

ECONOMIC GROWTH CENTER

YALE UNIVERSITY

Box 1987, Yale Station
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 34

ECONOMICS OF EXTERNAL BORROWING: THE LIQUIDITY
CONSTRAINT AND THE TWO-GAP MODELS OF
FOREIGN AID*

Sunanda Sen

August 1, 1967

Note: Center Discussion Papers are preliminary materials circulated to stimulate discussion and critical comment. References in publications to Discussion Papers should be cleared with the author to protect the tentative character of these papers.

ECONOMICS OF EXTERNAL BORROWING: THE LIQUIDITY CONSTRAINT
AND THE TWO-GAP MODELS OF FOREIGN AID*

The paper seeks to analyse some implications of the debt-service requirements for the two-gap models of economic growth built around the notion of self-reliance. The analysis attempts to point out the inadequacy of the two-gap models of foreign aid when the exchange earnings available to the borrowing country from exports and from the non-committed portion of foreign loans are inadequate to meet the debt-service requirements.¹ The paper shows it explicitly that the terms of loans play a significant role in shaping the debt-retirement process --- not only in its influence over the size and the duration of the savings gap --- but also in the qualitative difference it introduces in the nature itself of the (foreign) resource gap. Thus while the conventional literature distinguishes between domestic and foreign resources as supplements to domestic investment and/or import capacity,² it does not

*The author owes a large debt to Dr. Anisur Rahman and to Prof. Richard N. Cooper for their valuable comments and suggestions at crucial stages of the present work. Thanks are also due to Prof. Robert Triffin for the clarification of some basic notions. The responsibility of the paper, however, entirely rests with the author.

explicitly introduce the qualitative distinction between the gaps in foreign resources and foreign exchange (or simply, liquidity). The term of foreign loans, as it has been shown below, can under certain circumstances, introduce a third pre-condition for the aid-cum growth process in terms of the liquidity-margin requirement.³ The paper introduces the institutional features of public borrowing and seeks to examine the implications of such a programme of borrowing when the major portion of the gross inflow of capital are committed to the merchandise purchases in the current account. The consequences are quite serious when one recognises the alternatives open to the borrowing country under the existing institutional set-up. Thus the country facing such a crisis can meet the situation by drawing down the reserves, or, alternatively, by borrowing larger amounts at less favourable terms. While the first method can never be a permanent solution to any country, the second one is accompanied by all its repercussions and reinforcing effects on the savings gap, the trade gap, the liquidity margin, and on the terminal date for self-reliance.⁴

The terms at which a country can borrow are influenced to a considerable extent by the conditions of supply governing such loans. It is important to recognise that the supply situation of foreign aid as visualized by the individual recipient of foreign aid is quite different from what the donor (or the donors) takes it to be. Thus the recipients are often at too low a scale in their bargaining strength in relation to the donors to be able to exercise decisions on a joint basis. It is apparent that the overall supply schedule of foreign loans is always an upward rising one since aid

other than grants are often sensitive to the terms offered in the market and a sizeable portion of loans are offered at commercial terms. For the recipient as a single country, however, one can conceptually visualize a step-function type of supply schedule for foreign capital^{4(a)} --- each step representing the maximum flow of loans at particular loan terms. The range of continuity of each step, again, may be shorter at higher ranges of loan terms. The aid-composite at each weighted average of loan-terms, therefore, is almost determined for the borrowing country and the maximum amount of loans it is able to obtain at a particular loan term may not always be adequate to meet its total requirements. The alternatives left open to the recipient often consist of an excess demand for foreign resources, an effective matching of total demand at terms less favourable than before,⁵ or, lastly, a rescheduling of the debt-structure as a temporary solution of the problem.

The present paper introduces certain changes in the contents of a few conventional concepts used in the existing literature on foreign aid. Thus the inflow of foreign resources necessary under the two-gap estimates is considered in its net rather than in its gross entirety and the savings-gap is defined as the foreign resource necessary to supplement domestic savings net of foreign claims. One can here recall the debt-cycle models of savings-gap analysis⁶ built around the assumption of a terminal date for capital inflow. The contribution of foreign loans towards saving is in reality limited to the initial phase when such loans contribute towards domestic investment. It is useful to introduce the concept of the savings-coefficient

