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ABSORPTIVE CAPACITY AND DEVELOPMENT PLANNING

by

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INTRODUCTION

The choice of, and phasing of, investment and other development activities is a key task faced by development planners.[1/] A typical approach makes use of the Harrod-Domar framework: the amount of investment programmed is the amount needed to achieve a given growth rate under the assumption that output increases are proportional to investment. The simplicity of this approach has given it a powerful appeal not only for theoreticians but also for aggregative planners. However, the underlying assumption of this framework - that the capital-output ratio (whether average or marginal is immaterial) is constant - implies that regardless of the amount of investment undertaken in any period, the effect on output will continue to be proportional. Since it is well known that large sectoral variations in capital-output ratios persist and since aggregative capital-output ratios show considerable variation over short periods of time,[2/] the realism and usefulness of this assumption for analytical work in investment programming may be strongly questioned.

Once this assumption is discarded, the amount of investment which can be absorbed - productively used in a broad sense[3/] - can no longer be determined in a simplistic manner by applying a target (maximum) rate of

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1/ It is taken for granted that the reason that this task is of importance is that macro- and micro-investment and operating decisions represent key policy instruments of the government, changes in which are likely significantly to affect the economic progress of the country. Although some of our initial discussion refers to investment activities, we include also in our analysis a wide variety of recurrent or non-investment activities which may be of equal significance in the development process.

2/ Cf. P. R. Crosson, "Capital Output Ratios and Development Planning," Center for Development Planning paper, M-8118, November, 1964.

3/ The concept will be more precisely defined below. See pp. 3-4.

income growth to a capital-output ratio. Instead, it becomes necessary to analyze the factors which limit absorptive capacity (and cause the capital-output ratio to increase) and to relate the programming of investment to these limiting factors. Formulated thus, the planning problem is two-sided: (a) the limits on the ability to invest productively must be analyzed in aggregative terms, projected over the planning period and, if possible, widened or loosened; and (b) the proposed projects must be analyzed to determine the extent to which they "use up" or exhaust the aggregative limits. This analysis, together with the use of more usual project appraisal techniques, will make possible the rational choice of a development program which does not violate the limits.

Despite the disillusionment with the Harrod-Domar approach expressed in many references to limits on absorptive capacity, a well defined theory of absorptive capacity has yet to emerge. Neither methods for estimating the limits on absorptive capacity nor techniques for programming investment relative to these limits have been made available to planners. As a result, limits on absorptive capacity have frequently been ignored in practical planning situations. In section II of this paper we attempt to provide the theoretical background of the concept of absorptive capacity and, in addition, in order to relate the present study to the earlier - rather general - references to absorptive capacity, we review the literature. In this section it is shown that absorptive capacity may be alternatively approached through analysis of profitability with the use of accounting prices or by combining a profitability criterion with absolute limits on factor supplies and financing. The emphasis in this study is on the

usefulness of treating the financial constraints of the government budget and the balance of payments as absolute limits while incorporating physical scarcities into an overall profitability criterion.

In the remaining sections of this paper we outline a framework for the incorporation of absorptive capacity into the development planning process. Section III is devoted to an examination of the ways in which aggregative limitations on the budget and balance of payments come to exist, the determinants of these limits, and the possible methods of projection or computation of these limits. Some problems in the use of a profitability criterion are also considered. Section IV deals with the ways in which individual development activities exhaust the budgetary or foreign exchange limits or margin of profitability. This exhaustion is characterized by an interaction of costs and financing, and the analysis concerns the ways in which different types of costs of activities result in using up the available funds. These two sections together provide guidelines for the choice of micro-economic development activities in quantities less than the aggregative limits on absorptive capacity. A concluding section is followed by a brief Appendix in which a more formal statement of the method of project analysis in Section IV is presented. Before turning to the next section, we wish to note that it is the absorption of development <u>activities</u> rather than <u>investment</u> which is to be analyzed. This broadening of emphasis appears both conceptually necessary and practically useful. The financial limits on which the main emphasis of this paper is placed make no distinction between expenditures for indirectly productive activities (investment),

expenditures for directly productive public consumption, or expenditures for productive inputs (intermediate goods). All of these activities are necessary for development and exhaust the available funds. At the practical level, it is extraordinarily difficult to define investment, and any definition is bound to be arbitrary.[4/] Unnecessary involvement in conceptual questions is pointless when the programming task really demands only a distinction between recurring and nonrecurring costs.

4/ E.g., Is the training of teachers investment? Are recurrent expenditures on research, agricultural extension, and pilot projects investment? What about expenditures on public safety and defense? How does one treat expenditures on automobiles and other durable goods? Are expenditures for medical care "investment in human capital," or consumption, or intermediate inputs?

II. ABSORPTIVE CAPACITY: BACKGROUND

A. Profitability Versus Limits on the Availability of Non-Capital Factors

The supply curves of productive factors (including financial factors) are known only very imprecisely, particularly in the less developed countries. Hence, in the aggregative analysis of development it has often been assumed that at any given time each of the factors was in perfectly elastic supply up to its fixed limit of availability.[1/] This, in effect, is an assumption that the supply curves approximate "L"s lying on their side (see figure 1). If the nature of the aggregative production function is such that only limited possibilities for factor substitution exist,[2/] the implication of the supply assumptions is that some factors of production may be in excess supply when the supply of the scarcest factor has been exhausted. By excess supply we mean simply that more of the factor is offered than demanded at the prevailing price (which may be zero).

In the widely used Harrod-Domar approach to development programming, capital is regarded as the scarce factor which limits aggregative output. By extension, the development program which maximizes the output value less the value of inputs (net output value) of a given quantity of investment is

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1/ This is the assumption of most linear programming models. See, e.g., H. B. Chenery and M. Bruno, "Development Alterations in an Open Economy: The Case of Israel," EJ 72: 79-103, 1962. See also W. A. Lewis, "Economic Development with Unlimited Supplies of Labor," Manchester School 22: 139-191 (1954), reprinted in Agerwala, A. N. and Singh, S. P., The Economies of Underdevelopment (New York: Oxford University Press, 1958).

2/ Cf. R. S. Eckaus, "The Factor Proportions Problem in Underdeveloped Areas," AER 45: 539-565, 1955, reprinted in Agerwala and Singh, op. cit.

the optimum program.[3/] The idea of limits on the absorptive capacity for investment is that a situation may exist in which (a) the availability of other factors of production is exhausted before all the investment is allocated or (b) gradual or abrupt non-capital factor price increases and/or product price decreases result in unprofitability of activities prior to the allocation of all the available investment. Thus, the relevant limit on supply is no longer the limited availability of capital but rather absolute or relative shortages of other factors of production which result in unprofitability of activities at a point before all of the investment is allocated.

In order to make clear the foregoing, we refer to Figure 2. Under the assumption of a production function which is linear, homogeneous, and permits no factor substitution, a variety of planning situations are graphically depicted in which the factor supply conditions correspond to the assumptions above. The production assumptions ensure that the volume of output of the activity bears a unique proportion to the input of each factor. By appropriately choosing the units for each of the factors, we may make all the input-output proportions equal to unity and represent the volumes of the factors by the volume of output. In Figure 2a, capital is scarce, and the limit on absorptive capacity is potential, becoming operative only if

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3/ Parenthetically, it may be noted that one of the characteristics of such an optimum program is that the net output value of each activity must be non-negative; if an activity were to have a negative net output, its elimination would raise the total net output value obtainable from the given volume of investment.

Figure 1

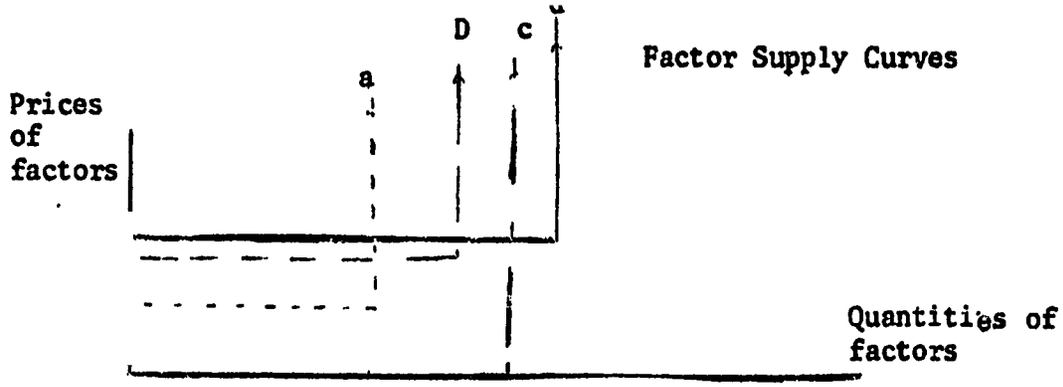


Figure 2(a)

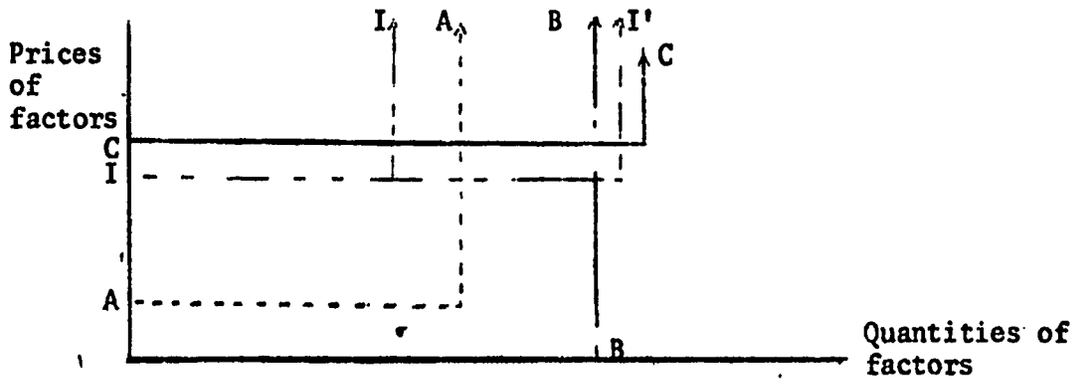


Figure 2(b)

