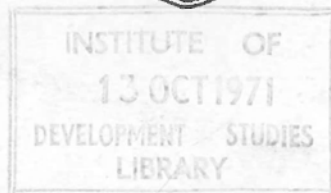


ESSAYS IN DEVELOPMENT ECONOMICS

No. 2

The Incubus of Foreign Aid

Syed Nawab Haider Naqvi



PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS

Old Sind Assembly Building,
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This is the second number in the series *Essays in Development Economics*, published from time to time by the Pakistan Institute of Development Economics.

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Pakistan Institute of
Development Economics

SYED NAWAB HAIDER NAQVI
Officer-in-Charge

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Other volume in the series
No. 1: Egalitarianism Versus Growthmanship

Price

Inland: Rs. 2.00
Foreign: US \$ 1.00

Published by
The Pakistan Institute of Development Economics, Karachi

Printed at
Din Muhammadi Press, I. I. Chundrigar Road, Karachi

JUNE 1971

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The Incubus of Foreign Aid*

Foreign aid enables the economy to grow fast by permitting a growth of investment which is more rapid than domestic saving will support. This is because a contribution of real resources on concessionary terms represents a real addition to total resources which can be used to promote development. A fast rate of economic growth leads to a higher level of domestic saving, which in turn makes the growth process more self-supporting.

Pakistan has been cited as having used foreign aid effectively. Foreign aid has financed about 40 per cent of the increase in investment since 1960. This has enabled domestic investment to grow at a rate of about 15 per cent of the gross national product which is more rapid than the saving capacity of the country would have been able to support. At the same time, the savings rate has responded to this acceleration in the rate of economic growth and is now about 10 per cent of the gross national product, as compared with only 5 to 6 per cent of the gross national product in 1955. Thus, foreign-aid inflow has been 'productive' in Pakistan in the sense that it has made the economy grow much faster than it could have done otherwise.

However, foreign aid-financed growth has not been an unmixed blessing for Pakistan. For, as growth is a long-term problem, long periods of borrowing and a high level of debt and debt service can hardly be avoided. While capital inflow is net addition to domestic resources, foreign borrowing continues for a longer period because domestic savings are still insufficient to pay both for domestic investment requirements and debt service on past loans. The economy has been saddled with large foreign debt-servicing liabilities which, up to 1965-66, amounted to Rs. 1,413 million and formed 8.4 per cent of Pakistan's total foreign-exchange earnings. As a result, net accumulated debt stood at Rs. 6,842.8 million in December 1965 and formed 15 per cent of gross national product. Already, in 1969-70, Pakistan's debt-servicing liabilities had increased to 19 per cent of total foreign-exchange earnings, while total net debt stood at Rs. 14,080.1 million and formed 25.9 per cent of the G.N.P. This strain on the economy and the country's balance of payments will become gradually more severe as interest and amortisation charges grow at a compound rate.

*This essay is based on an earlier study by the author [5]. The author wishes to acknowledge his indebtedness to all the participants in IEA's Conference held in Kandy, Ceylon, in 1969.

The magnitude of the problem that Pakistan faces in the not-too-distant future can be appreciated by the fact that resource *outflow* on account of interest payments on past loans alone will already be greater than the net resource inflow by 1980 (*see* Appendix A). In other words, from 1980 onwards, foreign resources will be required just to pay interest on past loans, and their effective contribution to domestic resources will have dwindled down to zero. Furthermore, net debt will be about 72 per cent of G.N.P. by 1985. It follows that, given the terms on which foreign capital is obtained (*i.e.* the rates of interest and amortisation), the economy must be able to save an increasing proportion of additional income in order to avoid the sure prospects of economic bankruptcy and achieve the much-cherished goal of an early "independence" from foreign aid.

Apart from the mounting burden of debt servicing and repayment, the contribution of foreign aid to development has been seriously eroded by the various conditions put by the donor countries on the use of the resources and for repayment. These conditions — e.g., the tying of aid by sources of supply — create a wedge between the nominal aid flows and their real value to the recipients. On top of all this, there has been a growing disenchantment with economic assistance in the donor countries for reasons ranging from the more pressing domestic problems to the allegedly poor economic performance of the developing countries. As a result, the nominal amounts of aid have been falling over time while their real value has fallen still further. The immediate implication of this decline in foreign aid flows is that developing countries like Pakistan will have to dig deeper in their already meagre foreign-exchange resources to meet their debt-servicing and repayment obligations instead of doing this out of increments in foreign-aid flows.

