Ru_2(dC^1 + dC^2/R) = Ru_2(dY^1 + dY^2/R + \frac{C^2 - Y^2}{R^2} dR) \\ &= u_2(R\, dY^1 + dY^2 + F^1 dR) \end{aligned}$$

Thus one can write

$$(11) \qquad dU/u_1 = (H^1 - N^1)d\Pi_n^1 + \frac{H^2 - N^2}{R} d\Pi_n^2 + \frac{F^1}{R} dR + \Pi_n^1 dH^1 + \frac{\Pi_n^2}{R} dH^2 \ .$$

As one would expect, the welfare indicator depends on the respective raw-material price changes weighted by the self-sufficiency measure for each period. The third term in (11) stands for the welfare effect of a change in the interest rate (i.e., the rate of intertemporal substitution). *A net debtor gains while a net creditor loses from a fall in R (and conversely for an increase in R).*[7]

This finding suggests an interesting application to the effect of the oil price shock on a net importer who also happens to be a net debtor in the world capital market, the situation of a large number of LDCs. It may very well be that after the first oil shock, the welfare gain from the fall in the real interest rate could in some of these countries have compensated for or even outweighed the direct loss due to the rise in real oil prices. We return to this topic below.

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[7] It is a straightforward extension of the model to assume that at the beginning of period 1 there is a net asset endowment B^0 (negative for net debt). We now have $B^0 + F^1 = -F^2/R$ and therefore total assets $(B^0 + F^1)$ must replace F^1 in equation (11).

II. DETERMINATION OF THE REAL INTEREST RATE IN A MULTI-COUNTRY MODEL

The model will now be extended to a world with many countries; each of them has the same basic technology as the single economy described in the preceding section, but different initial factor endowments are allowed. We preserve the simplicity of a single final tradable good and an exogenous relative price, Π_n, confronting all countries. However, one country (the OPEC country, subscript 0), which is a net exporter of the material input, is singled out, while all other countries ($i = 1, 2, \ldots, m$) are net importers. The output of the raw material by all other countries is assumed exogenously fixed ($H_i^t = \bar{H}_i^t$) while that of country 0 will be endogenously determined by world demand given the fixed relative price, Π_n^t, which is assumed to be set by country 0. We thus have:

$$(12) \qquad H_0^t - N_0^t > 0, \qquad \bar{H}_i^t - N_i^t < 0, \qquad \sum_{i=0}^{m} (H_i^t - N_i^t) = 0 ,$$

where $t = 1, 2$; $i = 1, 2, \ldots, m$.

In aggregating real income over all countries, using the world balance equation (12) for the material, we find that world income (Y_w^t) equals world production of final goods (Q_w^t) and the world-market balance of final goods can be written as

$$(13) \qquad Y_w^t = Q_w^t = \sum_{i=0}^{m} Q_i^t = C_w^t + G_w^t + I_w^t ,$$

where $C_w^t = \sum_{i=0}^{m} C_i^t$, etc.

While the exogeneity of the real price of oil is kept for simplicity (see further comment in Section V), the real rate of interest now becomes endogenous. It will be assumed that R is determined by the world equilibrium of savings supply and investment demand in the first period.

The main object of this section is thus to consider the factors determining the world savings and investment schedules. Consider first aggregate investment demand which is obtained by aggregating the investment function of the individual countries (we continue to ignore investment in the production of H). Assuming constant returns to scale and summing $I^1(\ )$ from (7) over countries, world investment can be written as

$$I_w^1 = \sum_{i=0}^{m} I_i^1 = \kappa^2(\underset{-}{\Pi_n^2}, \underset{-}{R}) \cdot L_w^2 - \bar{K}_w^1 , \tag{14}$$

where L_w^2 is second period's world labour input (in intensity units) into final goods production.

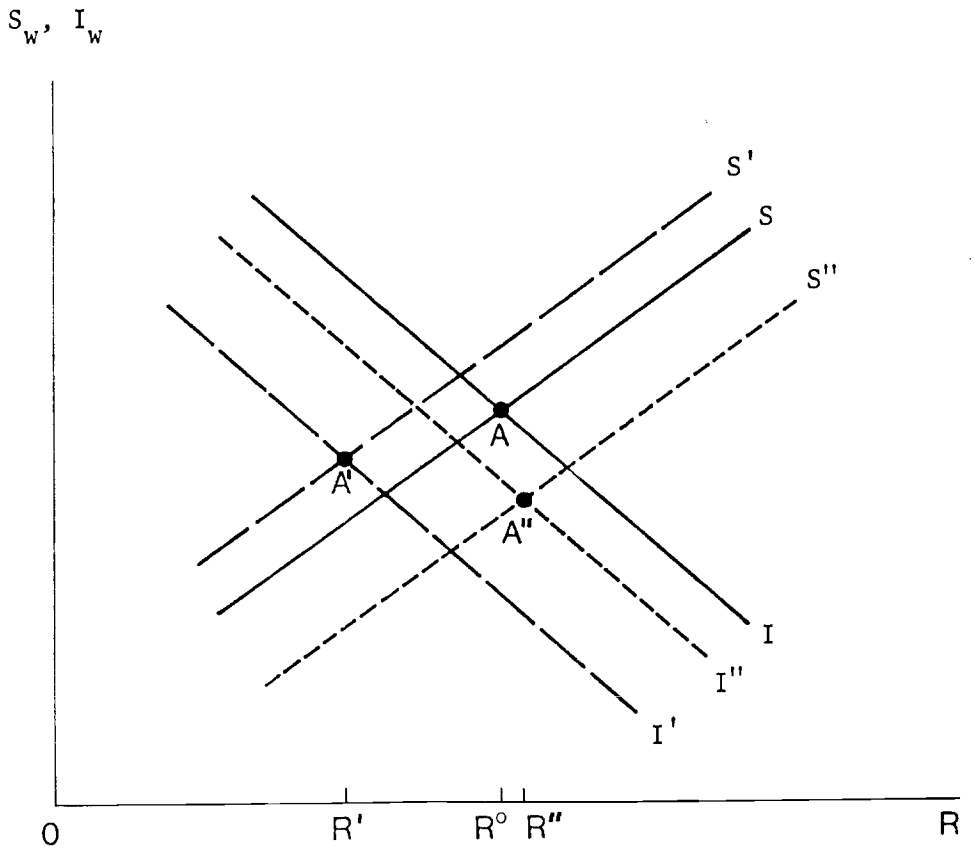
Figure 1 (below) shows the world investment schedule as a downward sloping curve in $[I_w, R]$ space. An increase in the expected cost of oil or in the capital stock will shift the I curve down and to the left.