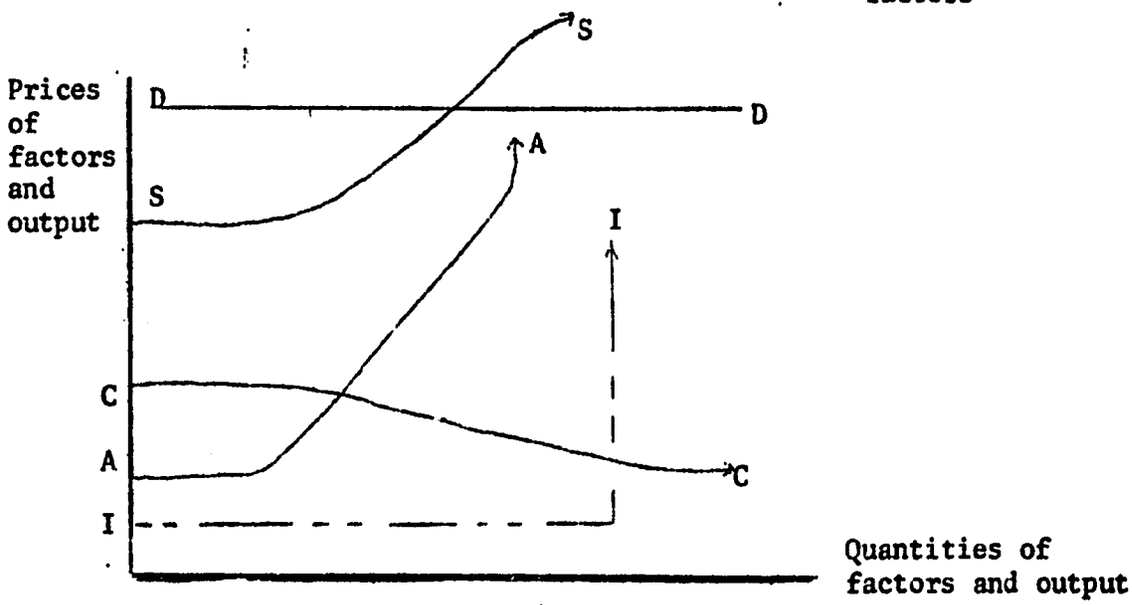
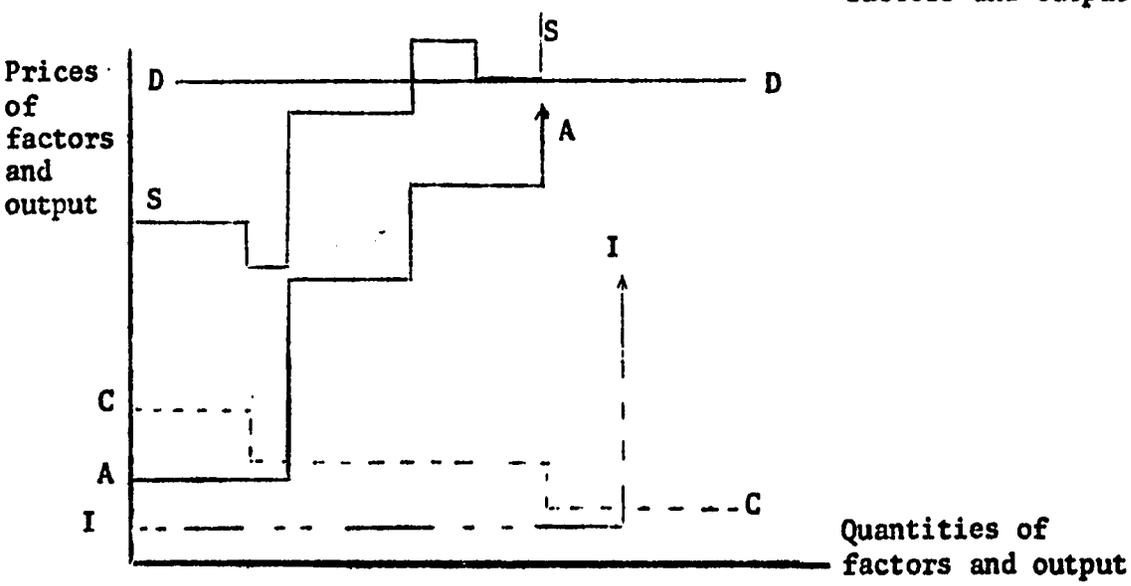


Figure 2(c)



investment is greatly increased so that I-I, the capital supply curve, shifts to the right I-I' beyond the next scarcest factor supply curve (A-A). In this latter case, the availability of factor A imposes a limit on the amount of investment which can be absorbed. Attempts to invest beyond this point will raise the price of A to infinity and thus cause the profitability of investment to become negative. It may be noted that in this second case factor B is also scarcer than investment, but it does not provide the operative constraint on absorptive capacity.

In Figure 2b a slightly more complex supply situation is depicted; this situation is reproduced in a modified form in Figure 2c. In these two diagrams a gradual limitation on the supply of factor A causes its price to rise with output, and this results in the unprofitability of output (and investment) beyond P. (This is depicted in the upper part of each of the figures in which the supply of output is shown intersecting with the demand for output.) For the marginal or final acceptable activity the cost of additional units of output is greater than the value of this output. This transition from profitability to unprofitability is abrupt in cases a and c and gradual in case b, but in each case it is clear that investment beyond P results in negative contributions to income.

In principle, then, it is clearly correct to assess the extent of a development program according to the profitability of the component activities. In practice, however, it is very difficult to estimate correctly the prices of many inputs which are in potentially short supply. Consequently, it may be useful to use an equally acceptable alternative

method of programming; i.e., choosing these activities which maximize net output from the employment of the scarcest resource. In this latter method, the analytical problem is largely cast in terms of determining which factor scarcity provides the operative constraint on development activity[4/] in order to determine the amount of activity which may be undertaken without violating the constraint. Profitability will still be important in the sense that no unprofitable activities should be undertaken, but profitability calculations will not normally determine the amount of activity to be undertaken. Instead, the limits on the availability of factor inputs and the input-output coefficients indicate the amount of investment which can be absorbed.

Either (a) a combination of limits and profitability calculations based on price assumptions over the range of activity prior to the operation of the limits or (b) profitability calculations alone, assuming the relevant supply prices of all factors to be known throughout the range of possible operational activity, may thus be used in programming development. The choice between these techniques depends on the convenience of computation and the appropriateness of the assumption of absolute limits on factor supplies.

4/ The assumption of fixed factor proportions must be maintained here or else a shift on the production function may alter the ranking of scarcity of factors.

B. The Literature

In the literature on absorptive capacity both these emphases may be found. Some discussions focus on the availabilities of complementary non-capital factors of production, while others cast the concept in terms of profitability computations for proposed activities.[5/] The concept is usually restricted to absorptive capacity for investment, although in some cases absorptive capacity with respect to foreign assistance may be referred to. The profitability approach is used by Higgins who defines "absorptive capacity" as the amount of investment that can be undertaken (say within a five-year program) without reducing the marginal contribution of the last block of capital below "x." In other words, it is the amount that can be undertaken without raising the incremental capital-output ratio (ICOR) of the last block of investment, or marginal ICOR, above 1/x.[6/]

5/ Both of these aspects must ultimately, of course, be included in the overall analysis. The distinction made here concerns the level at which they are incorporated into the analysis. An assessment must also be made regarding the availability of investment goods; but if absorptive capacity is to be an interesting concept, such goods must be available in relatively unlimited supply. If profitability is defined in terms of social marginal productivity greater than "x," or marginal ICOR less than 1/x*, or some other criterion, the use of the concept of absorptive capacity differs only from the normal profitability calculations made in judging projects in that it is an aggregative general equilibrium criterion, while profitability analysis is usually carried out using micro-economic assumptions.
* No implication is intended that these two criteria are equivalent.

6/ Benjamin Higgins, United Nations and U. S. Foreign Economic Policy (Homewood, Illinois: Richard D. Irwin, Inc., 1962), pp. 22-25, parenthesis in original. See also, pp. 32, 105, 175, 206-7.

Higgins feels that it makes little difference to the operation of the criterion whether x is set at zero or some low percentage rate, but he believes that a positive rate is likely to find more favor with aid-donors. For investment financed by foreign loans, he believes that x should equal the interest rate on these loans or the interest rate at which the government can borrow. Mason includes in development expenditure some non-investment outlays and defines the appropriate size of a development program as "... the largest flow of development expenditures, including private investment, that ... can be expected to yield a marginal return equal to or above some socially acceptable discount rate."[7/] This sort of profitability approach is likewise adopted by Adler in his very recent study. He defines "absorptive capacity as that amount of investment that can be made at an acceptable rate of return with the supply of cooperant factors considered as given."[8/] Adler's main focus, however, is to relate profitability of specific projects to shortages of cooperant factors. In a basically similar manner, Mikesell defines "...capital absorptive capacity as the capacity of a country to employ financial capital in a manner which will result in an increment to the net national product, the discounted value of which is equal to the value of the financial capital employed."[9/]

7/ E. S. Mason, On the Appropriate Size of a Development Program (Cambridge, Massachusetts: Center for International Affairs, Harvard University, 1964), p. 1.

8/ J. H. Adler, Absorptive Capacity: The Concept and its Determinants (Washington, D. C.: The Brookings Institution, 1965).

9/ R. F. Mikesell, "Capital Absorptive Capacity as a Limitation on Lending for Economic Development," United States Private and Government Investment Abroad, ed. R. F. Mikesell (Eugene, Oregon: University of Oregon Books, 1962), p. 365.

Stolper also puts emphasis on profitability measurements rather than absolute limits on factor availability.[10/] Meier and Baldwin note that, in addition to shortages of complementary factors, capital absorptive capacity is determined by the requirements of avoiding inflation and maintaining balance of payments equilibrium.[11/] They go on to say that "the lack of technology, the shortage of ... managerial, technical, supervisory, and skilled manpower ... result in a sharp decline in the marginal productivity as capital accumulates ... and, if the amount of investment is increased greatly, the marginal productivity may decline rapidly because of bottlenecks in production and may even become negative."[12/]

Although the same factors are typically mentioned by other authors who acknowledge the existence of limits on the capacity to absorb investment, most have preferred to approach the problem in terms of absolute scarcities of cooperating factors of production. Millikan and Rostow, for example, use limits on what they term "technical absorptive capacity" to determine the amounts of aid required by the underdeveloped world during the coming years.[13/] "These limits ..., the technical absorptive capacity, are set by such factors as the technical and a [sic] managerial capacity available, the size, stability, and motivations of the non-agricultural labor force, the

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10/ Wolfgang Stolper, "External Economies from a Planning Standpoint," Zeitschrift fuer die gesamte Staatswissenschaft, 119: 195-217 (1963). See especially pp. 199-204.

11/ G. M. Meier and R. E. Baldwin, Economic Development Theory, History, Policy (New York: John Wiley and Sons, 1957), p. 351.

12/ Ibid.

13/ M. F. Millikan and W. W. Rostow, A Proposal: Key to an Effective Foreign Policy (New York: Harper and Brothers, 1957), p. 102.

level of skills and education, the development of markets, the state of basic facilities for transport, communication, power, and community services."[14/]

Hirschman argues that the "ability to invest" is limited "by a shortage of the ability to make and carry out development decisions ... [It] ... is acquired and increased primarily by practice; and the amount of practice depends in fact on the size of the modern sector of the economy." "We may therefore think of the ability to invest as a coefficient v that, applied to the total income Y_m of the economy's modern sector, yields the investment vY_m that can and will be undertaken, providing financing is available."[15/] Lewis seconds Hirschman but adds to the possible constraints "the foreign exchange bottleneck," and manpower and technique scarcities which, apparently, are treated as absolute limits on investment rather than as lowered profitability.[16/] Hagen mentions the same factors including foreign exchange, and he stresses the aggregative nature of the limits imposed on absorptive capacity.[17/]

14/ Ibid., pp. 50-51. They argue that "the different stages of growth have several important implications ... The first is that substantial outside foreign capital can be productively used by an economy in the first or precondition stage only in a few fields like transport, irrigation, mining, and power. Some capital can be absorbed in agriculture and industry, but the amounts will be quite small. In the transition stage ... there continue to be sharp, if ... rising, limits on how much can be absorbed ... In the third stage, technical absorptive capacity ceases to be a limiting factor on the volume of investment..."

15/ A. O. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958), p. 36; italics in original. Hirschman distinguishes his "ability to invest" from "absorptive capacity."

16/ J. P. Lewis, Quiet Crisis in India (Washington, D. C.: The Brookings Institution, 1964), pp. 33-42.

17/ E. E. Hagen (ed.), Planning Economic Development (Homewood, Illinois: Richard D. Irwin, 1963), p. 329.

Kindleberger has suggested that "it seems somewhat strained to use the concept of absorptive capacity to cover both the act of capital formation [World Bank emphasis][18/] and the subsequent economic justification of the capital where formed [the Millikan and Rostow approach], without making a distinction between stages. Perhaps, the capacity to absorb can be broken down between the first stage, where the question is one of capacity to form new capital and, a second, concerned with its efficient use. Both concepts should be included in absorptive capacity ... Capacity to form capital with foreign loans refers to the consistency of its development plans in terms of physical requirements...; capacity efficiently to use foreign capital, on the other hand relates to ... balance in supply and ... demand which ensures that the newly constructed capital contributes to current production ..."[19/] A similar, although less sharp distinction between absorption and effective utilization of investment appears to be made by Buchanan and Ellis,[20/] and Robock.[21/] This distinction does not, however, correspond to that drawn here between the assessment of projects solely in

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18/ IBRD, "Memorandum on Financing Economic Development," in United Nations, Methods of Financing Economic Development in Underdeveloped Countries, (New York, 1949), pp. 91-92. "The most striking lesson of the Bank's experience to date is the dearth of soundly conceived development projects ready for financing...The very fact of underdevelopment connotes an insufficiency of the talents necessary to translate development concepts into practical propositions ready for execution..."

19/ C. P. Kindleberger, Economic Development (New York: McGraw-Hill Book Co., Inc., 1958), p. 264. Words in brackets have been added to the quotation, but the distinction between the two approaches and references to their background is made explicitly by Kindleberger in the same location.