Thanks to all these considerations, the dependence on foreign assistance must end by a finite period. Other motives like national self-respect also point in the same direction. As a matter of fact, all foreign-aid models stipulate a definite ending of the inflow of foreign borrowings. Pakistan's perspective plan (1965-85), prepared by the Planning Commission [6], aims at substantially reducing Pakistan's dependence on 'external resources' by closing the saving-investment (or equivalently the export-import gap) by 1985. However, the Planning Commission's estimates refer only to net capital inflow and neglect the extra foreign borrowing that would be required to pay for service payments on previously incurred debt. Anisur Rahman [7] has made estimates of Pakistan's foreign-debt liability implicit in the Planning Commission's estimates of net resource inflow (loosely termed as 'external resources' in the perspective plan). The purpose of this essay is to present fresh estimates up to 1985 of Pakistan's requirements of foreign capital and of the external debt liabilities that such capital inflow will impose on the economy by employing a modified capital inflow-debt service model.

The discussion in this essay is divided into four main sections. In the first section we attempt to provide definitions of the basic concepts used in this paper, since much of the confusion in the discussion of foreign assistance has stemmed from semantic ambiguities. In the second section are presented estimates of net capital inflows required to (nearly) fill up the saving-investment gap, while section three gives estimates of external debt liabilities that such capital inflows will entail. Section four concludes this discussion.

I. DEFINITIONS

Before we present our basic estimates it may be useful to be clear about the definitions of the terms we use in this study. To begin with, foreign aid consists of an *explicit* transfer of resources to less-developed on *concessionary terms* [2]. Thus, business transaction, private trade and capital movement are not foreign aid since the resources so transferred are not provided on concessionary terms. Likewise, a concessionary *implicit* transfer of resources occasioned by special import quotas and preferential tariffs accorded the imports from developing countries — e.g., such as advocated in the UNCTAD meetings — cannot be defined as foreign aid even though such arrangements imply a very definite addition to the purchasing power of the developing countries.

In order to avoid these ambiguities in the concept of foreign aid, we have used in this study two basic concepts, 'net resource inflow' and 'net borrowing', for clarity of analysis. Net resource inflow has been defined as

$$F_n = I_n - S_n \dots\dots\dots(1)$$

where F, I and S stand for net resource inflow, domestic investment and domestic saving respectively. In words, net resource inflow is the difference between domestic saving and investment¹. This definition assumes that all foreign assistance takes the form of grants. However, most of the foreign assistance in Pakistan has been in the form of loans on which interest has to be paid. Hence, total foreign assistance equals net resource inflow plus interest on net debt in the previous year. This magnitude is defined as 'net borrowing' and is given by

$$B_n = I_n - S_n + i^{n-1-j} \sum_{j=1}^{n-1} F_j \dots\dots\dots(2)$$

where $\sum_{j=1}^{n-1} F_j$ is the net debt of the previous year and i is the average rate of interest. Furthermore, loans must also be repaid, which means that total borrowing is equal to net borrowing plus amortisation charges on the net debt of the previous year. In symbols,

$$B_g = B_n + a \sum_{j=1}^{n-1} F_j \dots\dots\dots(3)$$

where B_g and a stand for gross borrowing and rate of amortisation, respectively.

¹Alternatively, we could define net resource inflow as the difference between total exports and total imports, *i.e.*, $F = M - X$, where M and X stand for imports and exports, respectively. These two definitions are actually equivalent in an *ex post* sense, since $Y - E = I - S = M - X$, by definition, where Y and E stand for national income and national expenditure, respectively, *see* Balassa [2].

It may be noted that these distinctions between the above-noted concepts are not mere semantic differences. For, the concept of 'net resource inflow' is most relevant when we are concerned with the net contribution that foreign capital resources make to economic growth by supplementing domestic investment resources. On the contrary, when we are interested in analysing the balance-of-payments implications of a given foreign-assistance programme, then 'net borrowing' is the most relevant concept. It is important to distinguish between these concepts as a confusion between them can lead to faulty analysis. For instance, in Pakistan's perspective plan the estimates of 'external resources' must be interpreted as estimates only of 'net resource inflows' required to fill the so-called 'saving-investment gap' (or equivalently, the 'export-import gap'), because these estimates do not include foreign borrowing required to pay interest on past debt. The concept of gross borrowing highlights the basic importance that attaches to the terms of repayment. If, as is the case, a particular value of net borrowing is contemplated in order to fill the saving-investment gap and to service the debt, the volume of gross borrowing will be progressively large as debt-service payments have to be made².