The world savings schedule raises more ambiguities. Consider aggregate savings as the difference between world income and consumption. Assume first that labour markets clear. Then

$$\begin{aligned} S_w^1 &= Q_w^1(\Pi_n^1) - C_w^1[\Pi_n^1, \Pi_n^2, H_0^1(\Pi_n^1), H_0^2(\Pi_n^2), R] - G_w^1 \\ &= S_w^1(\Pi_n^1, \Pi_n^2, R) . \end{aligned} \tag{15}$$

From the earlier analysis we know that gross output in each country in the first period depends only on the first-period relative price and on the given quantities of labour and capital (here omitted). Private consumption in each country depends on R and on wealth which in turn varies with the various relative prices. We have also inserted H_0^t to express the indirect dependence of OPEC consumption on its own price through the real income effect on total oil revenues. The C_w function

Figure 1.



is where the aggregation ambiguities come in, so it will be discussed in greater detail.

Consider first the aggregate response of C_w^1 (and of S_w^1) to changes in the rate of interest. Aggregating (10) over countries, we can write

$$(16) \qquad \partial S_w^1/\partial R = -\partial C_w^1/\partial R = \sum_i u_{2i}/A_i + 1/R \sum_{i=0}^{m} (\partial C_i^1/\partial \Omega_i^1)(-F_i^1) \ .$$

The first term on the right-hand side of (16) is positive, as in the single-country case. For the second term we know that the aggregate current account balance for the whole world must be zero ($\sum_{i=0}^{m} F_i^1 = 0$). The second summation is the world aggregate propensity to consume out of wealth. Let us divide the countries into net debtors ($F_i^1 < 0$) and net creditors ($F_i^1 > 0$). A simple proposition follows:

World savings will be positively related to the rate of interest if the deficit-weighted marginal propensity to consume of the net debtors is greater than (or equal to) the surplus-weighted marginal propensity to consume of the net creditors.

Empirically one is more likely to find net debtors among the lower income countries for which one would assume that MPCs tend to be higher than in countries with higher levels of income. It thus makes sense to assume that the world savings schedule is upward sloping (or flat).

The dependence on input price changes is more problematic. Consider the first-period price first. We have

$$(17) \qquad -\partial C_w^1/\partial \Pi_n^1 = \sum_{i=0}^{m} (\partial C_i^1/\partial \Omega_i)(N_i^1 - H_i^1) + (\partial C_0^1/\partial \Omega_0)(-\Pi_n^1 \partial H_0^1/\partial \Pi_n^1) \ .$$

The second term in (17) is the negative real income effect on OPEC consumption coming from the fall in demand for H_0^1 as Π_n^1 is raised. For the first term we apply an argument very similar to the one underlying

(16), i.e., the first term is $\sum_{i=1}^{m} (\partial C_i^1/\partial \Omega_i)(N_i^1 - H_i^1) - (\partial C_0^1/\partial \Omega_0)(H_0^1 - N_0^1)$, where $\sum_{i=1}^{m} (N_i^1 - H_i^1) = H_0^1 - N_0^1$. Thus, $-\partial C_w^1/\partial \Pi_n^1 > 0$ if $\partial C_0^1/\partial \Omega_0 < 1/(H_0^1 - N_0^1) \sum_{i=1}^{m} (\partial C_i^1/\partial \Omega_i)(N_i^1 - H_i^1)$.

Thus we have the proposition:

Aggregate world consumption falls with an increase in the real price of oil if the marginal propensity to consume of the net oil exporter(s) is less than the weighted marginal propensity to consume of the net importers.

While the condition may have held immediately after the oil price shock of 1973-74, it can at best be assumed to have been temporary, as OPEC countries may have taken time to adjust consumption (the absence of infrastructure may have held up imports, etc.). Even if it holds, however, there is another force working in the opposite direction, that is, current oil prices reduce real income and output (Q_w^1). A temporary price increase may thus move savings either way. This argument does not hold for an anticipated price increase (Π_n^2) which will affect C_w^1 but not Q_w^1.

Now consider a permanent increase in price $(d\Pi_n = d\Pi_n^1 = d\Pi_n^2)$. Suppose $H_i^t - N_i^t = H_i - N_i$ $(t = 1, 2)$. Repeating the derivation of (17) for Π_n^2, and using the fact that $\partial C_w^1/\partial \Pi_n^1 = \sum_{i=0}^{m} (H_i - N_i) + \Pi_n^1 \partial H_0^1/\partial \Pi_n^1$ and $\partial C_i^1/\partial \Omega_i + 1/R \partial C_i^2/\partial \Omega_i = 1$ (for all i) we eventually get

$$(17') \qquad R(\partial S_w/\partial \Pi_n) = \sum_{i=0}^{m} (\partial C_i^2/\partial \Omega_i - \partial C_i^1/\partial \Omega_i)(H_i - N_i) + [\Pi_n^1(\partial H_0^1/\partial \Pi_n^1)(\partial C_0^2/\partial \Omega_0) - \Pi_n^2(\partial H_0^2/\partial \Pi_n^2)(\partial C_0^1/\partial \Omega_0)] .$$

The first term in (17') will be positive (or zero) if $\partial C_0^1/\partial \Omega_0 > \partial C_0^1/\partial \Omega_0$ (for OPEC) and $\partial C_i^2/\partial \Omega_i \geq \partial C_i^1/\partial \Omega_i$ for all oil importers ($i = 1,2,\ldots,m$). The second term in (17') represents net savings of OPEC from the real income effect of a change in Π_n in both periods; it will be positive if the fall in the demand for H_0^2 is sufficiently smaller than the fall in the demand for H_0^1 (note that the demand for the material will contract in period 1 because the reduced capital input bears part of the adjustment to higher material prices in that period).

So far we have assumed full wage flexibility in face of an oil shock. To the extent that real wages are sticky in at least some oil importing countries, Q_w, now dependent on real wages in different countries, will fall by more, with a further depressing effect on aggregate savings.

The analysis has been conducted all along under the assumption that producers always operate on their supply schedule and equate prices to marginal costs. There is good reason to suggest that the contractionary policies pursued by the major industrial countries after the first oil shock (1975-76) and again in 1980-81 have temporarily placed some of them in a short-term Keynesian disequilibrium (excess supply) situation. The detailed analysis of savings and investment determination in a demand-constrained situation will not be given here (for additional discussion see Bruno and Sachs, 1979). For the present purpose suffice it to state that contractionary demand policies in response to an input price shock may further reduce aggregate savings along with aggregate output.[8]

Figure 1 depicts one case in which the savings schedule shifts to the

[8] A fall in G will increase savings but the resulting contraction in Q may more than offset it.

left and there is also a substantial shift in the investment schedule. Equilibrium moves from A to A' and there is a drop in R from R^0 to R' (in the case shown here both S_w and I_w also fall). When the temporary effect on S wears off and the S curve shifts back R will gradually increase. This may correspond to the developments in the world capital market in the years immediately after the first oil crisis.