20/ N. S. Buchanan and H. S. Ellis, Approaches to Economic Development (New York: The Twentieth Century Fund, 1955), pp. 380-381.

21/ S. H. Robock, Brazil's Developing Northeast, A Study of Regional Planning and Foreign Aid (Washington, D. C.: The Brookings Institution, 1964), pp. 9, 11, 156, 187-188.

terms of profitability and the use of absolute limits on factor supplies in conjunction with profitability considerations. Kindleberger's statement to the contrary notwithstanding, the distinction between formation and utilization of capital does not seem to be useful with respect to the aggregative nature of the limits on absorptive capacity. The same factor scarcities which prevent the full utilization of investments already made may truncate the investment program currently undertaken as well. When dealing with the aggregative limits rather than their exhaustion, this distinction which may be useful on a micro-economic level does not appear to assist in the understanding of the nature of these limits.

Most of the authors stress shortages of physical factors such as skilled labor and management. Consequently, a consistent view is that the limits on absorptive capacity may be raised or eliminated through technical assistance.[22/] This paper takes issue with this assertion and finds a great deal of merit in Robock's qualification that "foreign assistance does not come at 'no cost' to the recipient...When scarce domestic resources...are employed to receive and properly use...aid, there is an 'opportunity cost' in administrative talent, and counterpart requirements are not available for other activities which [may] have much higher priority..."[23/]

22/ E.g., IBRD, op. cit., p. 92; Millikan and Rostow, op. cit., pp. 60-62; Higgins, op. cit., p. 28; Robock, op. cit., pp. 156-157.

23/ Robock, op. cit., p. 187. Adler, op. cit., pp. 35-36 has also questioned the orthodox view of the role of technical assistance.

In general, the concern with financial limits on development activities is spotty in the literature. Mikesell,[24/] Kindleberger,[25/] and the IBRD[26/] separate questions of debt service from absorptive capacity: Hirschman assumes that financing is available; Lewis stresses the importance of balance of payments limits while minimizing other possible financial bottlenecks. Meier and Baldwin are also sensitive to possible payments difficulties but fail to make clear the relationship of such problems to the shortage of physical inputs. Mason deals with both fiscal and balance of payments restraints, but his treatment - especially of the former - is quite general.[27/] Mikesell explicitly rules out financial limitations in his use of the concept in order to concentrate attention on the problem of transforming financial capital into real capital.

The question of empirical estimation of the limits differs according to the approach taken toward absorptive capacity. For those who emphasize profitability it is first necessary to define a minimum acceptable level of profitability for an activity as is done by Higgins. Then it is necessary to evaluate inputs and outputs of each of the activities with a "correct" set of prices. Since this correct set of shadow or accounting prices is that set of prices which will achieve equilibrium of supply and demand under the

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24/ Mikesell, loc. cit.

25/ Kindleberger, op. cit., pp. 265, 299-30.

26/ IBRD, op. cit., p. 99.

27/ Mason, op. cit.

plan,[28] it depends on a number of activities actually included in the plan if some inputs are not available in completely elastic supply. Although in theory a set of prices and a set of activities may be uniquely determined, in practice the solution to this problem is nearly impossible without making very strong - and probably unrealistic - assumptions. Consequently, an iterative procedure must be carried out. This procedure permits successive approximations to the optimal program by trial and error.[29] This is a well recognized aspect of investment programming although it is not generally included in discussions of absorptive capacity.

For those who view absorptive capacity in terms of absolute limits on availability of complementary non-capital factor inputs, only the IBRD, Hirschman, Millikan, and Rostow give us any idea of a method for the estimation of the limit on absorptive capacity. Hirschman's formulation is not very useful, however, because the extent of the modern sector and the value of v both remain to be defined and evaluated. The IBRD measures absorptive capacity by the number of "bankable" projects available -- something presumably related to profitability but not a criterion which has found wide acceptance. Although Millikan and Rostow argued that "It is extremely hazardous to attempt to estimate technical absorptive capacity,"[30] nevertheless, they were forced to such estimation by their criteria for

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28/ The optimum shadow prices will do more than this, because they will offset any technical external economies or diseconomies which may obtain and cause the socially optimal amount of savings to take place.

29/ It should be noted that shifts in the minimum acceptable level of profitability may alter the rank ordering of projects by profitability.

30/ Millikan and Rostow, op. cit., p. 96.

assistance. The first criterion was that "it must be within the technical and administrative capabilities of the receiving country to carry out its proposed project with reasonable efficiency over the time period of the loan or grant."[31/] Their estimation procedure was simply to assume that 130 to 150 percent of current capital formation could be absorbed after planning for three years. "Technical absorptive capacity would continue to rise ... [thereafter] by 5 to 10 percent per year ..."[32/] It is not clear what merit this procedure has besides simplicity. Surely, it has little to do with absorptive capacity as the concept has been used in the literature.

An iterative solution may also be necessary to determine the maximum which can be absorbed when using fixed limits along with some factors in elastic supply. However, it is likely to be simpler than that discussed above because the limits - unlike the accounting prices - are known in advance, and the problems arise from determining the relationship between the limits on factor availability and absorptive capacity. This may be a vexing question because of factor substitutability. This problem is, however, also present if profitability alone is used in determining absorptive capacity.

It is apparent that the literature on absorptive capacity tends to stress physical shortages of productive factors while neglecting financial limitations. In addition, very little guidance is provided to enable planners to use the concept of absorptive capacity in practical situations. Thus, a need remains to formulate the concept in such a manner that in

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31/ Ibid., pp. 70-71.

32/ Ibid., p. 102.

realistic planning situations limits on the availability of productive factors (including financial factors) may be employed in an iterative development planning process. It is to this need that the analysis in the following sections is addressed.

III. LIMITS AND PROFITABILITY

In this section, we consider the nature of the budgetary and balance of payments constraints on the amount of development activity, and we offer some suggestions for the empirical determination of these financial limits. In addition, we undertake to define a profitability constraint. This financially oriented perspective on absorptive capacity is advanced in the belief that these types of constraints on development activity have not yet received adequate attention. In our opinion, financial constraints override specific physical factor shortages because, we postulate, most underdeveloped countries can obtain scarce physical factors of production through importation if the higher prices (economic and political) demanded by these imported factors can be paid.[1/] Thus, expanding aggregative supply primarily involves the mobilization of financial resources to make such payments.

A great deal of the development literature has been concerned with the capacity of the government to finance development expenditures and the capacity of the country to finance development imports. It will certainly be generally accepted that in some, pdrhaps most, underdeveloped countries the budgetary and the balance of payments limits are significant and highly relevant to economic development policy. These financial limits may be important not only during the investment phase of a set of projects but also during the period of operation if there are inadequate cash flows. This latter long-term limit may be particularly critical with respect to public sector concentration on activities which generate little or no direct

1/ Cf., G.F. Papanek, "Framing a Development Program," International Conciliation (New York: Carnegie Endowment for International Peace, March 1960), p. 335. "In any case, there are very few proposals that are technically unfeasible. At a price, even Libya could produce ice cubes for export." Mikesell makes essentially the same point. Mikesell, op. cit., pp. 368-369. For a view opposed to this, see R.E. Asher, Grants, Loans, and Local Currencies, Their Role in Foreign Aid (Washington: The Brookings Institution, 1961), p. 86.

income,[2] but it may also be generally relevant, especially if accounting prices have been used to calculate the profitability of projects.[3] In the analysis below, we hope to make clear the way in which financial constraints impinge on investment in, as well as operation of development activities. In addition, we investigate the relation between the two limits and attempt to provide a bridge between the aggregative analysis of financial requirements and availabilities and the micro-economic appraisal of individual development projects.[4]

A. The Budgetary Limit

Government expenditures are limited by tax receipts, revenues from government enterprises, transfer receipts, borrowing capacity from abroad, and borrowing capacity domestically (including the creation of money). Transfer receipts and borrowing capacity from abroad will be discussed in the following sub-section on the balance of payments. With regard to tax receipts, the percentage of national income which is taken by taxes tends to be smaller in the less developed countries than in the United States and Western Europe. However, it is not at all certain that many additional resources could be secured through higher tax rates in these countries if the additional costs of tax collections were netted out.[5]

Most underdeveloped countries secure the greatest portion of their revenues from indirect taxation, in large part on foreign trade. The effects

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2/ E.g., schools, hospitals, roads, police facilities, etc.

3/ Cf. Stolper, op. cit., p. 217, and Adler, op. cit., pp. 18-23.

4/ Cf. Stolper, op. cit., p. 202.

5/ Cf., A. Basch, Financing Economic Development (New York: The MacMillan Co. Inc., 1964), pp. 93-94. Support for this statement may also be found in D.S. Paauw, Financing Economic Development: The Indonesian Case (Glencoe, Ill.: The Free Press, 1960), chapters 5 and 6.

of increased tariff rates in many of these countries would surely be a lowered volume of trade passing through the customs houses (and an increased volume of smuggling) and increases in administrative costs of tax enforcement, such that the net revenue impact of the rate change probably would be small. Insofar as indirect tax rates are levied domestically, disincentive effects may tend to erode the tax base. In addition, there is a high average cost of tax administration with rapidly rising marginal cost per unit of additional revenue collected. As tax rates increase, maintenance of false records, bribery of tax officials, and evasion all become more attractive and more prevalent. Consequently, the additional revenue net of additional administrative cost is likely to approach zero as tax rates are raised.[6/]

The difficulties of collecting direct taxes are well known. While there is little doubt that far more progressive rates (and far higher rates as well) are needed to satisfy some sense of distributive justice in many poor countries, there is doubt that higher rates would, in fact, increase the taxes paid by the rich in these countries. These levies, characteristically, fall mainly upon civil servants and foreign enterprises. Hence, increased direct taxation may simply lower incentives for effective public service and penalize the most productive sector of the economy.[7/]

Revenues of government enterprises are limited by the same market forces which limit revenues of any kind of enterprise, including those with some degree of monopsony or monopoly power. Moreover, in the case of government enterprises, attempts to exploit whatever monopsony or monopoly powers

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6/ See, e.g., U Tun Wai, "Taxation Problems and Policies of Underdeveloped Countries," IMF Staff Papers, IX (1962) pp. 428-448; G.S. Sahota, Indian Tax Structure and Economic Development (New York: Asia Publishing House, 1961).

7/ Cf. Basch, op. cit., pp. 95-97; Paauw, op. cit., pp. 246-257.

they may possess may sharply worsen private profit calculations and impair the allocation of investment resources, including those subject to public decision-making.[8/] Thus, increased revenues may have to be offset against lowered productivity in the economy. These considerations may well mean that the scope for increasing the funds available for governmental expenditure by means of increased cash flow from government enterprises is less than might be thought from a casual inspection of the pricing policies pursued by the individual enterprises.[9/]

Domestic borrowing capacity can be roughly divided into voluntary lending by the public to the government (i.e., borrowing at market interest rates, plus money creation sufficient to match the increase in the demand for money without causing price rises) and involuntary lending (creating money in excess of the requirements of the economy). Although it is difficult to make this distinction empirically, it serves conceptually to clarify the natur nature of the limits on domestic borrowing capacity. The limit on voluntary lending is similar to that on external lending, and it is determined by the confidence domestic lenders have in the ability of the government to repay their loans, as well as the amount of loanable funds available. Typically, capital markets are thin and unorganized in the less developed world; in addition, there are often arbitrary limits imposed by custom or law on the interest rates which can be applied to loans. Thus, the ability of the government to borrow voluntarily on the domestic capital market is likely to

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8/ The maximum contribution to government revenues will occur at the point where increases in cash flow of government enterprises from more monopolistic policies are just offset by the losses in net tax revenues generated by the rest of the economy. It must be stressed that the budgetary limit discussed here is a cash flow limit, i.e., a financial limit, and not a physical limit. The policy which generates maximum profits for government enterprises is not necessarily identical with that which results in maximum cash flow.