²The converse is also true: if a particular volume of gross borrowing is contemplated, the volume of net borrowing will be progressively less as debt-service payments have to be made.

II. ESTIMATES OF NET RESOURCE INFLOWS DURING 1965-85

We have used a modified version of the Avramovic's debt-model³ in order to find out the time path of the net resource inflows up to 1985, the terminal year of the perspective plan. The net resource inflow in the year n is defined as⁴

$$\begin{aligned} F_n &= I_n - S_n \\ &= k(Y_{n+1} - Y_n) - [S_o Y_{n-1} + s' (Y_n - Y_{n-1})] \\ &= k_1 Y_n - [S_o Y_{n-1} + s' Y_{n-1}^r] \dots \dots \dots (4) \end{aligned}$$

where

- Y = gross national product
- F = net resource inflow
- I = domestic investment
- S = domestic saving
- k = marginal capital-output ratio
- r = the rate of growth of G.N.P.
- S_o = gross domestic savings ratio
- s' = marginal savings ratio

It can be readily seen that for net resource inflow ultimately to decline — *i.e.* for $F_n < F_o - i$) $MRS > ARS$, and *ii*) $kr < s'$ (see Appendix B-1). In words, the marginal rate of saving must exceed both the average rate of savings and the product of the capital-output ratio and the rate of growth of the gross national product, which is the rate of investment.

We have made the assumptions shown in Table I in estimating the magnitude of net resource inflow up to 1985.

³An important shared property of the two models is that the length of the debt cycle generated by external borrowing to cover the saving-investment gap is highly sensitive to the marginal rate of saving assumed and to the extent of the initial gap itself. This is because the stock of debt would grow rapidly if the gap were large, and because the larger the accumulated debt relative to national income, the higher would be the marginal rate of saving required by the economy to meet both its own investment requirements and its debt-servicing obligations. This point was clarified by K. N. Raj during the Conference, *see* [5].

⁴The saving-investment gap in year n is usually defined as

$$k(Y_{n+1} - Y_n) - [S_o Y_o + s' (Y_n - Y_o)]$$

where both the average and marginal savings are defined in relation to the base-year income (Y_o). *See*, for instance, Avramovic [1] and Mikesell [4]. In contrast, we have defined both these magnitudes in relation to the previous year's national income (Y_{n-1}). The reason for this modification is that, on the previous definition, the economy tends to save much more than is reasonable to expect in the case of a developing country like Pakistan. As a result, the saving-investment gap closes much too early, around 1975, which is a highly improbable result even on the most optimistic assumptions.

TABLE I
THE KEY ASSUMPTIONS OF 'NET RESOURCE INFLOW' REQUIREMENTS
PROJECTIONS FOR 1965-85

	1965	1970	1975	1980	1985	Annual compound rate of growth (in percentage terms) 1965-85
1. GNP growth*	5.2	6.5	7.3	7.5	7.5	7.2
2. Marginal rate of saving (per cent)*	22	22	25	28	25	25
3. Average rate of saving*	10.3	13.6	16.9	20.2	21.8	
4. Capital-output ratio (gross)*	2.8	2.9	2.9	2.9	3.0	2.9

*In the preceding five years.

It may be noted that these are in fact the assumptions of Pakistan's perspective plan (1965-85). We have taken these assumptions in order to make our results comparable with those of the perspective plan. Also, these assumptions are in the nature of policy directives which the economic analyst must take as given. Furthermore, we have made our calculations, as the Planning Commission have done, on the basis of the 1965 G.N.P. figures. The main results of our exercise are reproduced in Table II.