The alternative case depicted in Figure 1 is one in which the output-depressing effect dominates and S shifts to the right (to S''). Suppose the investment schedule shifts to the left by less (to I'') after an oil shock. This might correspond to the case in which an oil price increase is perceived to be temporary or when there are other long-run expansionary effects on I. A movement from A to A'' will involve an *increase* in R after an oil shock rather than a decrease.

These possibilities can be summarized in analytical form. For a permanent change in Π_n the equilibrium interest rate has to satisfy

$$(18) \qquad \underset{-}{I_w}(\Pi_n, R) = \underset{\pm}{S_w}(\Pi_n, R) \; .$$

It follows that[9]

$$(19) \qquad \frac{\partial R}{\partial \Pi_n} = \left(\frac{\partial S_w}{\partial R} - \frac{\partial I_w}{\partial R}\right) \div \left(\frac{\partial S_w}{\partial \Pi_n} + \frac{\partial I_w}{\partial \Pi_n}\right).$$

The numerator in (19) is positive while the denominator is positive or negative according as $\partial S_w/\partial \Pi_n \gtrless (-\partial I_w/\partial \Pi_n) > 0$. Thus R will be expected to fall whenever world savings shift up with Π_n or S_w shifts down by less than I_w. However, for R to rise in the wake of an oil price increase S_w must shift down by more than I_w.

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[9] The partial derivative $\partial S_w/\partial \Pi_n$ should be interpreted as comprising the effects of both aggregate supply and aggregate demand shifts.

The two cases just described may be relevant for an explanation of the differences in real-interest behaviour after the two oil shocks. As is well-known, one of the concomitants of the first supply shock (1973-74) was a sharp reduction in real interest rates in the financial markets of most industrial countries. Very small or negative rates were recorded throughout 1974-77. As noted by Sachs (1981) and others, this drop can mainly be attributed to the sharp fall in investments in the industrial countries that followed the profit squeeze. While savings also contracted substantially during 1974-75 in the industrial countries, it seems that the temporary increase in OPEC savings more than compensated for the fall in IC savings, so that the representation of the movement from point A to A' in Figure 1 seems pertinent. The combined surplus of OPEC countries and the ICs was matched by a rising deficit in the oil-importing countries, financed to an increasing degree by private commercial loans which, in turn, were funded by the recycling of petrodollars. Between 1972 and 1978 the flow of nonconcessional finance to LDCs more than quadrupled, from $13 billion to $56.1 billion at current prices. By 1978 this formed over 50 percent of total external finance in the oil-importing and over 60 percent in the oil-exporting MICs (see World Bank, 1981, p. 53, Figure 5.3). All of this increase was obtained at zero or negative real interest rates.

The OPEC surplus fell substantially between 1974 and 1978, before the next oil shock set in. On the eve of the second shock (1978), the real interest rates and relative current-account positions of the various country groups were of roughly the same order of magnitude as in 1973. Yet the second shock seems to have been followed by quite different developments in the world capital market. By 1980 real rates had in most markets reached high positive values above their pre-1973 levels, the United States

being a temporary exception.[10] A glance at relative current account developments may suggest part of the answer. This time round the ICs were running large and persistent deficits (unlike with the first oil shock, when their combined deficit was small and quickly disappeared) and so were the oil exporting MICs (which in 1974 were running surpluses).

While a full answer to the question must await more detailed analysis one may at least speculate that there has been a change in post-shock investment behaviour. Figure 2 compares the combined quarterly investment and savings developments of the three large industrial countries (United States, Japan, and Germany) before and after the two oil shocks. The most marked difference between the top and bottom parts of the figure seems to lie in the much more moderate fall in investment immediately after the shock and a very slight downward movement later on. While the three countries represent only close to half the IC group, and the figures represent *ex-post* rather than *ex-ante* movements, they may be indicative of the aggregate shifts. It is highly likely that the aggregate world investment schedule (see Figure 1) shifted down by much less this time, with the savings schedule possibly shifting down by more, especially with the sharp 1980-81 contraction in the major industrial countries (and a higher marginal propensity to consume in OPEC).

It is an open question, and one that is not directly relevant to our present discussion, why investments have responded more moderately after the second shock. The fall in investments after 1973 may in part have

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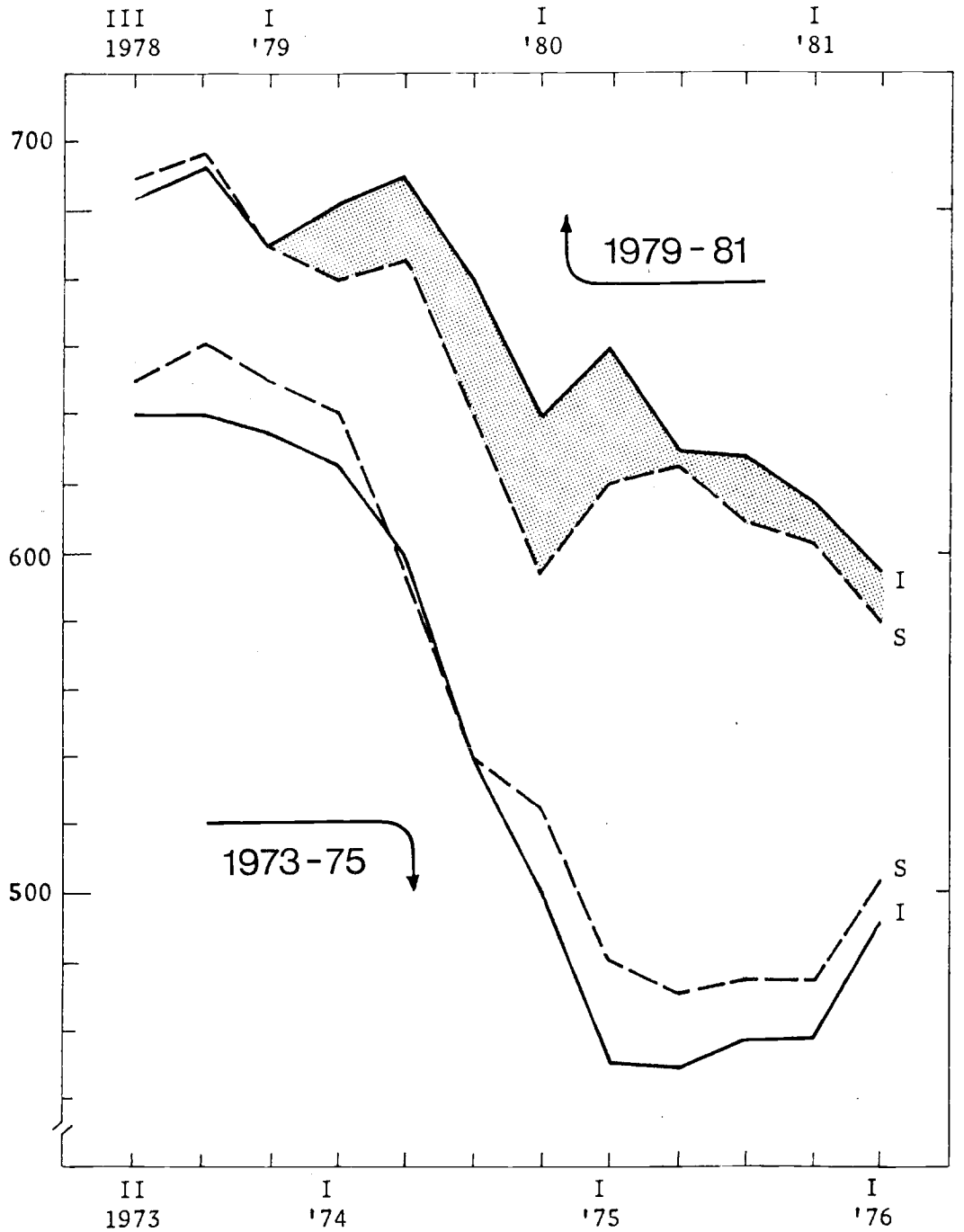
[10] E.g., the 90-day bill rate for the United States implied negative real rates between the second quarter of 1979 and the third quarter of 1980 (this was not so in Germany and Japan). Only then did the U.S. real rate rise to positive levels.