9/ This is not to argue that improved management in government enterprises would not increase cash flow substantially. This is a long-term change, however, which can only take place over several years.

be severely circumscribed.[10/]

The limits on the ability of the government to obtain control over additional resources by simply adding to the supply of money are of a different nature. Excessive money creation causes inflation. In the very short-run, the government may secure additional resources through the inflationary process, but in the longer run, the share of government may be unchanged. The result depends very much on the relative political strength of the various groups which are affected favorably and adversely by the inflation. Moreover, inflation may well reduce the absolute amount of resources under government control if it lowers overall output.[11/] It is in this process that the underlying physical limitations in the economy are reflected in financial limitations.[12/]

B. The Balance of Payments Limit

The ability to import is limited by export receipts, capacity to obtain net capital inflow,[13/] transfer receipts net of payments (including

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10/ U Tun Wai, "Interest Rates in the Organized Money Markets of Underdeveloped Countries," IMF Staff Papers, V (1956), pp. 249-278.

11/ Cf., E.M. Bernstein and I.G. Patel, "Inflation in Relation to Economic Development," IMF Staff Papers, II (1952), pp. 363-398. U Tun Wai, "The Relation Between Inflation and Economic Development: A Statistical Inductive Study," IMF Staff Papers, VII (1959), pp. 302-317.

12/ The interactions between the various limits on government expenditures should be noted in this connection. Revenues are likely to rise less rapidly than money income in the economy because specific tariffs, property taxation, head taxes, etc., are more important than direct progressive taxes. International financial confidence also is likely to be impaired by increasingly rapid price rises.

13/ Net capital inflow equals new receipts of equity and debt finance, less repayments and repatriation of old capital, less net investment by nationals abroad.

interest on foreign-held public debt), reduced expatriation of domestic non-national income, plus permissible lowering of exchange reserves. The first three are the most important although expatriation of domestic non-national income may represent a critical drain of foreign exchange for some less developed countries. Changes in foreign exchange reserves are likely to be unimportant, because in most underdeveloped countries where a determined development effort is being made, such reserves will be close to minimum acceptable levels.

Export receipts provide over three-fourths of the foreign exchange acquired by the less developed countries as a whole.[14/] For all except a very few of these countries, exportation is the primary source of import capacity. Export receipts are determined by the volume and unit price of the goods and services sold to non-residents. It is generally believed that the supply elasticity of exports in underdeveloped countries is low, a fact which tends to constrain increases in volume. Moreover, inflexible marketing arrangements and possible low elasticities of demand[15/] prevent the exporting country from exercising much control over export value. Thus, for the period within the planning horizon, there seem to be fairly narrow limits on the extent to which exchange rate and trade policies of less developed countries can improve the amount of export receipts. This fact is reflected in the extent to which such countries maintain over-valued

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14/ See B.A. Balassa, Trade Prospects for Developing Countries (Homewood, Ill.: Richard D. Irwin, 1964), Tables 4.5.2, p. 95; 5.1.1, p. 103; and 5.2.2, p. 106.

15/ The situation for some primary-producing countries may be one in which the country is aware that it acts as an oligopolist; changes in export receipts consequently depend also on the reactions of other sellers of the same products.

exchange rates by means of restrictions on trade and payments, thus indicating a widespread lack of confidence in the positive effects of price changes on import capacity.

Capacity to secure net capital inflow depends primarily on the confidence of the international financial community in the safety of investments in the country in question, as well as the profit potentialities there and elsewhere. Public policy in the less developed countries is unlikely to be able to exert much positive influence on this inflow except over the long-run. Consequently, some combination of profit opportunities (and interest returns), together with the gradually increasing risk of default as the amount of lending is increased, places a limit on the net capital inflow which can be secured from private sources.[16/] The volume of loans from public multilateral or bilateral institutions is also likely to be relatively insensitive to positive public policy in the less developed countries. Such loans tend to be distributed in part according to normal financial criteria and in part for political motives. These latter are not necessarily invidious but may merely reflect a desire of the lenders for widespread political distribution of investments.

That portion of transfers which consists of interest payments on foreign-held public debt and emigrant and immigrant remittances tends to be invariable with respect to the normal range of policy actions available to the government.[17/] The flow of financial foreign aid makes up a portion

16/ Policies hindering the repayment or repatriation of capital - although intended to lessen capital outflow and thus increase the next inflow - are likely to sharply cut the gross inflow of capital as well. The extent to which the net expatriation of capital by nationals can be controlled is imposed by the increasing administrative and political costs of enforcing exchange control on this sort of transaction.

17/ Default or expropriation are not considered normal policies, but rather actions reserved for the crisis brought on by exceeding the limit of absorptive capacity.

of the transfers in many countries.[18/] Although foreign aid in some cases has responded to balance of payments difficulties of recipient countries, such cases are not relevant in the context of this paper. Therefore, we assume - as must be assumed by the planners in most countries - that the flow of financial foreign assistance is substantially independent of tightness of the balance of payments constraint on foreign exchange expenditures.

Expatriation of domestic non-national income consists of profits of foreign-owned enterprises, interest on foreign-held non-public debt,[19/] and wages and salaries paid to non-residents. Thus, these sub-elements are really imports of factor services. Each of these sub-elements is relatively small in the whole balance of payments, yet the services purchased by these income payments are likely to be inputs which are critically scarce in an underdeveloped country. Consequently, excessive governmental pressure to reduce these sub-elements in order to increase the import limit is likely to have a deleterious effect on the entire development effort, causing a reduction in capital inflow and possibly a decrease in export capacity as well.

Nothing in the foregoing should be taken to imply that either the import limit or the expenditure limit is fixed over time. Instead, the argument is that, at any time during the planning period, limits exist regarding: (a) the amount of funds net of collection costs which can be expended by the government, and (b) the amount of foreign exchange available for imports. Both these limits will normally rise with rising incomes -

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18/ In the formulation of the balance of payments used here, foreign aid in kind is not included as a transfer which is balanced by an import, but is excluded since it does not directly influence the financial aspect of the balance of payments.

19/ The distinction in national income accounting practice between public and private debt is arbitrary and is based on the assumed unproductiveness of such public debt. Interest on productive debt is a factor payment and that on unproductive debt a transfer. The distinction is not inconvenient for this paper because it groups government transfers and interest separately from private interest payments.

though possibly less rapidly than income - and both may change secularly in some fashion which is independent of income changes. It is believed that both these limits, as formulated above, are likely to be at sufficiently low levels in the less developed world that they are relevant to the formulation of the development plan.

C. A General Equilibrium Aggregative Profitability Criterion

As Lerner[20/] emphasized long ago, the rate of return on investment is governed not only by the state of technology and volume of capital stock relative to other productive factors, but it is also dependent on the rate at which the investment itself takes place. As the proportion of investment to consumption in any given time period is increased, the profitability of marginal and inframarginal investment activities declines. This does not occur because poorer projects are being undertaken - although this may play some role - but because the relative costs of inputs rise as consumption goods become scarcer, and the factors of production become less and less suited to the production of investment goods. In addition, the prospective prices of the outputs may decline.[21/] Declining marginal profitability of

20/ A. Lerner, Economics of Control (New York: The MacMillan Co., 1946), pp. 330-342. Lerner was the first to emphasize the distinction between the marginal efficiency of investment (MEI) and the marginal productivity of capital (MPC). "The marginal productivity of capital is... the marginal efficiency of investment when the rate of net investment is zero." "The rate per unit of time at which the capital increases when its marginal productivity is greater than the rate of interest... is determined by the schedule of the marginal efficiency of investment. Investment will be carried on at that rate per unit of time which makes equal the rate of interest ... When there is a positive rate of net investment ... the marginal productivity is above the rate of interest ... The difference ... is the force which makes the stock of equipment grow ..." p. 335 italics in original.

21/ Over time, of course, the normal result of development will be to expand the volume of investment which may be undertaken profitably in any period. In addition, the flexibility of the economy may be increased so that the decline in profitability becomes more gradual.

additional investment i thus traceable in the first instance to the necessity of selecting investments of decreased productivity, and in the second instance to the fact that the production of investment goods is subject to increasing costs at any moment of time.

At the micro-economic level, profit is typically defined as the difference between the value of the outputs and the value of the inputs in a particular productive process or activity. If the productive activity is carried out according to profit maximizing criteria, the cost of the inputs will be minimized for a given output. At that output, the quantity of each input will be determined according to a production function relating physical outputs and inputs and according to the supply curve of each input. This profit calculation requires the following information: a quantity-price relationship for output (demand curve); quantity-price relationships for each input (supply curve), such that the price depends only on the quantity demanded for the particular activity or is constant; and production functions for each activity. An activity will be undertaken if the present value of its flow of outputs exceeds that of its flow of input when both are appropriately discounted by the cost of capital.

At the macro-economic level, we may define profit as the discounted social value of all outputs (including external effects) less the discounted social value of all inputs. A limit on aggregative profitability would be the rejection of all activities for which profitability was not positive because such activities use more inputs than the output they yield and thus contribute negatively to overall output.[22/] Unfortunately for the ease of

22/ This is not a trivial constraint. There is some indication that too much investment has been carried out in some less developed countries with resultant negative marginal efficiency of investment. Cf., Mason, op. cit. p. 13.

analysis, the supply and demand relationships for each activity are not independent. Thus, it is extremely difficult to determine which activity is the marginal activity, the elimination of which lowers total output more than total costs (both appropriately discounted). Put in a slightly different way -- in practice, it is almost impossible to determine the "correct" or equilibrium set of shadow prices for a development program, yet only if such prices are given over the entire life of every activity can the profitability of these activities be determined. Profitability is, in fact, a useful criterion only when applied to specific situations in which specific development activities are under consideration, and the interdependencies of these activities with the rest of the economy are either known or are trivial and, consequently, ignorable.[23/]

D. Projection of Limits

Without describing projection techniques in detail, we consider in this section several general aspects of the projection of budgetary and balance of payments limits. As noted in the previous sub-section, the profitability limit cannot be estimated in general, but is relevant only to specific activities. Projections of the financial limits must be based on estimates of the components of the government cash inflow and government administrative expense, and of the components of net foreign exchange inflow for each of the years of the planning period.[24/] By adding the various components, the projections are derived.

A powerful and necessary first step in the estimation procedure is the elaboration of an aggregative model of the economy. For some small

23/ Cf., Wolfgang F. Stolper, Planning without Facts (unpublished manuscript).

24/ Some of these components are, of course, identical (e.g., export taxes or earnings on public foreign exchange reserves). We have discussed these components in the previous section.

countries this may be a very simple system involving only five or six relationships; for larger and more complex economies a more elaborate model may be required. Inasmuch as such a model is essential if plans are to be formulated and carried out in a consistent fashion,[25/] it need not be created solely for the projection of changes in the government budget and in the balance of payments. It will serve the purpose, however, of providing a consistent framework within which disaggregated income and production changes take place. It is on these changes that components involving income or production flows are based. The extent of these changes is likely to be dependent on a selected target rate of income growth and on the expected rate of growth of exports. The income growth target may be arbitrarily selected.[26/]

The estimation of export receipts must be based on world supply and demand projections for each of the major export commodities of a country.[27/] A comparison of these will produce an estimate of price developments. Then the domestic supply of exportables can be projected on the basis of past export performance and past and current investments, modified by the expected reaction to expected price developments. Investments currently under way or about to be undertaken will also affect exports, but these will be taken into account in the analysis of the individual activities below.[28/]

25/ Of course, a number of countries have attempted to plan without developing such a model. The result typically is either internal inconsistency or underspecification of key economic parameters in the plan.

26/ It will have to be adjusted through iteration to conform with the expected income increase produced by the ultimate plan.

27/ Such projections may be found in Belassa, op. cit.

28/ A survey of the major exporting firms is likely to provide fairly accurate information on the likely volume of exports from past investments over the next three to four year period.

Account will also have to be taken of likely fluctuations in export volume if this is variable. By incorporating the export projections and income growth targets into the aggregative model a number of variables needed for the projection of the limits can be estimated. In addition to export receipts itself, direct and indirect tax receipts, revenues of government enterprises, and expatriation of profits and interest by foreign-owned enterprises are all likely to be dependent on expected levels of the components of income, production, and exports. However, mechanical projections based on regression techniques may not suffice to take account of alterations in the tax structure and financing of foreign businesses, improvements in tax enforcement, and reforms in management of government enterprises. Consequently, modifications of the estimates may be necessary in order to incorporate expected changes of this type. To some extent, this latter type of modification of the estimates may be reflected in changes in the amounts of revenues which are devoted to tax administration and other non-development activities.