TABLE II
PAKISTAN'S REQUIREMENTS OF 'NET RESOURCE INFLOW' DURING 1965-85
(in million rupees)

	1965	1970	1975	1980	1985	Annual compound rate of growth (in percentage terms) 1965-85
1. GNP at 1964-65 (market price)	45,540.0	62,393.8	88,744.2	127,403.7	182,904.5	7.2
2. Gross investment	9,142.3*	13,208.6	19,301.8	27,710.4	41,153.4	8.3**
3. Gross domestic saving	5,341.8*	8,919.7	15,667.9	26,162.3	40,281.5	11.2**
4. Net resource inflow [= (2) - (3)]	3,800.5*	4,288.9	3,633.9	1,548.1	871.9	-7.5**
5. (4) as percentage of GNP	7.8	6.9	4.1	1.2	0.5	

*Figures are for 1966.

**Growth rates for nineteen years only.

See Appendix A for details.

It can be seen from row 4 that *if* the G.N.P. grows at the target rate of 7.2 per cent, and *if* the economy succeeds in saving 25 per cent of additional income and the capital-output ratio is 2.9:1, *then* Pakistan's dependence on net resource inflow can be substantially reduced from 7.8 per cent of G.N.P. in 1966 to 0.5 per cent of G.N.P. in 1985. In the meantime domestic investment will have increased from 18.2 per cent of G.N.P. in 1965 to 22.5 per cent of G.N.P. in 1985; and domestic saving will have risen from 11.0 per cent of G.N.P. in 1965 to 22.0 per cent of G.N.P. in 1985. However, it may be noted that our estimates of net resource inflow promise an earlier filling-up of the saving-investment gap than do the Planning Commission estimates: whereas according to our estimates net resource inflow in 1985 will have been reduced to 0.5 per cent of G.N.P., the Planning Commission estimates put it at 1.1 per cent of G.N.P. Since we do not know their method of calculation, it is difficult to explain this difference. (Recall that the values of 'key' parameters are the same in both the estimates. Also, both estimates start from the base-year G.N.P. figures, Rs. 45,540 million.) At any rate, this difference in the magnitude of net resource inflow in the two estimates is not of great significance for foreign-aid policy.

III. ESTIMATES OF PAKISTAN'S EXTERNAL INDEBTEDNESS DURING 1965-85

The estimates of net resource inflow that have been presented in the preceding section give an idea only of the magnitude of the net resource inflow required over a number of years to close the saving-investment gap. However, these estimates should not be taken to signify, as Pakistan's Planning Commission appear to be doing, independence from 'external resources'. For, as foreign capital comes in the form of loans, interest and amortisation charges must be paid on the accumulated debt. Since debt-service liabilities must be met for a considerable period of time by new borrowing, the estimates of net resource inflow are considerably less than Pakistan's total requirements of foreign borrowings. For this reason we have made estimates of net borrowing, gross borrowing and net debt. These estimates have been generated within the framework of our model.

Estimates of Net Borrowing: The estimates of net borrowing, as indicated above, are given by

$$B_n = I_n + S_n + i^{n-1-j} \sum_{j=1}^{n-1} F_j \dots\dots\dots(4)$$

where i is interest rate and $\sum_{j=1}^{n-1} F_j$ is the net debt in the year $n-1$. The conditions for net borrowing to decline are, as it turns out, the same as those necessary to make net resource inflow decline, *i.e.* i) $MRS > ARS$ and ii) $MRS > kr$. (The proof of this is given in Appendix B-2.) However, the period after which net borrowing does in fact decline depends on the rate of interest: the lower the rate of interest, the earlier will 'independence' from net borrowing be achieved, if the above-stated conditions are satisfied.

We have estimated Pakistan's requirements for 'net borrowing' up to 1985. In order to calculate interest payments on net debt outstanding in 1965, we have used an average interest rate of 3.9 per cent⁵. The results of our exercise are reproduced in Table III.

⁵According to a recent study (unpublished) made by the Planning Commission, 52 per cent of all loans contracted up to 1965 carried an interest charge of 3 per cent; 41 per cent of all loans an interest charge of over 5 per cent; and the rest of the 7 per cent of all loans carry an interest charge between 3 and 5 per cent. This gives an average of 3.9 per cent.

TABLE III
PAKISTAN'S REQUIREMENTS OF NET BORROWING FOR 1965-85
(in million rupees)

			Net borrowings	As per cent of G.N.P.
1966	..	..	4,067.4	8.4
1970	..	..	5,290.3	8.5
1975	..	..	5,878.1	6.6
1980	..	..	5,147.1	4.1
1985	..	..	5,795.9	3.2

See Appendix A for details.