Figure 2. Savings and Investment Under Two Oil Shocks--United States, Germany, and Japan (billions of 1975 dollars)



Source: OECD, *Quarterly National Accounts Statistics.*

been compensation for an excessive earlier boom. The profit squeeze may have been smaller this time, owing to a more moderate rise in oil and raw-material prices or a more flexible downward real wage adjustment. Another reason could be perception of the second shock as a temporary (in terms of our previous analysis the *ex-ante* rise in Π_n^2 may have been perceived as less than that of Π_n^1). Also, investment in energy-replacing equipment may have become a more important factor than in 1974.

III. THE DIFFERENTIAL RESPONSE OF ICs AND MICs

We can now go back to consider some additional aspects of the differential response of individual countries to the combination of a raw-material price shock and the concomitant change in real interest rates. We shall confine ourselves here to the aftermath of the first oil and raw-material price shock. It is too early to say anything definite about the more recent developments, and even the earlier episode still needs to be analysed in greater detail than can be done here.

The question to which we now return is how to account for the different responses of the ICs and the MICs to a similar exogenous shock. To keep the analysis as simple as possible and also stay within the framework discussed earlier, let us assume that production in both types of country uses the same technology in terms of the basic production function $Q = Q(L, K, N)$, but that they might differ in the (intensity units) × (employment) decomposition of the labour input (L) and in its rate of growth. An IC (subscript a) would initially have more intensity units represented by each employed person than a MIC (subscript m), while the time rate of change of total $\bar{L}_m$ supplied exogenously would

be higher than that of $\bar{L}_a$ on account of faster population growth and faster labour-augmenting technical progress (being further away from the technology frontier).

As long as we confine ourselves to the measurement of labour in intensity units, the factor-price frontier for both types of country will be the same. The curve ϕ in [R, W] space (see Figure 3) is drawn for a given initial relative price of the raw material (Π_n).[11] Suppose the IC is initially producing at the point A_a on the FPF, being in equilibrium at the real rate of interest (= rate of return on capital), R^0, and paying a real wage W^0 per (intensity) unit of labour. The slope of the tangent TS to the FPF at the point A_a measures the capital-labour ratio $(K_a/L_a = \kappa_a)$, and the intercept OT measures real income per unit of labour (Y_a/L_a). For simplicitly assume that the initial rate of return to capital in the IC is also the world rate of interest on borrowing. It is also realistically assumed that a MIC initially operates with a rate of return to capital above R^0, either because it does not have free access to the relevant private capital market or because its domestic capital market is segmented and there is a high risk premium. The MIC thus produces at the point A_m with rate of return $R_m > R^0$, real wage $W_m < W^0$, capital-labour ratio $K_m/L_m < K_a/L_a$, and real income per unit of labour $Y_m/L_m < Y_a/L_a$.[12]

Consider now a permanent shock to the relative price, Π_n. This

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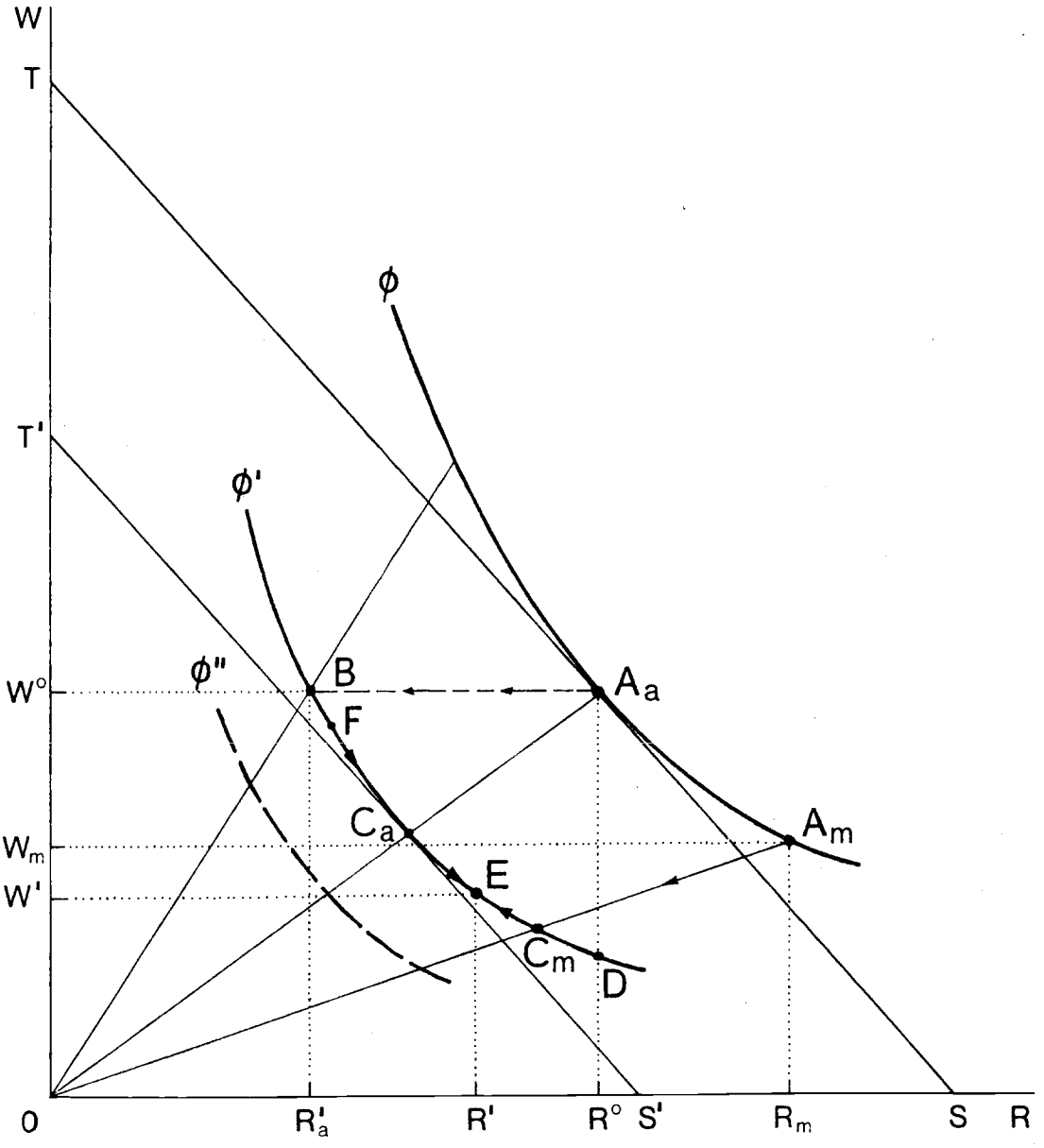
[11] The use of the factor-price frontier for both theory and empirical estimation is discussed in greater detail in Bruno (1981a).