Budgetary expenditure for government administration and non-development purposes and foreign exchange expenditures on non-development imports both depend (in different ways) on political considerations and the administrative competence of the government. For a variety of reasons, it is impossible to suppress entirely such expenditures which result in the lowering of the financial limits.[29/] Minimum levels of such drains on the limits are likely

29/ Problems of definition exist with respect to the purpose of some imports or government expenditure. A practical assumption may well be that all imports and all government expenditures are developmental and, consequently, part of a particular development activity. As part of such an activity, they can be analyzed and through appropriate policy measures discouraged or promoted. Who is to say that Scotch whiskey imports are inessential if they are necessary to promote tourism -- or that "essential" diesel generators will not be imported for use in the pleasure yacht of the Minister of Finance?

best to be estimated by reference to past performance and present trends. The other current transactions which must be estimated are the net expatriation of wages and salary payments by non-residents and the amounts of private transfers. Both of these are relatively minor items which are unlikely to fluctuate greatly. Consequently, estimates can simply project past levels into the future.

With the exception of money creation and domestic public borrowing[30/] the remaining components to be estimated involve capital transactions or shifts of assets rather than current or flow transactions. These components are not public transfers, foreign public borrowing, receipts of equity finance, repayments and repatriation of capital, and net investment abroad by nationals. Receipts of foreign transfers, loans, or equity finance during the plan period should only be counted as positive expansion of the limits if they are received entirely in foreign exchange without implicit or explicit strings attached.[31/] Otherwise, such receipts should be treated as part of the development activities to which they give rise; the impact of such activities on exhaustion of the limits will thus be negative to the extent to which the above conditions of stringlessness and liquidity are satisfied.[32/] Debt service payments on existing debt can be precisely scheduled; correspondingly, repatriation and expatriation of capital, as well as

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30/ While domestic borrowing is also an asset shift, it is more convenient to consider it along with money creation, which is essentially interest free domestic borrowing.

31/ This is a condition which may seldom be satisfied.

32/ In other words, the provision of a loan or grant to the domestic government in connection with some project serves to expand the balance of payments limit to the extent that it is not used for imported inputs for the project, and to expand the budgetary limit to the extent that it exceeds the total cost of the project.

dividends on equity investments, can be fairly well kept in bounds by means of appropriate incentives and restrictions. Thus, likely projections can be made for such "leakages" of foreign exchange.[33/]

Estimating the borrowing capacity of a nation -- and, more specifically, the borrowing capacity of the government of a nation -- is likely to be one of the more critical aspects of the overall estimation problem. This remains true even when we restrict ourselves to general purpose borrowing because, although export receipts and tax receipts are likely to be larger components of the limits, borrowing capacity is subject to greater variation. Moreover, its character as a time-discrete transfer of a financial stock, rather than a flow, means that the entire borrowing capacity of a country can be used up in one period. The foreign exchange and budgetary limits will be greatly expanded at that time but reduced in succeeding years as a result of amortization and interest payments. General borrowing capacity, domestically and abroad, will depend on a variety of factors which are both quantitative and qualitative. Estimates may be based on the ease or difficulty with which earlier loans were floated, or on a survey of financial opinion in some of the leading financial centers. For loans in domestic currency, the effective interest rate may be governed by the degree of inflation. Consequently, the expected amount of money creation may be an important factor influencing the availability of domestic funds.

Increasing amounts of money are required in an expanding economy. This is particularly true in a less developed country where a general expansion is accompanied by a shift from non-money subsistence economy to a market economy. It follows that it may be possible to create substantial

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33/ As pointed out earlier, the service and repayment of foreign investment and the exportation of capital by nationals reduce the limits on budgetary and balance of payments expenditures.

amounts of money without causing price rises. The extent of non-inflationary money creation may be estimated on the basis of the experience of other nations in a similar stage of development and on the basis of past performance in the economy in question. If excessive money creation is likely or expected, the increase in the domestic price level must be estimated in order to gauge the resultant effects on incomes, taxes, exports, and other key economic variables. This will greatly complicate the entire planning process without necessarily increasing either of the financial limits beyond the level that would otherwise have obtained.

Two general difficulties in the estimation of the components of the financial limits may be noted -- error and circularity. Error results from a variety of sources: inexact data, imprecise estimation techniques, and random future events. A standard way of dealing with this would be to use the estimates as measures of central tendency while specifying a variance as a measure of dispersion. Unfortunately, in this context, errors on the optimistic side are far more serious than those in the other direction. This assymetry in the economic and political consequences of errors may be dealt with by making two sets of estimates -- one of which reflects the likely course of events, and another which is geared to a highly conservative set of probable events.[34/]

Circularity of causation results from the dependence of the components of the limits of planned development activity on income and export growth

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34/ This latter set might reflect, for example, a 90 or 95 percent certainty level of no worse set of events occurring.

assumptions which the development plan itself is supposed to realize.[35/] In theory, at least, this problem can be dealt with by means of a system of simultaneous equations. In practice, a process of iteration is required which makes possible an approximately consistent program. One important aspect of this problem will be dealt with below. It relates to the plan's assumed relationship between investment and output (including multiplier effects) and the relationships between investment and output, which are believed to exist for each of the activities comprising the micro-economic components of the plan.

35/ There is increasing recognition of this problem. For example, the "Report of the Inter-Regional Workshop of Problems of Budget Classification and Management in Developing Countries" held in Copenhagen, Denmark, September 1964, stated in paragraph 75, page 29:

"It was noted that most medium-term development plans include forecasts of resources. Since they concern a period of four to six years ahead, they are naturally of a tentative nature. They are based on broad assumptions about the expected or planned rate of growth of gross national product. Although there is clearly an inter-relationship between government revenues and the gross national product, basing long-term forecasts on this relationship often amounts to begging the question. The growth of national product depends on fulfillment of the plan, which, in turn, depends on the availability of resources. The Workshop stressed the need for making more realistic estimates, year by year, in the light of actual progress and changing conditions."

[This report is available as UN document ST/GAO/SER.C/70, New York, 1964]

IV. EXHAUSTION OF LIMITS

A. Introduction

The limits which were described in the previous sections operate as more or less independent constraints on the total amount of development activity which can be undertaken. In this section, we consider the ways in which development activities use up or exhaust the budgetary funds and balance of payments funds available. We also deal with some problems involved in profitability calculations, but we make no attempt to contribute to the vast literature on investment criteria. That is a task far beyond the scope of this paper. The maximum possible extent of development activity is that amount which just uses up the limited budgetary or foreign exchange funds but does not exceed either limit in any year of the planning period, and is not likely to exceed either limit in the post-planning period. The maximum profitable volume of activity is the amount of activity for which the effect of the least profitable element on income is positive. Absorptive capacity, as measured in this paper, is the lesser of these two volumes.[1/]

Individual development activities should be delimited in the pragmatically most useful way for the purposes of this analysis. A conflict may well arise between a delimitation based on decision-making and one based on analytic simplicity. The desirable balance between these two criteria

1/ Thus, the problem may be cast in terms of activity analysis, as the maximization of absorptive capacity (i.e., development activity) subject to: (a) a budgetary constraint, (b) a balance of payments constraint, and (c) a profitability constraint. The usual formulation of the development problem is the maximization of profits subject to constraints on the budget, balance of payments, and -- possibly - absorptive capacity. Our approach will not maximize profits unless the profitability constraint is operative. Instead, it "satisfices" with respect to profits. This means that bad projects are rejected, but not all of the best projects may be selected. If a country has a large backlog of unimplemented profitable projects, the satisficing approach is undesirable; its use here reflects a belief that few countries have such a backlog, and that the key planning problem is more likely to be the rejection of bad projects than the choice among good projects with significantly different profitability levels.

should reflect the maximum degree of disaggregation consistent with a meaningful allocation of costs and benefits (at least in a marginal sense) and feasible in terms of the resources available to the planning office.[2/] The distinction between developmental and non-developmental activities should likewise be pragmatic. Although few types of activities or expenditures can be rigidly allocated to one group or the other because almost all activities have some import on development under some circumstances, the degree to which activities can be controlled by the central government and the significance of their contributions to development provide guidelines for making this distinction in practice.

Each activity which is to be programmed into the development plan involves time-specific physical inputs and outputs and financial arrangements, with respect to payments for and receipts from the activity. These financial arrangements distribute the costs and benefits of an activity among the government of the less developed country and various other public and private, internal and external economic entities. In order to gauge the net exhaustive impact of an activity on the limited available budgetary and balance of payments funds in each year of the planning period, we must evaluate and attribute the inputs and outputs of the activity. This should be done with

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2/ The former would result in many very small activities, since separate decisions may be made with respect to individual members of a technically assisted project, such as an FAO rice agronomist for a swamp-rice project or individual teachers for a technical school. If, on the other hand, activities are defined in such a way as to minimize the analytical interactions among them, it is likely that several separate but related projects will be grouped together as one activity. For instance, a swamp-rice project, a rural health project, a rural education project, and a farm-to-market road project might all be taking place in the same area and all interacting with one another. To minimize the analytical difficulties of allocating costs and benefits among these projects, they might be considered as one activity (frequently labeled "community development").

market prices, cash accounting, and opportunity attribution or costing.[3/] In addition, we must include changes engendered by the activity in question on the prices and/or quantities of the inputs and/or outputs of other activities which must be considered as separate activities from the one in question.

Taking account of such inter-activity interactions, the net exhaustive impact of an activity on the budget is then the algebraic sum of the evaluated inputs (exhaustive), and outputs (expansive), and net asset transfers; i.e. total payments (exhaustive) and receipts (expansive) which are made by, or accrue to, the central government. The net exhaustive impact of an activity on the balance of payments is similarly the algebraic sum of the evaluated imported inputs (exhaustive), exported outputs (expansive), and net foreign asset exchange transfers; i.e. total payments (exhaustive) and receipts (expansive) of foreign exchange.[4/] These net exhaustive effects may conveniently be divided into nonrecurring and recurring impacts. In addition, it is convenient to distinguish service charges on foreign debt because this is an especially important component of the financing of an activity which is not necessarily related to the investment in, or output of, the activity.

3/ For evaluating profitability from a social point of view, we must use an evaluation based on equilibrium scarcity prices and accrual accounting, because profitability is an economic rather than a financial concept. We touch on this issue below and, in addition, consider valuation and attribution difficulties posed by non-market interactions and various financial arrangements.

4/ Expenditure of incomes generated through implementation of an activity will also have indirect multiplier effects on the exhaustion of budgetary and foreign exchange resources. With one exception (which is considered on pp. 51-52) these multiplier effects are subsumed in the aggregative analysis used to estimate the financial limits discussed in the previous section. Of course, for consistency, the assumed aggregative multiplier should approximate the sum of the multiplier effects of the planned development activities.

Before discussing each of these types of exhaustive impact, we must concern ourselves a little more intensively than heretofore with the difficulty of evaluating and attributing[5/] activity-specific inputs, outputs, and financial arrangements. Opportunity costing with market prices is the proper approach. Thus, activities currently under way should be assessed on the basis of the decrease in net foreign exchange and budgetary expenditure which would result from a decrease in the activity from current levels; increases in current activities or implementation of new activities should be judged on the basis of increases in expenditures or decreases in the size of other activities which would result from an increase in the activity.[6/] A particularly important use of the opportunity cost approach is with respect to the financing arrangements.

When assessing the impact of financing arrangements on the budget (balance of payments), it is important to make certain distinctions: (a) those for which the non-governmental (external) financing is independent among activities; (b) those for which the non-governmental (external) financing is interdependent; and (c) those for which non-governmental (external) financing is undetermined. In the first situation, the non-governmental (external) financing for an activity is activity-specific, or else such financing is not

5/ It is surprising that many of the interesting analytical problems of attribution of costs and benefits arising from joint public-private or internal-external financing have received so little attention from the point of view of the recipient or borrower country or government. An analogous problem exists within a federal government structure such as the United States, where State governments may receive Federal grants or loans.