These figures show that Pakistan's requirements of net borrowing will have increased from Rs. 4,067.4 million in 1966 to Rs. 5,795.9 million in 1985 at a compound rate of 4.1 per cent per annum over the twenty-year period. Pakistan's domestic saving will need to be supplemented by foreign capital only to the extent of 0.5 per cent of G.N.P. by 1985. As a result, Pakistan's balance of payments will have to bear an increasing burden of debt-service payments for a considerably longer period of time. However, it will be noted that, while the net borrowing will have increased in absolute terms, it will have declined as a percentage of gross national product — from 8.4 per cent in 1965 to 3.2 per cent in 1985—reflecting the fact that G.N.P. over the same period will have grown at a compound rate of 7.2 per cent per annum. This in turn reflects a greater 'readiness' of the economy to take the burden of debt-service payments.

Estimates of Net Debt: The increase in debt-service payments will have also increased Pakistan's net debt, constituting a net drain (net of debt repayments) on domestic resources; and complete independence from foreign assistance will have been achieved only when the entire outstanding debt is extinguished. For this reason, we have estimated the increase in net debt up to 1985. These estimates have been obtained simply by adding net borrowings of a given year to the net debt outstanding in the previous year. Our results are reproduced in Table IV.

TABLE IV
ESTIMATES OF PAKISTAN'S NET INDEBTEDNESS AND THE BURDEN OF
DEBT DURING 1965-85

(in million rupees)

			Net indebtedness	Per cent of GNP
1965	..	..	6,842.8*	15.0
1970	..	..	30,966.3	49.6
1975	..	..	63,421.9	71.5
1980	..	..	97,428.0	76.5
1985	..	..	132,052.3	72.2

*Actual net debt outstanding at the end of 1965. See Appendix A for details.

The figures show that Pakistan will have accumulated a large net debt by 1985. Not only will the absolute net debt have increased, but the net burden of foreign debt (net debt as percentage of national income) will also have increased by 1985: from 15 per cent of G.N.P. in 1965 net debt will have increased to 72.2 per cent of G.N.P. in 1985. This large increase in the proportion of net debt will have occurred because it has grown at a compound rate of about 15.9 per cent per annum, as compared with 7.2 per cent compound growth rate of G.N.P. These are large figures and give an idea of the magnitude of the debt legacy the present generation will have left for posterity.

Estimates of Gross Borrowing: So far we have not considered the repayment of loans. Not only interest charges but amortisation payments must also be made on past loans. Amortisation payments *plus* net borrowing give the figure for gross borrowings. It has been defined in Section I as

$$B_g = B_n + a \sum_{j=1}^{n-1} F_j \dots\dots\dots (5)$$

The concept of gross borrowing, though not significant for economic analysis once amortisation payments are fixed, is important for aid policy in that it highlights the crucial significance of the length of the period of repayments. For, given the rate of interest, the longer the period of repayment, the lower will be the amortisation payments and the smaller will be the gross borrowing required to maintain a given volume of net borrowing. For this reason, we have made

estimates of gross borrowing for 1965-85. An amortisation rate of 3.9 per cent (equal to the average rate of interest) has been assumed, since total debt-service payments so far have been devoted to pay interest and amortisation charges on a 50:50 basis. Our estimates are presented in Table V.

TABLE V
ESTIMATES OF GROSS BORROWING FOR 1965-85
(value in million rupees)

			Gross borrowing	Net borrowing
1965	..	..	4,334.3	4,067.4
1970	..	..	6,291.7	5,290.3
1975	..	..	8,122.3	5,878.1
1980	..	..	8,746.1	5,147.1
1985	..	..	10,719.9	5,795.9
Annual compound rates of growth (percentage terms)	..	..	4.9	1.9

See Appendix A for details.