of foreign loans which relates to the entire period during which foreign aid is forthcoming. Thus adverse changes in the terms of borrowing lengthen the time-period necessary to pay off such loans with a consequent reduction in the value of the coefficient. A recent work on the economic criteria of foreign loans has established an inverse relation between the savings-potentiality (or the coefficient, as defined above) and the terms of such inflow.⁷ The debt-retirement schedule has a more significant bearing on the trade-gap implicit in the growth process. It is henceforth defined as the amount of foreign resource necessary to supplement the domestically earned resources from abroad net of all foreign claims. The inclusion of foreign claims makes for a close relation between the magnitude of the trade-gap and the terms of foreign loans. While there has been some attempt in the literature⁸ to incorporate the above relation in terms of the bearing of loan terms on the amount of gross capital inflow necessary to maintain a stipulated growth rate in the merchandise balance, the more complete trade-cum-growth models do not introduce the complications. It is more important in the context of the present paper to distinguish the above two gaps in foreign resources from a third one which is described as the 'foreign exchange' or 'liquidity' gap.⁹ The latter can operate as a pre-condition for the aid-cum-growth process whenever the liquid portion of foreign loans (which consists of generally available free exchange) constitute a fraction of the total flow of such loans. The terms of loans can be defined in a generalised way to cover the tied loans and the residual elements in the terms of loans, viz., the interest rate and

the maturity, have an equally significant bearing on their quantitative implications on the liquidity margin. The next section develops the conditions where the liquidity-margin requirement can operate as a third gap for the foreign aid models and explores the structural implications of the constraint. It examines the time-path of the liquidity margin under certain specific assumptions of a simplified model for a borrowing economy and analyses a few empirical solutions to project the liquidity requirement for the borrowing countries. The concluding section brings together the implications of the analytical and the empirical solutions for the existing institutional set-up.

II

The terms of tied loans have some influence on the size as well as the composition of the gross capital inflow. The qualitative aspect of the foreign-resource gap however, can only be specified under the following institutional assumptions which are often less explicit under the real growth models:

(i) Currencies are inconvertible between countries. The assumption, while implicit in the resource-gap models of aid, should be explicit in all growth models which distinguish between domestic and foreign resources.

(ii) The import coefficient may change with changes in the exchange control mechanism and/or a different weightage from the different sectors. Thus the availability of the loan itself may increase the foreign resource-gap with a certain relaxation of the import-control mechanism, or simply,

with additional purchases by the government itself.

(iii) Foreign loans may be accompanied by contractual purchases in the current account. This reduces the potentiality of such loans to meet the liquidity as distinct from the foreign resource requirement of the recipient. Thus the loans tied to the purchases of the recipients are hardly as efficient in meeting the need for liquid foreign resources as these are to meet the resource-gap for the borrower. Thus the institutional pattern of the loans often introduce an additional element of inflexibility in the debt-servicing process for the recipients. Since a large portion of the total loans can easily be tied to imports,¹⁰ the actual rate of gross lending, though adequate in terms of the stipulated requirements to cover the trade-gap, may not be sufficient to meet a liquidity crisis when the exchange earnings from exports are smaller than the outstanding debt-charges. Thus a simple increase in the volume of foreign aid is unlikely to help the debt-service burden when the debt-service ratio¹¹ is sharply increased with mounting debt-service requirements.

One can develop the liquidity margin requirement as an additional constraint for an open economy whenever the inflow of foreign resources, as indicated in the above assumptions, are different from the generally available exchange under the tied loans with contractual terms of purchases. The following set of equations illustrate the basic nature of the problem under certain simplifying assumptions regarding the variables of the model. Thus the three instrument variables of the model, viz., i,

σ (reciprocal of amortisation period) and λ (the liquid portion of foreign loans) remain unchanged during the time period under consideration. Moreover, the model accepts an exogenous rate of growth in exports ($\times$) and imports (m) which remain unchanged during the specified time period. Thus it does not introduce the functional relationship between F_t , the gross inflow of loans, the import-coefficient and the trade-gap itself --- as mentioned in the second assumption given above.¹² The assumptions help to illuminate the basic nature of the problem as described in the following set of definitional relations:

$$\begin{aligned} (1) \quad L_t &= X_0(1 + \times)^t + \lambda F_t - (i + \sigma)B_t \\ &= M_0(1 + m)^t - (1 - \lambda)F_t \end{aligned}$$

The liquidity margin in period t equals the value of export earnings in the same period plus the liquid portion (λ) of the gross inflow of loans F_t net of interest (i) and amortisation charges (σ) on the loans outstanding (B_t).

$$(2) \quad B_t = B_{t-1}(i + 1) + M_0(1 + m)^{t-1} - X_0(1 + \times)^{t-1}: \text{ Loans }$$

outstanding in period t equals the outstanding indebtedness in the preceeding period, the interest charges on it and the merchandise balance during the preceeding period.

(3) $F_t = (i + \sigma)B_t + M_0(1 + m)^t - X_0(1 + \times)^t$: The gross inflow of loans in period t equals the interest and the amortisation charges on the loans outstanding during the current period plus an excess (or shortfall) of imports over exports during the current period. F_t , as indicated above,

can be identified to the trade-gap as defined in the present paper.