6/ This approach may serve to "explain" only a portion of currently planned expenditures. An implication is that the "unexplained" remainder is attributable to non-development activity. Debt service charges from past investments, it should be noted, fall into this unexplained remainder since they are a charge against general government revenues -- not project or activity responsibilities.

scarce relative to other development inputs.[7/] This means that the appropriate way to analyze the costs and benefits of such activities is to consider the financing as an integral part of the activity which cannot be separated from the physical aspects of the activity. In contrast, the financing for projects in the second category does not really eliminate a portion of the costs because using the non-governmental (external) funds for the activity in question means foregoing the use of the funds for some other activity. Thus, the opportunity cost impact on the budget (balance of payments) of undertaking any particular project is approximately equal to the total (foreign exchange) cost of the project -- assuming alternative activities have similar cost-benefit relationships. The third category consists of projects which are in a formulative stage and for which the financing arrangements have not yet been articulated. For such embryonic activities, the most desirable method of analysis is, alternatively, to assume (a) that the entire costs will be borne by the government (internally), and (b) that the costs will likely be financed in a fashion similar to that of earlier activities of the same kind. For negotiations regarding financing it will also be useful to generate information on the relationship between incremental changes in non-governmental (external) financing of certain typically financed costs, and incremental changes in the profitability and financial impacts of the activity.

7/ The extent of availability of non-governmental and external financing is clearly an empirical question. Yet, for the limits on absorptive capacity analyzed in this paper to have relevance, it must be assumed that such financing is sufficient so that it does not hold back development activity except in a very special sense: that the volume of external financing may depend on the availability of domestic government counterpart financing and this latter is inadequate. It should be noted that it is entirely possible for external financing to be scarce for some activities and plentiful for others. For example, a donor country may offer to construct one new school for every school constructed by the recipient, yet may refuse to finance road construction.

B. Types of Impacts and Costs

1. Nonrecurring

The budgetary impact of the nonrecurring aspect of an activity depends on the size and phasing of the investment costs involved and the extent of non-governmental financing secured for these costs. The balance of payments impact of the nonrecurring aspect of a project depends on the size and phasing of the foreign exchange cost of the investment and the proportion of non-governmental financing which is external. The financing for nonrecurring costs may range from total private and/or total external financing to total public internal (budgetary) financing. The degree of control or ownership which the domestic government has over the capital and income of the venture may similarly vary. This means that the analysis of the amount and phasing of the non-governmental financing must be tailored to the individual activity and may be quite complex.[8/] The phasing of nonrecurring physical inputs depends, in a technical sense, on climate and engineering considerations.[9/] Attempting to speed up or slow down the technically optimum phasing may increase the cost of these inputs. However, general economic considerations should also affect the phasing of an activity, as well as financial conditions and the short-term availability of specific inputs.

8/ For example, an agreement between foreign private interests and the domestic government to build a refinery might include on the part of the government the provision of a site, port facilities, and access roads. Meanwhile, the oil company might build the plant and pay an additional license fee to the government to be freed of the threat of competition. Profits might be taxed or shared and special amortization funds might be set up. Ownership might pass to the government after some fixed period of time.

9/ Systems such as PERT and CPM have been designed to minimize the time required to complete a project by concentrating on the successive elimination of bottlenecks. These methods are being increasingly used for program phasing and management, but they do not necessarily result in minimum economic cost.

Estimates of the investment cost of a particular project or activity depend on the type and scale of the activity, the quality specifications, and the intended ultimate input mix. In the period in which a project is being formulated, all of these variables may have some flexibility, although technical considerations may result in some minimum investment estimates. Even after an activity has been financed and the implementation has commenced, it is in many cases possible to alter the specifications in order to raise or lower the cost, although, for obvious reasons, the flexibility with respect to input mixes is progressively reduced as the project develops from conception through formulation to implementation and operation.[10/] Consequently, nonrecurrent cost estimates must reflect the cost thought most likely at the time the estimates are being made. As the activity gradually becomes more clearly defined, revised investment estimates will be necessary[11/] and can be prepared. It might be noted at this point that cost estimates for major public investments have almost never been too high,[12/]

10/ An example might be provided by highway construction. Nonrecurring costs depend mainly on the volume and type of excavation and fill required, the number and size of bridges necessary, and the type of grading and surfacing to be constructed. While the cost of the bridges may be fairly well fixed when the route has been chosen, the volumes of excavation and fill depend on the terrain and on the speed and width specifications of the highway. These latter, along with the surfacing specifications can be -- and occasionally are -- altered when initial construction has already begun.

11/ This necessity may arise in part from -- and the nonrecurring cost of the project be influenced by -- the lack of budgetary or balance of payments funds to carry out the desired number of activities.

12/ A recent analysis of this problem may be found in J.M. Healey, "Errors in Project Cost Estimates," The Indian Economic Journal 12 (1964), pp. 44-52. The upward cost revisions cited there were from 5 to 230 percent. Healey tentatively concluded (p. 52) "that the most significant and pervasive factor (resulting in project cost revisions) was not changes in the prices of material and labor, but inadequate geological and technical investigation of the projects in their initial stages."

but very frequently well below ultimate expenditures. Because the investment cost of very few large projects typically forms a major part of the overall development program of most underdeveloped countries, a careful and conservative treatment of all estimates of cost is essential.

The hypothesis that the proportions of imported inputs of nonrecurring expenditures -- and for that matter of other types of costs -- have fairly fixed minimum levels for most production functions is plausible, and, in a somewhat more aggregative fashion than used here, it has been accepted by a variety of authors.[13/] Of course, some variations in the minimum proportion of imports will occur according to the production function chosen. Estimates of this foreign exchange component of investment are subject to the same variations as are estimates of the total cost of the investment. Developing countries may attempt to minimize the import component of investment because in many of these nations there is a perception of potential or real foreign exchange shortage. However, there is a trade-off between cost and budgetary impact on the one hand, and the balance of payments impact on the other. Imported components may be cheaper than domestically produced inputs, and project-specific foreign assistance may vary positively to some extent with the proportion of imported inputs into a particular investment activity.[14/]

13/ G. Haberler et al. Trends in International Trade, A Report by a Panel of Exp Experts (Geneva: GATT, 1958), p. 48; I.G. Patel, "Trade and Payments Policy for a Developing Economy," p. 310; in R.F. Harrod, and D.C. Hague (eds.), Trade Theory in a Developing World (London: 1963), pp. 309-331; A.O. Hirschman, op. cit., pp. 169-173; S.B. Linder, Trade and Trade Policy for Development (Uppsala: Almquist and Wiksell, forthcoming). Linder has attempted to test this hypothesis.

14/ Loans or grants are sometimes made for the foreign exchange components of an investment. This was the policy of the IBRD, for example, over a long period. While the "foreign exchange cost" of a project has frequently been assumed to be constant in a variety of countries, and has not been carefully analyzed for specific projects, there is no reason to believe that in all cases it is entirely insensitive to the true foreign exchange impact of activities.

2. Recurring

The budgetary impact of the recurrent aspect of an activity -- whether this provides services, involves the use of investment or capital, or results in the output or availability of goods -- depends on the extent to which the recurrent cost[15/] of the activity is financed by the budget. Conversely, this impact may be expressed as the difference between this cost and the non-governmental financing. Thus, the budgetary impact of the recurrent aspect of an activity is analogous to that of the nonrecurring aspect in that it is the difference between cost and non-governmental financing. The corresponding analogy applies to the balance of payments impact of the recurrent aspect of an activity. However, the determinants of recurrent costs, the foreign exchange component of recurrent costs, and the financial arrangements with respect to recurrent costs differ somewhat from the nonrecurring case.

Recurrent costs of an activity depend on the inputs of indigenous and expatriate labor, the material inputs into the activity, the scale of output from the activity, and the amount of capital employed in the activity (or investment programmed into the activity). With respect to the nonrecurrent or capital input, we may distinguish two cases: (a) the size and shape of the investment have been determined and possibly taken form, or (b) the investment remains to be determined. In the first case, the relationship of recurrent cost is only to output and other inputs, as the capital is relatively fixed. The needs for replacement and maintenance must be considered in determining the recurrent cost. In the second case, some trade-offs are possible between recurrent cost and nonrecurrent cost, because the projects have not yet

15/ Cost is used to mean both negative and positive elements; it includes payments and receipts with respect to the physical recurrent inputs and outputs of the activity. For private profit-making ventures, however, it may be appropriate to analyze separately the determinants of costs and receipts.

acquired their ultimate shape. While this second case is more interesting for project analysis and from the point of view of long-term development strategy, the first case is more relevant for programming of recurrent cost, because where the nonrecurrent cost is not yet fixed, it may be appropriate to analyze the recurrent cost of an activity on the basis of an assumed fixed "most-likely" investment into it.

The foreign exchange component of recurrent costs consists of required imported material inputs and imported labor services. Exports of output may provide an offset to the exhaustive foreign exchange impact of these inputs. Given the investment for the activity in question, all of these will be related closely to the output desired. Recurrent imported material inputs may be spare or replacement parts, intermediate products, or raw materials, such as gasoline or coal. In most cases, given the investment and given the output volume, the technical possibilities of substitution for such inputs will be very limited, although in time domestic production of such imported inputs may be undertaken. Consequently, for a planning period of five years it should be possible to project the recurrent material imports required by development activities with some accuracy. Expatriate labor services, on the other hand, are often largely provided through technical assistance arrangements which provide partial or entire financing for the costs involved. It is difficult to program technical assistance for long periods in advance because of recruitment problems, new international and bilateral assistance offers, and international and domestic political considerations. It is also difficult to gauge precisely the cost and financing arrangements which will arise from a given number of expatriate

technical assistants [16/] and to estimate the speed at which natives can supersede the expatriates while maintaining performance standards.

Export volume is likely to be closely related to output if a particular activity is oriented toward the external market. Export prices which were used in projection of the limits may be employed here also in order to project export value produced by an activity. For most public sector activities export earnings will be negligible. In the private sector export earnings must be considered in the context of the financial arrangements which prevail regarding these earnings.

Except for technical assistance and commodity programs made available under various financial arrangements, financing for recurring costs of many public sector activities must be entirely supplied from general budgetary funds. Thus, the entire burden of such costs falls on the budget, and the entire foreign exchange costs must be borne domestically. For other activities involving either external or non-governmental participation financial arrangements may be of a Byzantine complexity. A good example is provided by the operation of the U.S. PL 480 (Food for Peace) Program. The effects of this program have been found confusing by Congress and some less developed countries, and several analyses of these effects on both donor and recipient

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16/ With regard to expatriate experts or technicians for public sector activities, the recipient country typically must pay for housing and local transportation and often must pay a portion of the salary costs as well. For UN personnel, this may amount to US$8,000 per expert per year of direct budgetary impact. Less expert expatriates with typically greater motivation are provided through volunteer (Peace Corps) arrangements of many countries. Such personnel may involve direct inputs of US$400-$3,000 per volunteer per year.

have been offered.[17/] The distribution or attribution of the financial impacts of private sector activities may assume many forms. Distribution of cash flow through dividends or amortization is discussed in the next section, but the effects of taxes and altered prices for government purchases or sales may also have significant influence on the balance of payments and government budget.