These figures show that, given the terms of repayment, Pakistan will have to borrow in 1985 Rs. 10,719.9 million in order to ensure that Rs. 5,795.9 worth of foreign resources do in fact flow in to sustain the stipulated rate of growth of G.N.P. and to pay the interest charges on net debt. Also, when compared with the corresponding magnitudes in 1965, gross borrowings will have increased faster than net borrowings; *i.e.* whereas during 1965-85 net borrowings will have increased at a compound rate of 1.9 per cent per annum, gross borrowings will have increased at a rate of 4.9 per cent per annum. Thus, Pakistan will have to borrow in gross terms more in 1985 than in 1965 in order to ensure the 'required' amount of net borrowing. The implication of this for aid policy is clear. The aim of the aid negotiators, given the rate of interest, should be to narrow down this differential between the growth rates of gross borrowings and net borrowings. This can be done by negotiating for lower amortisation payments, which means that the period of repayment will become longer. However, such a policy means that the day of 'independence' from foreign aid will be pushed farther into the future.

IV. CONCLUSIONS

In this essay we have made an attempt, by employing a modified version of Avramovic's capital inflow-debt service model, to provide estimates of net capital inflows that Pakistan will require over a number of years in order to close the gap between domestic saving and investment. We have shown that capital inflows of such magnitude impose large debt-servicing liabilities on the economy and leave a legacy of a large net debt for posterity.

Our estimates present an alarming picture of debt liabilities. Firstly, it has been shown that *despite* low rates of interest (3.9 per cent) and of repayment (seventeen years) and of a relatively optimistic rate of economic growth (7.2 per cent per annum) postulated in this study, foreign debt builds up to a level of over 70 per cent of national income by 1985! There was, of course, no reason to be worried about the size of the debt simply because it was a high percentage of national income or to assume that it would all have to be repaid; a developing country's debt and capital stock could both go on growing like they do in a successful corporation. But in the real world in which uncertainty is crucial, it is important to see the problem in terms of the developing country's 'balance sheet' taking into account the complexities introduced by equity capital (which can be repatriated at any time) as a form of 'aid', short-term loans and related 'hot-money' flows, limited foreign exchange resources and so on. The sort of difficulties that even a high-saving developing country could run into has been well-illustrated by Brazil's experience, since 1950, of the consequences — in sudden repatriations, devaluations and so on — of low international confidence, even when coupled with a comparatively low debt.

Secondly, on the basis of past trends, even if there were no debt amortisation, interest charges for Pakistan will have outpaced net receipts by 1980. Thirdly, even though net borrowing will decline as a percentage of GNP, this should not make us complacent about the future. For, debt must also be amortized and this makes the magnitude of gross borrowing so crucial for aid policy. We have shown above that Pakistan will have to borrow more in gross terms in 1985 than now.

It follows that the Government has been contracting a debt-servicing liability that future generations could not possibly finance from domestic resources. Private foreign investment at the moment is negligible addition to these resources, and it promises to remain so. Is Government morally justified in burdening the posterity to this extent? After all the government must ensure equality between the present and the future generations. We cannot duck the issue simply by throwing our hands in the air and say 'but what else can we do'. For, a capital inflow of this order would be unnecessary if we attacked the import-export gap seriously — by tightening controls on consumer imports and by shifting industry's import coefficients through developing an indigenous technology

based on indigenous resources and a technology-oriented educational structure. As for the savings-investment gap, there is some evidence to show that aid and domestic savings are inversely related. Of course, it would be naive to think that a contraction in aid flows would automatically shake investible funds from the economy. But it is equally naive to believe that savings are a function of income alone. In practice, a lot is decided in Planning Commission in terms of some sort of calculus which, while it values oligarchic resistance, also values total resources. If one source of savings falls away, the planners would look very hard for another. In Pakistan, they might well find them in the urban sector where savings account for 8-9 per cent of income compared with 12-13 per cent in the rural sector. Besides, competition between the countries of the region is such that any drop in the rate of growth as a result of the withdrawal of aid would be unacceptable.

The moral is that successful negotiation of aid should not always be celebrated as an event of immense rejoicing. Our traditional euphoria on such occasions must be replaced by sober thought. For, we could really plunge the economy right into the morass of bankruptcy if we do not spend the foreign aid funds even more wisely than our own. We must be careful enough to boost up our foreign exchange earnings along the way. Furthermore, a high marginal savings rate must be attained in order to fill in the saving-investment gap and to pay for debt-servicing charges. Of course, debt servicing can be paid for by new borrowing, and it will in fact be inevitable to do this to some extent, but such a strategy will lead to a rapid accumulation of net debt. However, while domestic savings must grow, there are definite limits to what the economy can be forced to save. Hence, part of the solution of the problem of external indebtedness will inevitably have to be provided by the donor countries who must be prepared to provide loans at lower interest rates and on easier terms of repayment. For, such a policy would not only lengthen the period of net transfer of resources and make their aggregate value larger, it will also make it possible for the economy to achieve independence from foreign assistance without imposing too heavy a 'consumption' cost on the domestic consumer. However, in the last analysis, the responsibility for wise housekeeping is our own. While we must try to make the donors see reason, we should be the ones to see it in the first place.