[12] This could be represented by a tangent to FPF at A_m with slope and W intercept less than those of TS. Note that per employed person (instead of units of labour) the initial difference in K/L and Y/L between ICs and MICs would be much larger.

Figure 3.



will show as an inward contraction of the FPF from ϕ to ϕ', like the effect of technical regress. The way in which the FPF contracts depends on the general specification of the production function. As long as one considers a general increase in raw-material prices, the assumption of weak separability is probably empirically valid and it is made here,[13] i.e., it is assumed that $Q = Q[N; V(K, L)]$. In this case the FPF shifts inward homothetically and the tangent at C_a on the new FPF would be parallel to TS. In other words, C_a represents the new short-run, full-employment, full-capacity equilibrium point for the IC, and C_m fulfils the same role for the MIC.

The immediate response of the two economies to the same exogenous price shock is probably different. Consider the extreme case in which real wages are rigid in the IC and fully flexible in the MIC. In that case the IC moves from A_a to B, there is a sharp profit squeeze (with quasi-rents falling from R^0 to R'_a), and unemployment emerges (at B the capital-labour ratio is higher than at A_a).[14] In the MIC, on the other hand, the movement is from A_m to C_m as real wages adjust downward and employment need not fall (partial empirical evidence is discussed below).

One can also tell a short-run story about differential demand management in the two types of country. A contractionary fiscal or monetary policy may push the IC further away from ϕ' and cause an even

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[13] If one considers only the oil input, it might be more valid to assume something closer to fixed proportions between N and K. In that case ϕ' would be parallel to ϕ. See discussion in Bruno (1981a).

[14] This would not be so under the alternative assumption, when FPF moves to a position parallel to the original one.

tighter profit squeeze.[15] This undoubtedly characterized most ICs after 1973 but did not happen in the typical MIC. As will be shown below, the latter pursued expansionary policies and were willing and able to incur higher current-account deficits and higher rates of inflation, an option not pursued by the major industrial countries. In any case, even if real wages were temporarily rigid in many ICs, unemployment helped to reduce real wages with varying lags. In terms of Figure 3 the implication of IC short-run adjustment is a gradual movement along ϕ' from B towards C_a.

The long-run behaviour depends, as we have seen, on what happens to the real rate of interest. Suppose it falls from R^0 to R'. In that case a new long-run equilibrium for the IC would be at the point E, at which the capital-labour ratio is lower than at C_a (or A_a). In our simplified two-period model this move will take place in one period. In a more realistic model it will be a gradual development. One would thus observe a slowdown in capital accumulation (K_a/L_a falls but since L_a goes on rising, K_a need not fall but investment will). Note that the new long-run equilibrium need not lie to the right of C_a but could be at a point such as F, if R' falls enough. In the latter case real wages (relative to productivity trend) might first fall in response to unemployment and then rise again as the capital-labour ratio adjusts upwards. This is less likely to have actually happened, especially since the sharp fall in real interest rates did not last very long.

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[15] Formally, the argument is that firms will no longer be on their supply curves. The curve ϕ' remains the relevant frontier for the marginal product of labour and capital but not for actual rates of return. In such a disequilibrium situation prices are above marginal costs, so that the actual FPF would be shifted further inwards, homothetically, as is illustrated by, say, the curve ϕ''.

The long- or medium-run story may again be different for the MICs. The rate of return at C_m is higher than the newly established rate of interest, R^1, and the extended private capital market has now become fully accessible to MICs. There is an incentive to borrow, invest, and increase the capital-labour ratio towards its long-run level at E. The movement along the FPF is from C_m to E. In the process the real wage may or may not rise above its original level W_m (it will obviously rise per *employed person*).

The analysis is thus consistent with a marked difference in the effect of the same exogenous shocks on the two groups of countries.[16] Clearly there was also a third group of countries. A net importing country that does not have access to the capital market or that does not have the industry base to which the private loans could be channeled would obviously not enjoy the full benefits of recycling and would suffer the terms-of-trade loss due to rising oil and raw-material prices. This probably happened in most of the lower income LDCs in the 1970s. However, quite a few of the MICs may have benefitted, at least temporarily, from the combination of events after the first oil shock.[17]

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[16] If, as is likely, for the aggregate economy the shock itself was smaller for a MIC than for an IC (see next section), the relevant FPF *a fortiori* shifts inwards by less, adding another component to the difference in response between countries.

[17] This does not seem to have happened after the second shock. An increasing number of MICs ran into trouble at the end of the 1970s (e.g., Korea, Brazil, Mexico). This is probably not unconnected with the sharply rising cost of foreign borrowing and the rising real cost of labour.