The financial arrangements, the outputs, and the labor and material inputs thus determine the recurrent impacts (in an algebraic sense) of an activity. Unfortunately, the state of knowledge concerning the relationships among these variables is pitifully weak in most areas of the world. Even if the paucity of relevant data were overcome, there are great differences in

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17/ For example, D.R. Khatkhate, "Some Notes on the Real Effects of Foreign Surplus Disposal in Underdeveloped Economies," OJE LXXVI (1962), pp. 186-196, with C. Baringer, "Comment," and W.P. Falcon, "Further Comment" OJE VXXVII (1963) pp. 317-322, and 323-326, and D.R. Khatkhate, "Reply," OJE LXXVIII (1964), pp. 653-658, D.R. Khatkhate, "Money Supply Impact of National Currency Counterpart of Foreign Aid: An Indian Case," REStat XLV (1963) pp. 78-83; J.P. Lewis, op. cit. pp. 315-322; R.E. Asher, op. cit. pp. 10-12, 58-59. Insofar as possible, PL 480 commodities move through normal commercial channels. They are sold through wholesalers in the recipient countries and absorb local currency, which is deposited in nonconvertible accounts either owned by the recipient government or turned over to the United States. A portion of both accounts may be made available by agreement to defray U.S. administrative expenses in the recipient country. Most of the remainder of the accounts may be made available as local currency grants, loans, or disbursements for various mutually agreeable development projects. The appropriate measure of budgetary impact is the increase in central government money creation made possible by sterilization of the sales proceeds in blocked accounts, less the extent to which sales proceeds are expected to be spent for U.S. local costs. The financial impact of the program on the balance of payments consists of the foreign exchange saved from not having to purchase food imports on the world market, less the foreign exchange lost through U.S. local expenditures being paid for from local counterpart funds. The benefit of the program to the recipient country is thus the additional foreign resources it can command as a result of the commodity inflow. These resources may be in the form of investment, intermediate, or consumption goods. (These will be solely consumption goods if -- given the inflexible production structure of most underdeveloped countries -- Congress' desire that PL 480 supplement domestic good resources is carried out.

costs from country to country. Road transportation costs[18/] or school operating costs[19/] vary greatly as do manufacturing[20/] and industrial costs.

3. Debt Services

The impact on the budget and balance of payments which results from debt service payments may be attributed entirely to the financing arrangements made with respect to an activity. Two cases must be distinguished: (a) the financing arrangement has not been formalized, or the project has not yet been implemented; and (b) the financing agreement has already entered into force, and cannot be rescinded or revoked. In case (b), the debt service payments due are a general government obligation -- they can no longer be attributed to individual projects since they correspond to "sunk costs."

18/ Such costs consist in large part of wages and salaries of maintenance workers and vehicle operators, fuel, and replacement of vehicles. The relationship between benefits (which are difficult to evaluate) and maintenance inputs is not necessarily stable, nor is the division of financing between public and private (or various public) sources clearcut. This is due to the levies on gasoline and other transportation inputs and the charges made with respect to some types of services. In the less developed world, little reliable data is available on the production function of road transportation, and even relatively simple trade-offs, e.g., between road maintenance and vehicle maintenance, are not known.

19/ The recurrent costs of education within the country consist mainly of wages and salaries of the teachers and maintenance of buildings and equipment. These costs may be financed by virtually any combination of private, public, profit-making, non-profit, external, and internal sources. The foreign exchange component for this type of activity is likely to be much lo lower than for foreign study since it will mainly consist of expatriate salaries, and some portion of this may be offset by local expatriate expenditures. As long as a school is operating below capacity, its output of benefits is closely tied to recurrent inputs. The valuation of the benefits will depend on the state of demand or potential demand for the graduates of the school. The analysis required for this type of activity is typical of that required for most domestic educational, health, research, and extension activities.

20/ See e.g. P. Kilby, "Organization and Productivity in Backward Economies," OJE 76, (1962), pp. 303-310.

Consequently, such payments must be entered as a negative item in computing the limits on budgetary and foreign exchange expenditures. In case (a), on the other hand, prospective debt service payments must be taken into account in assessing the expected impact of the as yet unimplemented activity on the financial and economic limits. Let us now consider further the impacts of debt service payments which fall into case (a).

Debt service payments may be divided into three categories: government payments to domestic lenders and domestic borrowers' repayments to the government; government payments to foreign lenders; and non-governmental payments to foreign lenders.[21/] Debt transactions and resultant interest payments between the government and domestic sources of finance affect the budget adversely to the extent that the outflow of funds to the non-governmental sector may be re-lent or expended. Since the normal ex-ante assumption is that such flows will not be sterilized, the entire outflow of such debt service will normally result in a negative budgetary impact. In situations where the government (or government development bank) lends to independent (non-government) corporations,[22/] a considerable inflow to the government of debt service may take place. This, of course, will have a positive impact on the budget, provided that the payments are made from the cash flow of the corporations and are not made from additional borrowings or defaulted. No balance of payments impact arises from either one of these types of debt service payments.

21/ There are obviously additional categories which, in the present context, are irrelevant or negligible: domestic non-governmental payments to domestic non-governmental lenders, intra-governmental payments, foreign payments to domestic lenders, etc.

22/ Outside assistance may result in such lending; a U.S. Development Loan to the government of a less developed country may be re-lent to the semi-public Power Authority on terms much more difficult than those of the original loan. Thus, the domestic government acts as a financial intermediary and it, rather than the Power Authority, receives the benefit of the subsidized terms of the Development Loan.

Debt service payments made by the government to foreign lenders result in equal budgetary and balance of payments impacts. Those made by non-governmental borrowers result in only the balance of payments impact. A distinction must be drawn between foreign currency repayments and domestic currency repayments. The former almost certainly need to be considered as a potential charge against the balance of payments. The latter, however, only has a negative foreign exchange impact when the domestic currency repayments can be converted to foreign currency or used as substitutes for foreign currency inflows. Furthermore, repayments in domestic currency to foreign lenders may be sterilized so that no relending is possible.[23/] In this event, no unfavorable budgetary impact occurs.

4. Indirect Effects

The indirect impacts on the budget and on the balance of payments result from the increase in incomes (on a financial accounting) which occur from the implementation of development activities. This may be broken into two portions -- the expatriate, non-national income and the national income increase. The presence of expatriates in the country results in a substantial expenditure on their part (or for their account) for domestically produced goods and services. These "exports," which correspond to exports of goods and services to tourists, depend on the number of different classes of expatriates in the country and the budgets of these different classes. These exports represent a positive balance of payments impact (and, in the absence of full employment, income impact) and, to the extent that indirect

23/ There are many examples of financing arrangements with repayments in domestic currency under various U.S. loan and commodity programs. In some cases, fixed percentages of debt service proceeds may be used for U.S. government expenses in the domestic country. In other cases, re-lending or use can only take place under mutual bilateral agreement, thus effectively sterilizing the repayments to the extent desired by the domestic government.

taxes are involved, a positive budgetary impact. Since the number of activity-associated expatriates is likely to be highly variable, and since their income is not part of national income, it is best to treat the effect of their expenditures in the domestic economy separately as an impact on the exhaustion of the financial limits rather than incorporating it in the projection of the limits.

The national income increase (in financial terms) also has multiplier and accelerator effects which result in additional imports, additional taxes, and additional investment and income. These import, tax, and consumption multipliers are likely to differ sharply among income classes, depending, at different income levels, on marginal propensities to import, marginal incidence of taxation, and marginal propensities to consume. Analysis of the direct income effects of activities will shed light on the shares of the income increase going to different income classes. The sum of the indirect impacts of marginal expenditures and tax payments by these groups will provide an estimate of the overall multiplier relationships of the development program. If this is significantly different from the relationship posited in the projection of the financial limits referred to in section III, it may be necessary to revise these projections. Thus, in the programming procedure outlined here, the indirect impacts resulting from increases in national income would not be attributed to individual projects, nor would they be included in the total financial impacts; instead, they would be incorporated into the projections of limits on the financial expenditures.

C. Profitability Considerations

In order to gauge the profitability of any activity, one must compare the properly evaluated benefits and costs involved. In this section, we discuss some of the issues involved in the proper evaluation of these benefits

and costs. In particular, we consider discrepancies in the relative desirability of the activities to governments of developing countries and donor countries, and to private corporations or individuals. These discrepancies may stem from a different perception of benefits and costs, but even if the same costs and benefits are identified by all parties, the attribution of these is unequal and leads to differences in evaluation.

Were the contrary not often assumed, it would appear trivial to point out this difference in evaluation. The criteria of the donor countries are designed to ensure that the political and psychological benefits (and the commercial benefits on investments) which they require are, in fact, received. It is fairly clear that the recipient countries do not take the same view of these political or psychological benefits. In some cases,[24/] they have been quite prepared to forego very real economic benefits in order to avoid the political implications of the aid-relationship. If they act rationally, they seek to ensure that the benefits which accrue to them in respect to an activity outweigh the costs which are involved.

This divergence between donor and recipient evaluation has two sources -- differences in the economic values attached to inputs and outputs of the activity because of attribution and differences in relative prices, and differences in the rate of time preference. It appears plausible that differences in time preference make a higher discount rate appropriate in the less developed countries than would be the case in the donor countries. However, only when substantially different discount rates are applied to projects which have very long lives, will the differences in donor and recipient evaluations become so important that they cannot be ignored. Most projects with a positive stream of net additions to income, exceeding possible

24/ Ceylon, Burma, and Guinea come to mind.

negative benefits in the initial year or two, will have positive profitability or negative profitability for all reasonable rates of time preference. This does not mean that time preference can be ignored -- in fact, it may be a relatively important determinant of the rank ordering of projects by both donor and recipient, -- but, its effect is likely to be greatly outweighed by differences in the economic evaluation of inputs and outputs.

The proper measure of the cost of an activity to the recipient country is the output or benefits foregone by failing to use the resources employed in their most profitable -- or next most profitable -- employment. This means that activity-specific resources supplied by external sources are costless as are unemployed domestic resources, while transferable or transferred resources must be evaluated at their scarcity prices (opportunity uses) in the recipient country. These may be higher than in the donor country and, in the case of some types of workers (e.g., Peace Corpsmen), considerably higher than the financial cost of the workers either to the recipient country, or to recipient and donor country together. The cost of capital borrowed from abroad is the repayments of domestic resources which will be required in the future to repay the loan with interest. This stream of costs may be discounted by a social rate of time preference in order to arrive at a single figure which represents the present value of the investment cost.[25/] Similarly, it is clear that the cost of domestically financed investment is the value of the consumption which could have been produced had the resources employed been devoted to consumption goods production.

The present value of benefits is, similarly, obtained by discounting the stream of benefits by the social rate of time preference. The stream of

25/ It is important to stress correct treatment of prospective debt service payments of planned activities. At realistic rates of time preference in the less developed countries, some apparently attractive activities can become unprofitable if amortization is too rapid. Errors in the rate of time preference used will lead to systematic errors in the estimates of present values. Unless caution is used, these errors may become significant.

benefits derived from an activity must be evaluated on the basis of the equilibrium worth to the recipient country of the goods and services derived. Surplus food products which may be received, for example, are worth only their scarcity price c.i.f. in the ports of the recipient country, not some general world market price or the U.S. domestic price. In some cases, benefits may be produced directly by the activity; in other cases, they may be in the forms of additional availability of imports. In both cases, care must be taken to include as benefits only those outputs which actually are attributable to the country and its nationals. This requires a careful analysis of the equity and financial arrangements. For public sector activities in particular, evaluation of benefits may be difficult because output is not sold or is sold at arbitrary prices. In fields such as education, public health, communications, and transportation there is no apparent reason why benefits should be evaluated in the same manner by recipient and donor.

It seems fairly clear that different sets of relative prices in the two countries, which stem from differences in social preference functions and resource availability, as well as differences in the attribution of the costs and benefits to donor and recipient, must result, in most cases, in sharply different evaluation of the relative importance of activities. Thus, the community of interest between donor and recipient will seldom be perfect. The leverage of foreign aid results precisely from this divergence of interest, but it should not be overestimated.

If we take the entire set of possible activities prior to the time they are financed, they may be rank ordered on the basis of the welfare function of the recipient country. Some will be unprofitable, given the existing valuation of benefits and the necessity of total financing by the recipient. Some assistance may support activities which would be undertaken in any case,

and thus only serves to expand the size of the possible development program without altering its shape. In other cases, activity-specific foreign assistance, which pays part of the costs and perhaps changes the relevant price for benefits (e.g. provides a guaranteed market for output or a portion of output), may change the rank order of the aided activity and may result in previously unprofitable activities becoming highly profitable.[26/] This will shift preferences among activities in such a way that activities which would not have been included in the development program are, in fact, implemented. This latter effect, however, uses up scarce budgetary resources and possibly scarce foreign exchange in the recipient country. The lack of financial resources may then result in the exclusion from the development program of other profitable activities which otherwise would have been implemented -- thus, causing a restructuring of the development program. In other cases, the shape of the development program may be altered because of interactions among activities such that the choice of one (foreign-assisted) project lowers the benefits or increases the costs of another (otherwise profitable) activity and makes the latter activity unprofitable.