The equations are self-explanatory with the following set of terminology:

X_0 : value of exports in the initial period 0

M_0 : value of imports in the initial period 0

i : rate of interest

σ : the inverse of T , the period of amortisation. An amount which falls due in each period on the assumption of a linear rate of amortisation.

λ : the liquid portion of loans under the terms of tied credits

x, m : exogenous rates of growth for exports and imports.

The model incorporates the implications of the debt-service requirements for the borrowing economy in the process of growth. While equation (3) restates the 'trade-gap' in terms of the debt-service requirements, equation (1) indicates the need for an additional target in terms of a possible gap between the total supply of and the need for internationally liquid resources. The equality condition indicates the possibility of a crisis whenever L_t drops down to zero. Strictly speaking, L_t can never be negative since it is always financed ex post by external liquid resources. There can, however, be always an ex ante situation where the borrowing country can always forecast a negative L_t and try to correct the situation by changing the values of the parameters (i, σ , and λ) whenever L_t tends to decline to zero. The recipient clearly finds it unnecessary to deplete its external resources, to borrow at less favourable terms or to ask for a rescheduling of loans so long L_t is positive. It is thus important for

the borrowing country to maintain a positive liquidity margin in order to avoid adverse changes in the terms of marginal borrowing and/or in the desired ratio of the G.N.P. covered by such borrowing.

It is useful to study the time-path of the liquidity-margin and analyse the structural nature of the problem under the above assumptions regarding the variables of the model. For a medium-term solution of the time-path of the liquidity-margin L_t , the values of the instrument variables, viz., i , σ and λ can be assumed to be unchanging and the two variables x and m are determined outside the system. As mentioned elsewhere in the paper, the repercussions of F_t (the gross inflow of capital) are likely to reduce the liquidity margin during the medium-term with the possibility of sharp increases in the value of imports and a less than remarkable change in the value of exports during the period. The model, it is interesting to note, is particularly suitable to provide a meaningful solution for the medium term (say, when t does not exceed 25) since the instruments are less likely to have constant values when the institutions are subject to changes. What is more, the model with its unchanging parameters is completely inadequate to explain the situation whenever L_t (defined ex ante) is negative. Thus the ex post financing of a liquidity crisis implies a change in at least one among the three parameters with or without similar changes in the exogenous growth rates for exports and imports. The model, clearly, has to be redefined in such a situation with new values both for the different variables and for the initial conditions.

The liquidity-margin L_t can be defined in terms of B_t and one can get

$$\begin{aligned}
 (1a) \quad L_t &= X_0(1+x)^t + \lambda[(i+\sigma)B_t + M_0(1+m)^t - X_0(1+x)^t] - (i+\sigma)B_t \\
 &= (1-\lambda)X_0(1+x)^t - (1-\lambda)(i+\sigma)B_t + \lambda M_0(1+m)^t \\
 &= \alpha X_0(1+x)^t - \alpha\beta B_t + \lambda M_0(1+m)^t
 \end{aligned}$$

where $\alpha=1-\lambda$ and $\beta=(i+\sigma)$.

The time path of L_t and B_t are defined by the following two difference equations:

$$(1b) \quad (L_{t+1} - L_t) + \alpha\beta(B_{t+1} - B_t) = \alpha X_0(1+x)^t + \lambda M_0(1+m)^t$$

and

$$(3a) \quad B_{t+1} - B_t = (i+1)(B_t - B_{t-1}) + m M_0(1+m)^{t-1} - x X_0(1+x)^{t-1}$$

Both the equations can be simplified in terms of the operator notation E to obtain,

$$(4) \quad L_t(E-1) + \alpha\beta B_t(E-1) = \alpha X_0(1+x)^t + \lambda M_0(1+m)^t$$

$$(5) \quad B_t(E-1)(E-i-1) = m M_0(1+m)^t - x X_0(1+x)^t$$

The second-order difference-equation in B_t can be solved to get the following analytical solution for the initial values B_0 and B_1 ,

$$B_t = M_0(1+m)^t/(m-i) + K_2(1+i)^t - X_0(1+x)^t/(x-i)$$

where $K_2 = (B_1 - B_0 - m M_0/(m-i) + x X_0/(x-i)) / i$

The above, when substituted back to equation (4) can be used to solve the value for L_t and one gets the following for an initial value of L_0 :

$$L_t = X_0(1+x)^t(1 + \beta/(x-i)) + M_0(1+m)^t(\lambda - \alpha\beta/(m-i)) - \alpha\beta K_2(1+i)^t + K_3$$

$$\text{where } K_3 = L_0 + \alpha\beta K_2 - \alpha X_0(1 + \frac{\beta}{x-i}) - M_0(\lambda - \frac{\alpha\beta}{m-i})$$