IV. COMPARATIVE EMPIRICAL EVIDENCE

The difference in aggregate performance of the two types of country in the 1970s will first be illustrated by an international comparison of 38 countries, 19 OECD countries and 19 MICs. While the OECD group covers almost all the industrial market economies, the MICs comprise only about two thirds, in terms of population, of the class of middle-income oil importers (as defined in *World Development Report 1981*). Aggregate employment data could be found for only 10 of these, comprising 43 percent of the population of all MICs. Table 2 accordingly gives averages for both subgroups of MICs.[18]

Note the group differences in average growth performance, comparing pre-1973 (period I, 1960-73) and post-1973 (period II, 1973-80). The growth of both GDP and GDP per employed person slowed down sharply in the OECD group. The MICs hardly slowed down in terms of total GDP growth and they may on average have improved their labour-productivity performance. Growth was by no means even during the subperiod in either group of countries. Table 3 gives more detail for a subsample of countries. Immediately after the first shock (1973-75) the difference between the groups was even sharper, with only partial recovery for OECD countries in 1975-78, while most MICs represented here grew faster during the period. The second shock (1978-80) was followed by a slump in both groups, again more pronounced in OECD countries. All countries seem to show a close relationship between GDP growth and labour-productivity growth, a point to which we shall return later.

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[18] Below (Table 5) we also give data of manufacturing employment for a group of 17 MICs.

Table 2. Annual Average Rate of Change of Selected Variables, [a/] *by Country Group: 1960-73 and 1973-80* [b/]

	19 OECD countries [c/]		10 MICs [d/]		19 MICs [e/]	
	1960-73	1973-80	1960-73	1973-80	1960-73	1973-80
1. Gross domestic product	4.7 1.8	2.6 2.2	6.7 4.9	6.0 3.8	6.6 3.6	6.3 3.4
2. Employment	1.2	0.7	4.0	2.9	-	-
3. GDP per employed person	3.6	2.0	2.7	3.0	-	-
4. Gross investment	6.4	0.4	8.9	6.6	9.7	8.1
5. Public consumption	4.8	2.3	9.9	6.6	8.4	7.7
6. Import/export prices	-0.5	1.5	-0.5	-0.5	0.2	0.5
7. Consumer prices	4.7 1.8	10.8 2.9	6.3 3.8	18.5 9.0	7.2 4.8	19.5 9.4
8. Current-account deficit/GDP	1.5 1.5	0.9 2.0	3.9 4.6	8.0 4.6	0.3 3.0	3.6 3.2

a/ Small numerals are mean standard deviation.

b/ Line 8, 1965-73 for first period, 1973-79 for some MIC countries in second period.

c/ Comprising all OECD countries with the exclusion of Greece, Iceland, Luxembourg, Portugal and Turkey.

d/ See list in Table 3.

e/ As above, with the addition of: Ivory Coast, Morocco, Malaysia, Pakistan, Thailand, Greece, Turkey, Brazil, and Colombia.

Source: Line 1. For OECD: Divisia index based on OECD accounts.
Lines 4 through 6, 8: OECD, *National Income Accounts*, and IBRD World Tables (for LDC).
Line 7: IMF, *International Financial Statistics*.

Table 3. Growth Rate of Gross Domestic Product (Q) and Gross Domestic Product per Employed Person (Q/L), in Nine Major OECD Countries and Ten MICs: 1966-80

(annual average rate of change, percent)

	1966-73		1973-75		1975-78		1978-80	
	Q	Q/L	Q	Q/L	Q	Q/L	Q	Q/L
Nine major OECD countries[a/]								
United States	3.4	1.3	-0.8	-1.0	5.1	1.4	1.3	-0.2
United Kingdom	3.3	3.4	-0.8	-0.9	2.7	2.8	-0.0	0.5
Belgium	5.2	4.4	1.2	1.2	3.2	3.5	2.4	1.9
France	5.5	4.7	1.7	1.9	4.0	3.3	2.3	2.2
Germany	4.5	4.6	-0.7	2.1	3.8	3.9	3.2	2.0
Italy	5.3	5.3	0.2	-1.2	3.5	2.7	4.4	3.1
Sweden	3.6	3.0	3.3	0.9	0.2	-0.3	2.8	1.3
Canada	5.3	2.5	2.3	-0.6	4.1	1.6	1.5	-1.8
Japan	9.7	8.3	0.6	1.0	5.2	4.0	4.9	3.7
Mean	*5.1*	*4.2*	*0.8*	*0.4*	*3.5*	*2.5*	*2.5*	*1.4*
Ten MICs[b/]								
Kenya	6.9	2.7	5.2	1.4	7.6	3.8	2.5	-
Mauritius*	3.7	-0.9	4.8	0.1	9.5	4.6	-1.4	-0.9
Korea*	10.1	6.4	8.2	5.0	11.7	7.0	1.7	0.9
Philippines	5.6	-	6.0	3.3	6.6	-	5.9	-
Singapore*	12.9	-	5.2	3.1	8.0	3.1	9.8	3.8
Yugoslavia*	5.7	2.9	7.6	2.2	7.4	3.1	4.0	0.3
Syria	6.4	-	25.3	20.2	4.7	1.2	7.1	-
Zambia*	3.2	-0.3	2.1	-0.6	0.5	2.8	-3.0	-5.2
Egypt	3.1	1.1	5.7	3.0	10.3	-	6.9	-
Israel*	9.6	6.1	4.2	3.3	2.2	-0.7	1.6	-0.2
Mean	*6.7*	-	*7.4*	-	*6.9*	-	*3.5*	-
Mean*	7.5	2.4	5.4	2.2	6.6	3.3	2.1	-0.2

a/ Ten smaller countries not shown here are: Australia, Austria, Denmark, Finland, Ireland, Netherlands, New Zealand, Norway, Spain, Switzerland.

b/ Asterisk denotes the subsample of six countries for which all observations are available.

Coming back to Table 2, note the important related intergroup difference in the variability of output growth. For the OECD countries the mean standard deviation of annual growth rose from fast growth (period I) to slow growth (period II). For the MICs the opposite was true. The coefficient of variation rose from less than 0.5 in OECD to 0.8 after 1973, while for the nineteen MICs it fell from 0.7 to 0.6. This difference is in turn related to differential demand management (the data for growth in public consumption and gross investment in the samples are also given in Table 2).

The terms of trade on average deteriorated in the OECD group (relative import/export prices fell by an average of 0.5 percent in period I and rose by 1.5 percent in period II), while they hardly changed for the MICs (slight deterioration for the entire group of 19, slight improvement for the subsample).[19] This difference probably stems from exports of primary commodities which were (and still are) sizeable in most MICs.

The trade-off for the more expansionary stance of the MICs is indicated in the lower part of Table 2. The acceleration of inflation was greater (and the coefficient of variation was higher). A more pronounced difference, which brings us back to the main topic of this paper, is the sizeable increase in the relative foreign-resource gap of the MICs shown by the rise in the real current-account deficit relative to GDP (with more or less constant average variability), while the OECD on average reduced an already small resource gap.[20]

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[19] There is reason to think that the average difference in the magnitude of the input price shock was similar for manufacturing in the two groups but we have no data for the MICs.