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Appendix A

**FOREIGN AID REQUIREMENTS FOR PAKISTAN'S LONG-TERM GROWTH (1965-85):
THE SAVING-INVESTMENT GAP APPROACH**

Year	G.N.P. (Y_n)	$Y_{n-1} \rightarrow Y_n$	$Y_n - Y_{n-1}$	Investment $I_n = k(Y_{n-1} - Y_n)$	G.D.S.R. $\times Y_{n-1}$	M.S.R. $\times (4)$
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1965	45,540.0	2,960.1	—	5,288.3	—	—
1966	48,500.1	3,152.5	2,960.1	9,142.3	4,690.6	651.2
1967	51,652.6	3,357.4	3,152.5	9,736.5	4,995.5	693.6
1968	55,010.0	3,575.7	3,357.4	10,369.5	5,320.2	738.6
1969	58,585.7	3,808.1	3,575.7	11,043.5	5,666.0	786.7
1970	62,393.8	4,554.7	3,808.1	13,208.6	7,967.7	952.0
1971	66,948.5	4,887.3	4,554.3	14,194.2	8,485.6	1,138.7
1972	71,835.8	5,244.0	4,887.3	15,207.6	9,105.0	1,221.8
1973	77,079.8	5,626.8	5,244.0	16,319.1	9,769.7	1,311.0
1974	82,706.6	6,037.6	17,509.0	17,509.0	10,482.9	1,406.7
1975	88,744.2	6,655.8	6,037.6	19,301.8	13,977.4	1,600.9
1976	95,400.0	7,155.0	6,655.8	20,749.5	14,997.8	1,863.9
1977	102,555.0	7,691.6	7,150.0	22,305.6	16,122.6	2,003.4
1978	110,246.6	8,268.5	7,691.6	23,978.7	17,331.8	2,153.6
1979	118,515.1	8,888.6	8,268.5	25,776.9	18,631.7	2,315.2
1980	127,403.7	9,555.3	8,888.6	27,610.4	23,940.1	2,222.2
1981	136,959.0	10,271.9	9,555.3	30,815.7	25,735.5	2,388.8
1982	147,230.9	11,042.3	10,271.9	33,126.9	27,665.7	2,568.0
1983	158,273.2	11,870.5	11,042.3	35,611.5	29,740.6	2,760.6
1984	170,143.7	12,760.8	11,870.5	38,282.4	31,971.2	2,967.6
1985	182,904.5	13,717.8	12,760.8	41,153.4	37,091.3	3,190.2

G.D.S.R. = Gross domestic saving ratio.
M.S.R. = Marginal saving ratio.

Savings $S_n = (6) + (7)$	Net resource inflow $(5) - (8)$	Interest at 3.9%	Amortiza- tion at 3.9%	Net borrowing $(9) + (10)$	Gross borrowing $(11) + (12)$	Net debt (12)
(8)	(9)	(10)	(11)	(12)	(13)	(14)
—	—	—	—	—	—	6,842.8*
5,341.8	3,800.5	266.9	266.9	4,067.4	4,334.3	10,910.2
5,689.1	4,047.4	425.5	425.5	4,472.9	4,898.4	15,383.1
6,058.8	4,310.7	599.9	599.9	4,910.6	5,510.5	20,293.7
6,452.7	4,590.8	791.5	791.5	5,382.3	6,173.8	25,676.0
8,919.7	4,288.9	1,001.4	1,001.4	5,290.3	6,292.7	30,966.3
9,624.3	4,559.9	1,207.7	1,207.7	5,777.6	6,985.3	36,743.9
10,226.8	4,880.8	1,433.0	1,433.0	6,313.8	7,746.8	43,057.7
11,080.7	5,238.4	1,679.3	1,679.3	6,917.7	8,597.0	49,975.4
11,889.6	5,619.4	1,949.0	1,949.0	7,568.4	9,517.4	57,543.8
15,667.9	3,533.9	2,244.2	2,244.2	5,878.1	8,122.3	63,421.9
16,861.7	3,887.8	2,473.5	2,473.5	6,351.3	8,834.8	69,783.2
18,126.0	4,179.6	2,721.5	2,721.5	6,901.1	9,622.6	76,684.3
19,485.6	4,493.3	2,990.7	2,990.7	7,484.0	10,474.7	84,168.3
20,946.9	4,830.0	3,282.6	3,282.6	8,112.6	11,395.2	92,280.9
26,162.2	1,548.1	3,599.0	3,599.0	5,147.1	8,746.1	97,428.0
28,124.3	2,691.4	3,799.7	3,799.7	6,491.1	10,290.8	103,919.1
30,233.7	2,893.2	4,052.8	4,052.8	6,946.0	10,998.8	110,875.1
32,501.2	3,110.3	4,323.7	4,323.7	7,434.0	1,757.7	118,299.1
34,938.8	3,343.6	4,613.7	4,613.7	7,957.3	12,571.0	126,256.4
40,281.5	871.9	4,924.0	4,924.0	5,795.9	10,719.9	132,052.3