It is significant to note that while the time-path of L_t is determined by the coefficient of the dominant root in the long-run, the intermediate solutions to the long-run can be significantly influenced by the changing weights of the different roots corresponding to different assumptions regarding the variables and the initial values. Such a case is particularly likely when the three roots assume small numerical values close to one another and the coefficients are more important in determining the solution. A simple exercise in numerical figures is sufficient to illustrate and establish the above statement. It is interesting to analyse a case which approximates the Indian situation with its implications for the choice of the instrument variables open to the policy-maker.¹³ The following include certain plausible values for the parameters and the exogenous variables. The estimates include the initial conditions for India during 1965-66 and seeks to project the liquidity-margin situation for the next few decades when i and σ are unchanging and λ is given at a value less than unity.^{14,15}

Solution 1 $i > m > x$

$i=0.06$	Initial conditions: $X_0=8.3$
$m=0.05$	$M_0=12.5$
$x=0.04$	$B_0=16.5$
$\lambda=0.10$	$B_1=21.5$
$\sigma=0.06$	$L_0=6.94$

One can compute the values for K_2 and K_3 from the above figures and

the general solution for L_t is as follows:

$$L_t = -37.35(1.04)^t + 136.25(1.05)^t - 91.8(1.06)^t - 0.5$$

The dominant root as well as one other root have negative coefficients in the solution and L_t tapers off with a value of 3.02 for $t=10$ to one of -3.88 for $t=15$ and -160.99 for $t=40$.

Solution 2. $x > m > i$

$x=0.06$	Initial conditions: $L_0=7.39$
$m=0.05$	$B_1; 21.1$
$i=0.03$	Rest as above.

λ and σ as above.

$$L_t = 29.88(1.06)^t - 48.75(1.05)^t + 27.13(1.03)^t - 8.60$$

The solution is predominantly positive both in the medium and in the long term while the close value of x and m makes for a temporary decline in the value of L_t when t is 15.

Solution 3. $m > i > x$

$x=0.03$	Initial conditions: $B_1=21.5$
$m=0.06$	$L_0=7.06$
$i=0.05$	

Rest as above

$$L_t = -33.61(1.03)^t - 122.50(1.06)^t + 163.25(1.05)^t - .04$$

The solution diverges towards larger negative values over time as it can be seen from the table given below.

Solution 4. $i > x > m$

$x=0.05$	Initial conditions: $L_0 = 6.94$
$m=0.04$	$B_1 = 21.5$

$$i=0.06$$

$$L_t = -82.17(1.05)^t + 68.75(1.04)^t + 20.69(1.06)^t - 0.33$$

The solution assumes a negative value in the long run only when t is 20.

Solution 5. $m > x > i$

$$x=0.05 \quad \text{Initial conditions: } L_0=7.39$$

$$m=0.06 \quad B_1=21.1$$

$$i=0.03$$

$$L_t = 41.08(1.05)^t - 32.50(1.06)^t - 0.81(1.03)^t - 0.39$$

The solution, again, is negative in the longer run.

Solution 6. $x > i > m$

$$x=0.06 \quad \text{Initial conditions: } L_0=7.06$$

$$m=.03 \quad B_1=-21.5$$

$$i=0.05$$

$$L_t = 89.64(1.06)^t + 63.12(1.03)^t - 14.55(1.05)^t - 131.11$$

The solution represents the most favourable situation with the smallest value of m .

The solutions recorded in the table reveal it significantly that the liquidity-margin L_t is influenced to a large extent by both the interest rate and by the relative value of x and m (compare solutions 1,4; 2,5; 3,6 where relative changes in x and m bring about significant changes in L_t for unchanging rates of interest). The time-path of L_t for the long-run, while dominated by the coefficients for the more dominant

$$\sigma = .06$$

$$\lambda = .10$$

	i>m>x	x>m>i	m>i>x	i>x>m	m>x>i	x>i>m
Solution 1	2	3	4	5	6	
x	.04	.06	.03	.05	.05	.06
t i	.06	.03	.05	.06	.03	.05
m	.05	.05	.06	.04	.06	.03
10	3.02	5.57	-2.98	4.51	7.21	99.04
15	-3.88	4.03	-5.68	2.16	5.79	151.32
20	-14.88	7.23	-21.48	-1.11	2.69	232.32
25	-29.41	11.02	-43.99	-7.25	-2.24	336.18
40	-160.99	43.80	-219.62	-36.11	-47.93	893.72

root, is often influenced by the second dominant root with larger values for its coefficients when the absolute values of the different roots are close to one another. Thus the structural relation of the three variables, x , m and i , when close to one another, are more significant than their absolute values in determining the margin of liquidity. It is also significant to note that small marginal changes in the three variables (e.g. between solutions 4 and 6) can bring about spectacular changes in the margin of liquidity. There can even be a temporary reversal in the direction of change of the liquidity-margin during the short-term (solution 2, $t=15$) followed by a more consistent trend for the longer run. The major directions in the time-path of L_t will be unchanged when the solutions are different with a different set of figures for λ and σ .