[20] There was some difference between large and small industrial countries, the smaller tending to borrow more. For the 9 major OECD countries the change in percentage gap was from 0.5 (±1.0) to -0.4 (±1.3); for the remaining, smaller 10 the change was from 2.3 (±1.9) to 2.0 (±2.7).

Regression of the difference in labour productivity growth between the two periods, 60-73 and 73-80 $[\Delta(\dot{v} - \dot{\ell})]$ on the difference in terms-of-trade change $[\Delta(\dot{p}_m - \dot{p}_x)]$ and in the growth of public expenditures $(\Delta\dot{g})$ gives the following equation, based on 29 country observations,

$$\text{(i)} \qquad \Delta(\dot{v} - \dot{\ell}) = \underset{0.467}{-0.460} - \underset{0.136}{0.309}\Delta(\dot{p}_m - \dot{p}_x) + \underset{0.080}{0.133}\Delta\dot{g} \qquad (\bar{R}^2 = 0.22)$$

where small numerals are standard errors. The ten smaller MICs on average show a positive deviation of 1.25 percentage points from this regression (and the nineteen OECD countries, a negative deviation of 0.66, on average). This could be accounted for by the differential growth in the capital-labour ratio, a variable missing from the regression owing to lack of data. The importance of demand management and of differential output variability can alternatively be seen in the cross-section regression (for the same 29 countries) of employment increments or input price $[\Delta(\dot{p}_m - \dot{p}_c)]$ on total demand acceleration $(\Delta\dot{d})$ and the change in output variability $(\Delta\sigma_v)$,

$$\text{(ii)} \qquad \Delta\dot{\ell} = \underset{0.413}{0.065} - \underset{0.061}{0.058}\Delta(\dot{p}_m - \dot{p}_c) + \underset{0.091}{0.223}\Delta\dot{d} + \underset{0.211}{0.491}\Delta\sigma_v$$

$$(\bar{R}^2 = 0.26).$$

The fact that the coefficient of output is substantially less than unity indicates the positive relationship between output and labour productivity growth (the implied elasticity of 0.78 seems too high — see below). This coefficient is hardly affected by the introduction of the variability measure, which turns out to be quite important in its own right. This result makes sense. On theoretical grounds, one would expect average employment

requirements (for given output growth) to rise (and productivity to fall) as output (demand) becomes more uncertain, thus bearing out the importance of sustained expansion for productivity growth.

When one breaks up the sample into its OECD and MIC components, the following two improved regressions are obtained

(iii) (19 OECD) $$\Delta\dot{\ell} = \underset{0.707}{-0.906} + \underset{0.079}{0.300}\Delta(\dot{p}_m - \dot{w}) + \underset{0.169}{0.524}\Delta\dot{d} + \underset{0.336}{0.708}\Delta\sigma_v \qquad (\bar{R}^2 = 0.54)$$

(iv) (10 MICS) $$\Delta\dot{\ell} = \underset{0.745}{-0.362} - \underset{0.086}{0.147}\Delta(\dot{p}_m - \dot{p}_c) + \underset{0.151}{0.325}\Delta\dot{d} + \underset{0.369}{0.275}\Delta\sigma_v \qquad (\bar{R}^2 = 0.39).$$

Note the fact that output variability played an important role for OECD and was of no significance for the MICs and that the demand variable is higher in the first regression. Finally, we note that the positive coefficient for the relative input to wage cost in the first equation while there is a negative response to the real input price in the second equation are both consistent with a conjecture that the OECD countries were closer to being demand-constrained while the MIC's may have been closer to being supply-constrained. The latter point is strengthened when we widen the MIC sample but narrows our view to the manufacturing sector across countries. Table 4 gives a set of figures for 17 MICs, again compared with the 19 OECD countries. This suggests that there was a slowdown in both output and labour productivity for the manufacturing sector also in the MICs.[21] The relative increase in the MICs' share of

[21] The variability among MICs was quite large, however, for both output and output per employed person.

Table 4. Annual Average Rate of Change, Selected Variables in Manufacturing, by Country Group: 1960(66)-73, 1973-79

	19 OECD countries		17 MICs[a]	
	1960-73	1973-79	1966-73	1973-79
1. Manufacturing output (mean stand. dev.)	6.1 (3.3)	2.0 (4.6)	10.1 (7.4)	6.4 (7.4)
2. Employment	0.4	-1.0	5.0	5.4
3. Ouput per employee	5.7	2.9	5.1 (4.6)	1.0 (4.0)
4. Real wage[b]	4.7	2.7	2.0	0.8[c]
5. Total uses	5.7	2.7	6.6	6.1
6. Import/export prices	-0.5	1.5	-1.1	-0.3
7. Consumer prices	4.7	10.8	6.0[a]	19.0[a]

[a] List of 10 countries as in Table 3 with the addition of: Hong Kong, Chile, India, Greece, Venezuela, Mexico and Peru.

[b] Nominal wage rate in manufacturing deflated by consumer price index.

[c] Excluding Chile.

Source: Output: IMF (IFS) and IBRD (World Tables)
Employment: ILO Bulletin
Real wage: Nominal wage (IMF and ILO) divided by consumer prices (IMF)

world manufacturing output, mentioned at the beginning of the paper (see Table 1) was thus primarily due to sizeable employment growth in this sector, which on average continued unabated at a rate of 5.4 percent (see Table 4, line 2).

The fact that labour productivity fell in the manufacturing sector for both types of countries is consistent with the overall rise in real oil and raw-material prices which has afflicted this sector more than the aggregate economy (no data exist for the MICs). Next we note that in the period preceding 1973 real wages in the MICs grew much more slowly than labour productivity, providing support to the argument that by 1973 profits in the MICs may have been relatively high. Next, Table 5 provides some evidence to our claim that real wages in 1973-75 were on average downward flexible in the MICs, much less so in the major OECD countries, and not at all in the smaller OECD countries.[22] This was most probably reversed in the subsequent upswing in 1975-78 when an increasing number of MICs encountered rising real labour costs.

A regression of the change in manufacturing employment growth for the 17 MICs between 1966-73 and 1973-79 on real import prices $\Delta(\dot{p}_m - \dot{p}_c)$, real wages $\Delta(\dot{w} - \dot{p}_c)$, and total aggregate uses $(\Delta\dot{d})$ yields the following significant results:

$$(v) \qquad \Delta\dot{\ell} = \underset{0.861}{1.503} - \underset{0.031}{0.190}\Delta(\dot{p}_m - \dot{p}_c) - \underset{0.040}{0.130}\Delta(\dot{w} - \dot{p}_c) + \underset{0.167}{0.716}\Delta\dot{d}$$

$$(\bar{R}^2 = 0.62).$$

Obviously capital stock growth is missing from this regression and it may be

[22] Of course, there are always exceptions (e.g., Austria and Finland).