*Debt outstanding at the end of 1965.

Appendix B-1

**PROOF OF THE CONDITION FOR NET RESOURCE INFLOW
TO DECLINE**

We have

$$F^1 = Y^1kr - Y_0[S_0 + s'r]$$

$$F^2 = Y^2kr - Y^1[S_0 + s'r]$$

if requirements for foreign capital inflow decrease, then $F^2 < F^1$, i.e.

$$Y^2kr - Y^1[S_0 + s'r] < Y^1kr - Y_0[S_0 + s'r]$$

or $kr(Y^2 - Y^1) < (Y^1 - Y_0)(S_0 + s'r)$

or $kr^2Y_0(1+r) < Y_0r(S_0 + s'r)$

or $kr(1+r) < S_0 + s'r$

$$k(1+r) < \frac{S_0}{r} + s'r$$

or $k + kr < k + s'$

or $kr < s'$.

Appendix B-2

CONDITION FOR NET BORROWING TO DECLINE

$$F_0 = I_0 - S_0 = krY_0 - Y_{-1}[S_0 + s'r]$$

$$= Y_{-1}kr(1+r) - Y_{-1}(S_0 + s'r)$$

$$F^1 = I_1 - S_1 + i(F_0)$$

$$= krY_{-1}(1+r)^2 - Y_{-1}(1+r)(S_0 + s'r) + [krY_{-1}(1+r) - Y_{-1}[S_0 + s'r]]$$

For F^1 to be less than F_0 , we have

$$kr(1+r)^2 - (1+r)(S_0 + s'r) + ikr(1+r) - i(S_0 + s'r) < kr(1+r) - (S_0 + s'r)$$

i.e. $kr(1+r)(1+r+i-1) < (S_0 + s'r)(1+r+i-1)$

i.e. $kr(1+r) < S_0 + s'r$

i.e. $k + kr < k + s'$

i.e. $kr < s'$.

Appendix B-3

CONDITION FOR GROSS BORROWING TO DECLINE

$$\begin{aligned}G_0 &= kr Y_0 - Y_{-1}(S_0 + s'r) \\ &= kr Y_{-1}(1+r) - Y_{-1}(S_0 + s'r). \\ G_1 &= kr Y_1 - Y_0(S_0 + s'r) + (a+i) F_0 \\ &= kr Y_{-1}(1+r)^2 - Y_{-1}(1+r)(S_0 + s'r) + (a+i) \\ &\quad [Y_{-1} kr(1+r) - Y_{-1}(S_0 + s'r)].\end{aligned}$$

For $G^1 < G_0$ we have

$$\begin{aligned}kr(1+r)^2 - (1+r)(S_0 + s'r) + (a+i) [kr(1+r) - (S_0 + s'r)] < \\ kr(1+r) - (S_0 + s'r)\end{aligned}$$

$$i.e. \quad kr(1+r)(1+r - a+i - 1) < (S_0 + s'r)(1+r + a+i - 1)$$

$$i.e. \quad kr(1+r) < S_0 + s'r$$

$$i.e. \quad k+kr < k+s'$$

$$i.e. \quad kr < s'.$$

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