The crucial bearing of the equality condition in the solutions, however, makes the situation itself different when L_t changes its sign from a positive figure.

The significant nature of the equality condition in the liquidity-margin requirement makes it important to find out the critical values of λ , the liquid portion of loans with a non-negative (say zero) value of L_t which is consistent with a set of plausible values for the rest of the variables. The institutional pattern of borrowing with large volumes of tied purchases (i.e., a small λ) makes it difficult for the borrowing countries to meet the liquidity margin requirement at the conventional terms of such borrowing coupled with the more likely rates of growth for their exports and imports. Or, to put it otherwise, the normal export performance and the import requirements of the recipient countries make for an inevitable liquidity crisis for the recipient countries unless there take place a change in the terms of their foreign borrowing (viz. in interest rate, maturity or the liquid component of loans). The following table illustrates the basic dilemma and the inconsistencies of the current institutional structure between the lending and the borrowing countries. Thus a moderate estimate of m at 6 per cent per annum and a linear rate of amortisation within 15 years make it difficult to avoid a liquidity crisis within a twenty-five year time-period unless i) the growth rate for exports is sufficiently high, ii) the rate of interest is sufficiently low or, iii) the liquid ratio of

loans, λ is sufficiently large. It is interesting to note that the choice of the four major instruments and variables in the model, viz. i , σ , λ and x are often beyond the control of the recipient while a drastic change in the import-growth rate ' m ' is also hard to attain. Again, the predominance of tied credits (i.e., a small λ for any value of F_t), the difficulties of increasing the export growth rates for the developing countries, the increasing import-coefficient of domestic production, and lastly, the rising cost (i.e. higher interest rate and shorter maturity) of foreign capital make it hard for the borrowers to attain a set of the relevant variables consistent with a non-negative liquidity margin.

Critical values of λ for $L_t=0$

$$B_0=16.5, X_0=8.3, M_0=12.5$$

$$m=.06, c=.06, t=25$$

$i \times$	.04	.05	.06
.03	.28	.14	*
.04	*	.22	.18
.05	.90	*	.15
.06	*	*	*

The table works out the critical values of λ for $L_t=0$ under different assumptions regarding x and i and a set of unchanging values for m and c at 0.6. The solution is worked out for a finite time-period at $t=25$. The spaces marked by asteriks indicate certain

values of λ which are not meaningful under the given circumstances. The large proportion of tied loans in the gross inflow of loans for India during the recent years (see Appendix Table 2 for the value of λ between 10 to 15 per cent) together with the typical terms of such borrowing (see Appendix Table 1) make it hard for the country to meet the liquidity condition for the typical rates of increase of her imports and exports during the growth process. Thus even an optimistic estimate of the export growth rate at 6 per cent require a λ at 18 or 15 per cent for certain plausible estimates of the terms of loans and the import growth rate. The table, however, reveals clearly the opposite influence of x as compared to i or σ in relation to given values of L_t .

The few solutions worked out above do not provide a complete exercise in the sensitivity of the liquidity margin for given changes in the term of foreign borrowing or in the growth rates for exports and imports. The two tables, however, illustrate it perfectly well that the structural conditions of the economy can be as important as the terms of foreign borrowing in determining the liquidity-margin for the borrowers. Thus L_t may be changed with certain marginal adjustments in the values of x and m even without a corresponding change in the terms of borrowing i and σ .

The model illustrates the necessity of recognising the liquidity-requirement as a pre-condition for a successful process of debt-cum growth. The whole of analysis, of course, is based

on the prior hypothesis that the borrowing countries do not anticipate an indefinite increase in their outstanding indebtedness. Thus the process of refinancing the loans, while permissible in the immediate future, has to be accepted with caution, especially when it changes both the volume as well as the terms of borrowing. The model may usefully be applied to anticipate a liquidity crisis for the Indian economy. While the initial conditions relate to the Indian situation for 1965-66, one can choose the particular solutions more appropriate to the projections available in different estimates. Thus a liberal estimate of the projected export earnings and import payments¹⁹ justify a choice of solution 2 while a different assumption regarding the interest rate and some variations in the values of the variables can lead to situation 4 with an inevitable liquidity crisis. A conservative estimate of the weighted average of interest does not, for obvious reasons, save the situation, as indicated in Solution 5. Solutions 1 and 5 are possible under a less optimistic assumption regarding the two exogenous variables, x and m , while solution 6 represents the most interesting type of a situation under the given assumption of a small value for λ when imports can be restricted to a minimal value, a situation which is not likely for India. The solutions, taken together, indicate explicitly the strong possibility of a liquidity crisis for the Indian economy in the not too distant future under the existing institutional features of her external borrowing and her trade potentialities.