Table 5. Average Real Wage Growth in Manufacturing by Sub-Period and Country Group

	1966-73	1973-75	1975-78	1978-81
7 major OECD	4.8	3.4	3.2	1.6[a/]
12 small OECD	4.4	5.3	1.7	0.7
15 MICs[b/]	0.9	-1.7	-	-
12 MICs[c/]	-	-1.4	4.4	-

[a/] Excluding U.S.

[b/] Group of 17 excluding Hong Kong, Kenya

[c/] Group of 17 excluding Hong Kong, Syria, Zambia, Egypt, Chile

Source: Nominal wage (IMF and ILO) divided by consumer prices (IMF).

proxied by the significant positive intercept and possibly also by the total expenditure variable ($\Delta\dot{d}$).

Finally, we turn back to the current account. The trade-off between demand or output growth and the current account is borne out by a regression (based on the full sample of 38 countries represented in Table 2) of the change in relative resource gap $[\Delta(-F/V)]$ on the change in import-weighted (with weight γ) terms-of-trade $[\Delta(\dot{p}_m - \dot{p}_x)\gamma]$ and in the growth of public consumption ($\Delta\dot{g}$) and investment ($\Delta\dot{k}$).

$$\text{(vi)} \qquad \Delta(-F/V) = \underset{0.87}{3.55} - \underset{0.77}{2.02}\Delta(\dot{p}_m - \dot{p}_x)\gamma + \underset{0.17}{0.39}\Delta\dot{g} + \underset{0.14}{0.26}\Delta\dot{k} \qquad (\bar{R}^2 = 0.51).$$

The terms-of-trade factor represents the substitution between domestic and foreign goods while the other two variables may be thought of as representing shifts in aggregate saving and investment. The relative deficits of the nineteen MICs deviate by an average of 0.6 from this regression (-0.6 for the OECD countries). An alternative view which would lead to similar results is represented by the pair of regressions

$$\text{(vii)} \qquad \Delta(-F/V) = \underset{0.92}{3.98} - \underset{0.70}{2.27}\Delta(\dot{p}_m - \dot{p}_x)\gamma + \underset{0.38}{1.27}\Delta\dot{v} \qquad (\bar{R}^2 = 0.51)$$

$$\text{(viii)} \qquad \Delta\dot{v} = \underset{0.19}{-0.44} + \underset{0.04}{0.13}\Delta\dot{g} + \underset{0.03}{0.24}\Delta\dot{k} \qquad (\bar{R}^2 = 0.79).$$

Here the interpretation of the model would be in terms of a direct trade-off between current-account and GDP growth derived from the import-requirement side, with GDP growth in turn generated by the two aggregate-demand components, g and k. When one substitutes from regression (viii)

into (vii), the resulting equation resembles (vi), except for a smaller coefficient of public consumption.[23] The model underlying (vi) is consistent with an *ex-ante* investment-savings-gap view while that of (vii)-(viii) is consistent with an *ex-ante* import-gap view of the current account. In the aggregate and for the period averages it is difficult to distinguish between the two. When the data are broken down into the two country groups, there is some indication that a model such as (vii)-(viii) may have worked better for the industrial countries.[24] A more detailed investigation would be required to substantiate this statement, but here, as in the case of employment, it does at least make sense to conjecture that the industrial countries were on average and by choice more demand-constrained while the MICs were on average more supply-constrained in their balance of payments behaviour during much of the post-1973 period. Whichever is the more accurate view of the role of foreign borrowing, there seems little doubt that there was a pronounced trade-off between aggregate productivity and the current account, both short-run and long-run, which the MICs actively used to their advantage in the period between the two oil shocks. There are also clear indications that this 'free-ride' was over by 1979-80 as the real costs of foreign borrowing as well as the real costs of domestic labour were rising substantially.

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[23] When $\Delta\dot{g}$ or $\Delta\dot{k}$ are added into regression (vii) as separate variables, a positive but not very significant role is indicated for $\Delta\dot{g}$ but none for $\Delta\dot{k}$.

[24] Model (vi) does not seem to yield anything, while the other model, (vii)-(viii), yields some, though not highly significant, results.

V. CONCLUDING REMARKS

The analysis of capital market equilibrium and the differential impact of external shocks, as discussed here, leaves some incomplete answers and several open questions. On the level of economic theory, the single-good model, although simple and transparent, is also too simple to take account of some important aspects of the world adjustment problem. Since no change in final-goods terms of trade are allowed there is no room for expenditure-switching effects and for real exchange-rate adjustments, which were of considerable importance in the 1970s. It also does not enable one to put the proper emphasis on the role of internal demand-management policies of different countries in the determination of world equilibrium. A step in this direction has been taken in a recent three-country model by Marion and Svensson (1981), in which the final-goods terms of trade are allowed to change. A simpler, though less ambitious, alternative would be to extend the present model by adding a domestic nontradable-goods industry in each country.[25]

Another set of issues raised by the world equilibrium analysis is the interplay of OPEC oil pricing, IC response and interest rate effects. We have taken the simplistic view that the real price of oil is fixed exogenously and that OPEC adjusts its output accordingly. The two-period model leaves open the question of oil depletion, or what happens to oil

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[25] The single-economy, two-good, two-period model is worked out in Bruno (1981b). If one keeps the assumption that capital goods are fully traded, the determination of the world interest rate would retain the single-sector simplicity, while the introduction of the nontradable good allows for domestic changes in sectoral allocation and an explicit role for domestic demand management.

that is left over at the end of the second period (here it is valueless). Next, while we believe that OPEC has had some command over the *real* price of oil its nominal price has certainly not been indexed on a continuous basis. Part of the adjustment problem has had to do with the ratchet effects of increases followed by decreases in relative oil prices. There is also the interesting strategic question of how OPEC's pricing behaviour is affected by the experience of the resulting change in real interest rates, an externality which in turn affects the rate of return on its own assets (there is always the alternative of leaving oil in the ground). There is a similar externality problem for the ICs whose contractionary policies have indirectly enabled the MICs to expand at the ICs' expense. Some of these interesting game-theoretic questions have been raised in a recent paper by Dixit (1981).

Finally, there is need to study in greater detail the actual recent experience of the MICs, particularly in the area of real-wage and profitability behaviour. A more detailed comparison of the experience of a number of these countries with that of the industrial countries would no doubt throw much more light on the questions discussed here and probably raise some new ones.

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