III. Conclusions

The analysis provides an exercises into the consequences of external borrowing for the recipients when the capital inflows are tied to unfavourable loan terms with contractual purchases in the current account. The lessons of the exercise are instructive for the developing countries where public interest-bearing loans form a major portion of the total capital inflows. There has, however, been a no less striking increase in the flow of official transfers (as well as local currency loans) to these countries during the last two decades. The above analysis points out the paradoxical situation where the composition of the gross inflow of capital is often incompatible to the requirements of the recipients for liquid foreign resources. Thus increases in the volume of tied aids and in official transfers (in their present form of commodity grants) are incapable to meet the liquidity margin requirements of the borrowing countries. The situation represents a structural imbalance under the present circumstances when the donors are unable or unwilling to provide liberal loan terms or free exchange to the recipients while the latter find it particularly difficult to reduce the trade gap over the course of their economic development. The logical corollary of the above for the policy makers is a choice between an increased inflow of gross borrowing at less favourable terms and a possible change in the institutional parameters like i,

σ and λ and also, a careful scrutiny of the structural pattern of the different variables and the parameters. These can, however, always be a short-term solution to a liquidity crisis in terms of a rescheduling of loans by the donor. The device, while providing in effect 'liquid' resources to the borrower, shelves the whole problem to the longer run when the liquidity problem emerges once again while the foreigners are in a position to claim a larger portion of the G.N.P. than before.

It may be relevant in the above context to refer to the efficiency limit²⁰ for investment postulated in the resource-gap models of foreign aid. The relative changes in the yield of capital beyond the stated limit of efficiency lends itself easily to a case of outright income grants from the donor country as a substitute for further transfers of loan capital.²¹

Similarly, one may advocate a substitution of loans by grants whenever the rate of return of investment is low at the borrowing country with increased costs of such borrowing. The approach, while useful with its attempt to rationalise the flow of resources between different countries in terms of the maximisation of world income, pre-supposes an institutional set-up which is hardly consistent with reality. Thus the existing fiscal and monetary set-up in the donor countries hardly permits an unlimited substitutability between loans and grants, or even, between loans

relating to different term structures. The value of loans as a proportion of G.N.P. in the donor areas and as a share of the total value of resource transfers from the same area are determined in a given time period when economic institutions do not change. The residual part of resource transfers takes the form of loans sensitive to a considerable extent to the terms offered in the market. Thus the implications of the adverse changes in the terms of loans for the aid-cum growth process can hardly be qualified by the possibility of compensations with income grants.

The problem might be entirely different under a situation where private capital is more important in the total inflow of foreign resources. While the rate of return on such capital might even be higher, the absence of repayment obligations under direct investment and the stimulative effect of such investment for certain exports might make the liquidity condition less difficult. One can here refer to the relative ease with which some Latin American countries including Brazil, Argentina and Mexico were able to service their external debt during the last decade. The implications of private capital inflow, however, are completely different and often opposite for the foreign resource gaps and one has to take note of different considerations before commenting on the relative desirability of any situation.

FOOTNOTES

1. "One technical problem seems almost certain to arise, if Aid can only take the form of P.L. 480 or of loans imported for specific projects; it would be impossible for India to find the free foreign exchange to cover debt repayments, essential materials, etc., and plan for projects not in the Aid programme. . . .

I doubt whether this would suffice to avert the need for some generally available aid --- or at least for Aid which could be used to repay trade debts and refinance old loans." Reddaway, W.D., "The Role of External Aid: reprinted in The United States and the Developing Economies, edited by Ranis, Gustav, pp. 129-30. (First italics mine)

2. For the standard exposition of the two-gap models of foreign aid which do not explicitly take into account the repayment process, see Chenery and Bruno /2/, McKinnon /11/.

3. The liquidity margin requirement is defined as the difference between the total exchange inflows (from exports and from foreign loans) and outflows (due to debt-services and the non-project imports) for a country during a certain period.

4. See Rahman /12/ for the implications of debt-servicing on the goal of self-reliance.

a. To simplify matters, one need not introduce the third dimension and be content with two axes representing the average loan terms (interest and maturity) and the quantity of loans respectively.

5. The hypothesis can be verified by actual experiences of the borrowing countries during the last decade. Thus the weighted average of interest rates and amortisations on foreign loans repayable in foreign exchange has gone up for India during the period 1956 to 1966. (See Appendix table 1)

6. See Avramoric, et al, for an excellent exposition of the repercussion of debt-charges on the savings-investment gap.

7. See Qayum A. /10/

Under the simplest assumption of an absence of gestation and payments lag, the net savings coefficient S^* for a certain capital inflow K_m is represented by the following formula:

$$S_n = K_m \sigma^{-1} (1 - c) - K_m r \left(\frac{n-1}{t} \right) - \frac{K_m}{t}$$

$$S^* = \sum_{n=1}^t S_n \frac{1 - \left(\frac{1-c}{\sigma} \right)^{t-n+1}}{1 - \frac{1-c}{\sigma}} + K_m$$

where σ = capital: output ratio; c =m.p.c.; r =rate of interest on loans; t = end year of the loan; K_m = initial capital inflow.

For a given value of K_m equal to unity, the value of S^* is significantly affected by changes in the different variables of the model including r and t . What is more, S^* can assume negative values for certain ranges of the variables --- a situation hard to justify unless increases in consumption are sufficient to compensate it.

The analysis, in order to be more relevant for practical purposes, should be modified by the following considerations:

- (i) That part of the initial capital inflow K_m may be consumed. This affects the value of S^* considerably.
- (ii) That the amount of savings and consumption out of the additional domestic product generated by K_m depends on the choice of the disposable income-unit. The specific assumption of the G.D.P. as the disposable unit of income in the Qayum analysis may not always conform to the reality and one may usefully introduce alternative assumptions like the GNP concept at factor cost or the GNP net of repayments concept as the relevant unit of disposable income. The alternative formulations for the savings coefficient would be as follows:

$$(a) \quad S'_n = (1 - c) \left[K_m \sigma^{-1} - K_m \left(1 - \frac{n-1}{t}\right) r \right] - \frac{K_m}{t}$$

$$S'_* = \sum_{n=1}^t S'_n \frac{1 - \left(\frac{1-c}{\sigma}\right)^{t-n+1}}{1 - \frac{1-c}{\sigma}} + K_m$$

$$(b) \quad S''_n = (1 - c) \left[K_m \sigma^{-1} - K_m \left(1 - \frac{n-1}{t}\right) r - \frac{K_m}{t} \right]$$

$$S^* = \sum_{n=1}^t S''_n \frac{1 - \left(\frac{1-c}{\sigma}\right)^{t-n+1}}{1 - \frac{1-c}{\sigma}}$$

where S' and S'' refer to the GNP concepts at factor cost and net of repayments respectively.

8. See Ohlin /7/.

9. We define the 'foreign resource gap' as the sum of merchandise balance and debt-service payments (i.e. as the gross capital inflow $F_t = M_t - X_t + (1 + \sigma) B_t$) and distinguish it from the foreign exchange or the 'liquidity requirement' L_t in the strict sense of the term.

10. See Cooper, Richard, /4/ for an explanation of the donor's interest for tied aids in terms of the liquidity-requirement. Also see the Appendix table 2 for an actual estimate of the proportion of tied loans for India.

11. The ratio, defined conventionally as the proportion of export-earnings absorbed by debt-services, gets an additional implication in the above approach towards the theory of foreign aid.

12. The assumption of an exogenous growth rate in exports and imports can be justified for an economy where imports are maintained at a minimum level consistent with domestic growth targets while the rate of export growth is subject more to external rather than to domestic repercussions. Similarly the model assumes away the terms of trade effect of the tied loans with its hypothesis that the value of λ does not influence the real content of the gross inflow of resources. Lastly, the assumption of an unchanging interest rate and amortisation period deals away with all complications of a difference between the marginal and the average terms of borrowing.

13. The Indian case is illustrative for the rest of the less developed nations which are inclined towards large scale public borrowing at conventional terms. Thus India received a large amount of capital inflow during the development decade and the pattern of such inflows had been fairly representative of the more recent trends with a large share of public loans at non-concessional terms.

14 The model, as indicated above, excludes transfers and other local currency loans which do not call for repayments in free exchange. The equations for outstanding indebtedness, B_t and for the liquidity margin L_t accordingly overestimate such values for a given resource gap ($M_t - X_t$). The numerical computations, however, are not significantly changed once one makes the plausible assumption that the rate of increases in imports and grants conform to each other. Thus one may recalculate the time-path of L_t on the basis of a different initial value of imports M_0' which is smaller than M_0 by the amount of grants G_0 used to finance such imports during the initial period. The above, to repeat it, is permissible under the assumption that the rate for the growth of overall imports m is identical to the corresponding rate for the growth of grants G_0 . A relatively small ratio of imports to transfers during the initial period (as it obtains for India with a figure of 0.10 for 1964 in spite of the large absolute value of transfer receipts), however, makes the model perfectly general

even without the necessary qualifications for the initial value of M .

15. The value of λ at 0.10 approximates the 12% share for non-project loans for the unutilised portion of loans (repayable in foreign exchange) by the end of 1965-66 (See table 1 in Appendix)

The initial conditions include the figures for 1965-66 for exports and imports (Rs 8376 m and Rs 12522m respectively). The figures for outstanding debt are recorded for 1965 as it is reported in a mimeographed publication of the IBRD at Rs 16510m (B_0) while the non-availability of data regarding the utilised portion of loans for 1966 has led to a roundabout method for computing the corresponding figure for the year. Thus B_1 as computed from the definition of B_t is slightly different from one case to another as the interest rates are different in each case. Similarly, the absence of an independent official series relating to L_t leads to differences in the initial values L_0 for different assumptions regarding the parameters. The qualitative implications of the solution, however, are not undermined by the above devices.

19. The conservative estimates relate to the projections by Manmohan Singh /14/ who predicts a maximum amount of exports for 1970-71 at Rs 10,000m and that by MacDougall G.D.A., /9/ whose estimates for imports of 1970-71 specify a minimum of Rs 14,000m to 15,000m. The liberal estimate of future projections relate to the Perspective Planning Division analysis of the Indian

Planning Commission with its respective estimates of exports and imports for 1970-71 at Rs 12,250m and Ps 13,600m.

20. Defined as the 'absorptive capacity' for the borrowing countries.

21. See Pincus /8/, Schmidt /13/ and Cooper /3/.

APPENDIX

Table 1. Average interest rate and Amortisation
Payments on Loans Repayable in Foreign
Exchange: India

Years	Interest rate (percentages) (weighted average)	Amortisation Period (Weighted Average)
1956	.70	60
1957	1.00	57
1958	1.06	74
1959	1.32	41
1960	2.71	29
1961	3.60	20
1962	3.27	26
1963	3.17	32
1964	3.56	34

Source: Data supplied by the I.B.P.D.

Economics Department. October 14, 1966.

TABLE 2

Pattern of External Assistance: Share
of Project Aid in Total Loans Repayable
in Foreign Currency (Rs millions)

	Total	Grants	Loans Repayable in Foreign Currency	Total Project Aid Re- payable in Foreign Currency	(4) as a percentage share of (5)
	(1)	(2)	(3)	(4)	(5)
1. Utilisation up to March 56	2017	702	1241	488	39.3
2. Undisbursed end of March 56	1801	678	882	86	9.7
3. Utilisation end of March 61	14298	1603	6079	4096	67.6
4. Undisbursed end of March 61	12541	287	5312	658	12.4
5. Utilisation end of March 66	28503	877	17530	7455	42.5
6. Undisbursed end of March 66	12322	216	10839	9547	88.0

Source Reserve Bank of India. Reports on Currency and Finance. 1965-66.

REFERENCES

1. Avramovic, Dragoslav, et al, Debt-Servicing Capacity and External Growth, Baltimore, 1963.
2. Chenery, H. B. and Bruno, M., "Development Alternatives in and Open Economy: The Case of Israel", E. J., March, 1962.
3. Cooper, Richard N., A Note on Foreign Assistance and the Capital Requirement for Development, RAND Memorandum, February, 1965.
4. Cooper, Richard N., "External Assistance and Balance of Payments of Donor Countries", U.N.C.T.A.D. Proceedings, Vol. V, 1964.
5. I.B.R.D., External Medium and Long-term Public Debt, Past and Projected Amounts Outstanding, Transactions and Payments: 1956-1975, Economics Department, October, 14, 1966.
6. Liefstinck, Pieter, External Debt and Debt-Bearing Capacity of the Developing Countries, Princeton Essays in International Finance, March, 1966.
7. Ohlin, Goran, Foreign Aid Policies Reconsidered, OECD, Paris, 1966.
8. Pincus, John, Economic Aid and International Cost-Sharing, Baltimore, 1965.
———, "The Cost of Foreign Aid", R.E. and St., November, 1963.
9. McDougall, G.D.A., "India's Balance of Payments", Bulletin of the Oxford Institute of Statistics, 1960.
10. McKinnon, "Foreign Exchange Constraints in Economic Development and Efficient Aid Allocation", E.J., June 1964.
11. Qayum, A., "Economic Criteria of Foreign Loans", E.J., June, 1966.
12. Rahman, A., "Perspective Planning for Economic Maturity", Yale Economic Growth Center Discussion Paper No. 28, June, 1967.
(mimeographed)
13. Schmidt, Williams, "Loans vs. Grants: Economics of Charity", J.P.E., August, 1964.
14. Singh, M., India's Export Trends, Oxford, 1965.