"Self-help" requirements imposed by donor countries thus force the use of complementary domestic resources by recipients. There can be little doubt that without "20 percent" or "local cost" counterpart requirements, a considerably larger volume of development activity could be undertaken.[27/] One of the most critical ways in which foreign assistance imposes burdens on

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26/ One of the reasons for project analysis is, of course, to determine the amounts of certain types of activity-specific assistance required to make projects profitable.

27/ Compare and contrast F. Benham, Economic Aid to Underdeveloped Countries (London: Oxford University Press, 1961), p. 117" ... although 'limited absorptive capacity' is a myth, in so far as any number of projects can be carried out with sufficient outside help, it remains true that a country will not 'take off' into self-sustaining economic growth unless it has the will to do so and the appropriate social conditions [including incentives]."

the finances of recipient countries is through failure to contribute more than skimpy amounts toward recurring costs of capital projects. Whether this results from design or neglect is difficult to judge; in part, it may stem from an unwillingness to be involved over long periods in the internal workings of another country. To the donor imposing his standards of profitability on activities which he assists, it is fairly obvious that only a limited number of activities will be profitable at a given time. In order to insure that these activities are profitable (which from the donor point of view is a function of donor costs and possible total output), the donor, therefore, forces the recipient country to pay part of the costs of all joint activities.[28/] Thus, the limit on the absorption of foreign assistance by the less developed countries does not result from inadequacies in the developing countries, but from restrictions on the terms of the assistance imposed by the donor countries.

For financing from private sources, whether domestic or foreign, the private profitability calculation is of course explicit, and the conditions negotiated with respect to an activity serve to provide a precise framework in which the private profits may be realized. At the same time, the social profitability should also be favorable -- otherwise, the government ought not to participate. For this sort of activity, the areas of conflict between negotiators are perhaps more clearly defined and the techniques of analysis and negotiation more developed. Thus, although private capital may typically flow into complex projects, economic analysis is better equipped to deal with the analytical problems which may result from such public-private developmental relationships.

28/ E.g. Donors, presumably for domestic political reasons, have typically demanded feasibility studies which justify the full cost of activities on the basis of recipient benefits.

V. CONCLUSION

The inter-relationships between the implementation and operation of development activities, on the one hand, and the budget and balance of payments, on the other, have been placed at the center of the foregoing analysis.

It has been argued that undertaking development activities, even when supported by private or external financing, generally results in budgetary and import requirements which limit the size of the total development program and, therewith, the size of the assistance program. These financial impacts of development activity on the budget and balance of payments of the less developed countries result from the fact that the non-governmental financing of the vast majority of development activities fails to cover the entire costs, while the external financing fails to cover the entire foreign exchange costs. Thus, the limits on absorptive capacity which have been analyzed above are, in fact, largely the product of restrictions placed on foreign assistance by donor countries and commercial negotiations between private interests and the governments of less developed countries.

This view of the relationship between external capital and absorptive capacity may be contrasted with the more usual approach in which it is assumed that development input shortages are relieved by the resources made available through capital imports. In this latter view, the externally provided resources are either a perfect substitute for, or supplement to, domestic resources, and no complementary resources need be marshalled from the domestic economy in order to make the externally provided resources effective. Earlier discussions of absorptive capacity laid stress on shortages of specific physical inputs such as skilled labor, administrative and managerial personnel, or infrastructure, and frequently argued that sufficient technical assistance

could eliminate barriers to the absorption of capital. Our approach has concentrated on the activity-specific and technically-specific nature of many of the externally provided inputs and the resultant requirements imposed on the recipient to provide complementary inputs. We have argued that in some relevant situations it is likely that financial bounds on the budget and balance of payments constrain the capacity of the recipient country to make available complementary inputs, and that these bounds -- together with a constraint that all acceptable activities have a positive impact on income -- determine the size of the development effort a country can undertake.

The implication of complementarity between public/domestic and private and/or external inputs is that the non-governmental inputs may have more leverage on the development program than is usually assumed. Complementarity means that a restructuring of the program is likely to follow from activity-specific receipts of private and/or external assistance. This effect occurs independently of any inter-industry effects of the production which may result from external assistance, although this may also be an important source of shifts in priorities among activities. Instead, it is based on shifts of profitability which result from shifts of financing. It cannot be sufficiently stressed that externally assisted activities typically preempt domestic resources which might have been used for other purposes and, in addition, that external capital is often available in such quantities that its lack of external capital does not constrain development.

All of the foregoing is not intended to deny the existence of other limits on the ability to absorb development activities. Some of these may be imposed by the recipient country, typically for political reasons. There may be restrictions imposed on the acceptability of the services of various types of experts or on the acceptability of certain forms of operating or

recurring assistance. Thus, "Africanization" or "Asianization" applied indiscriminately may retard economic progress while -- possibly -- resulting in rapid social progress. We have stressed the economic aspects of limits on absorptive capacity because we believe them to be important; yet, we do not wish to minimize the significance of social and political constraints. For some less developed countries, social and political goals transcend economic ones; and pronouncements on economic progress are used for their charismatic effect in favorably molding public opinions at home and abroad. We believe that the analysis of shortages of specific development inputs caused by xenophobic and ultra-nationalistic policies must be political, not economic.

For the planning office in the less developed country, the requirements of donors and private entrepreneurs, as well as the constraints imposed politically by his own country, must be taken as exogenous data which can be altered only through tough negotiations and which must receive due attention if planning is to be successful. In this paper, a general framework has been developed for the purpose of translating these restraints on specific activities into exhaustion of financial resources and lowering of profitability, and a general procedure has been outlined whereby the availability of such resources may be projected. We have been as broad and inclusive as possible and the framework developed may be applied to all types of development activities regardless of financing or duration. We believe that this sort of exploration of the financial relationships, which interconnect the external sector, the government sector, and the growth of the economy, lies at the heart of the development planning process. Without such a procedure the development program is likely to be inconsistent with the existing and potential constraints and, probably, it will either fail to utilize the growth potential of the economy to the fullest, or it will

overextend its resources and cause a crisis.

The data requirements for this procedure may appear to be formidable. For each activity, time-specific projections of different types of costs and benefits must be made in some detail, and an overall aggregative model must be manipulated to produce projection of aggregative financial limits. This must be done for public sector as well as private sector activities. In most countries the data for making such projections is in many cases fragmentary or of questionable accuracy. Yet, some data is preferable to none at all, and projections with a substantial variance may still yield useful policy conclusions.

The sort of information, typically lacking, is that which is essential to effective development planning. For example, research is urgently needed to develop information about the production functions of public sector activities. Very little information is available regarding the determinants of recurrent costs; yet, such costs are a crucial drain on the budgetary resources of many developing countries. Again, little is known about the requirements of activities for imported inputs, although there is general agreement regarding the grave balance of payments implications of such minimal import requirements.

While a relatively small country may have several hundred activities to program, it is likely that only ten to twenty of these will account for half to two-thirds of the impacts on budgets, foreign exchange, and income, and many of the activities will have great similarities.[1/] A careful and accurate analysis of these key activities (which are likely to include all major construction; the maintenance and operating costs of the educational system, of health facilities, and of the transportation network; and the

1/ E.g., scholarships offered by different countries -- or for different types of study -- may be treated as separate activities, yet be quite similar.

operation of major private enterprises) using current data is, therefore, sufficient to reduce the possible variance in the total impacts of all activities to a reasonable level. For a number of the minor activities relatively simple rules of thumb may be applied in the absence of precise data.[2/] It is important to attempt to include estimates -- even if based on shaky data -- of the impacts of all activities so that an order of magnitude estimate can be derived. Similarly, it is important to attempt to project the aggregative limits as accurately as possible. Then, the confrontation of limits with impacts will show whether the latter are excessively high. As data improve, both impacts and limits can be determined more precisely and their correspondence will, consequently, have to become closer.

While the procedure proposed in this paper has the merit of incorporating into the programming problem all development activity, and thus due emphasis is given to private sector activities and recurrent costs, a number of issues have been skirted. Little attention has been devoted to the problem of ranking projects by economic profitability. This has been defended on the basis of the lack of necessity for so doing.[3/] and because of the difficulties of accurately gauging economic profitability. Determining the proper prices to apply to inputs and outputs is, of course, the key problem in making a profitability analysis, but complexity of ownership and financial arrangements also cause difficulty.

2/ For example, transportation and housing provided to expatriate experts may be valued in this fashion, although, depending on the competence of the expert, these costs might vary substantially. Similarly, international transportation costs of students might be valued in this way. Road maintenance costs might also be averaged even though in less accessible areas they were higher than in relatively urban areas for the same type of highway.

3/ We do argue, however, that bad projects should be rejected and that this is typically the relevant issue in practical planning situations.

Much of the foregoing description and analysis has tacitly assumed that the complete specification of the "plan" is made at a single moment of time for a period of several years. While this is the typical theoretical approach to planning, it has little basis in the real world, where good plans must change over time and decisions must be taken sequentially. The budget (and foreign exchange budget) of the developing country represents annual decisions, but individual activities within budgetary categories may be decided upon at various times during the year and on an ad hoc basis. Sequential decision-making forces some modifications of the programming procedure advocated which do not, however, affect its essential validity. Annual budgetary decisions can be made on the basis of annual reviews of the program for the following five-year plan period, and these annual reviews will then involve the entire programming procedure outlined in this paper. Intra-annual decisions on various activities can be made within guidelines established for that purpose by the overall program of activities and by the annual, quarterly, or monthly budgetary allotments. These guidelines can establish limits on intra-annual decisions in order that the overall program should have the appropriate shape and phasing. For decisions on very large individual project proposals, which represent a significant fraction of the overall development program, an interim reappraisal of the development program may be required as an adjunct to the decision. If data on implementation are kept fairly current and annual reviews of the program are made, this should cause no real problem, although the decision may result in some significant changes in the overall structure of the development effort.

The formulation and operation of the aggregative model used for the projection of the financial limits has also not been dealt with in detail.

The space available here did not permit such a discussion, but in a number of places the necessity of an iterative approach has been stressed. Thus, it is not sufficient merely to formulate such a model and make projections, but it is necessary to compare the assumptions used in the model with the actual shape of the proposed set of activities which make up the development program. The fiscal, monetary, income, and trade effects of the development program, which have been assumed in the aggregative model, must be made consistent with actual relationships which link the entire structure of micro-economic development activities to these aggregative variables.

APPENDIX

We may formalize the accounting framework described verbally in the two preceding sections. For this purpose we require the following symbols. The prepositional subscript identifies the particular activity, while the postpositional subscript refers to the year in question. All symbols are considered to relate to a specific activity; when summed with regard to the prepositional subscripts, a set of activities or a program is being considered; and when summed with regard to the postpositional subscripts, a multi-year figure for the variable in question is obtained. The postpositional superscripts denote the type of expenditures, cost, or payment involved. If no superscript is included, the total of expenditures, payments, or increase in national income is implied. All variables are understood to be measured in financial terms unless marked by an asterisk.

LIST OF SYMBOLS[1/]

Variables

p^Z Profitability of the p'th activity.

E Budgetary Impact (Expenditures less receipts) of development activities. Impact is the net result of economic or financial interactions caused by the implementation of an activity.

V Limit on budgetary impact with respect to development activities.

BP Balance of Payments Impact (Payments less receipts) with respect to all development activities.

M Limit on balance of payments impact.

H Non-government financing with respect to development activities.

F External financing with respect to development activities.

1/ Some examples may clarify the notation: ${}_pF^N{}_t$ is the amount of external financing with respect to nonrecurring cost of the p'th project in the t'th year; ${}_pE^A{}_t$ is the amount of amortization with respect to the p'th project in the t'th year, etc.

B Domestic Borrowing of the government with respect to specific development activities.

C Cost of development activities. Cost is the total cost of implementing or operating an activity without regard to the nature of the financial arrangements.

Q Increase in national income at factor cost resulting from implementation and operation of development activities.

L Labor input of domestic workers into an activity.

L' Labor input of expatriates.

Postpositional Superscripts

Unscripted Total (net) overall appropriate superscripted elements.

D Direct impacts or increase in income.

S Indirect impacts or increase in income.

N Nonrecurring costs (investment) and impacts, financing, and coefficients related thereto.

R Recurring costs, impacts, and financing and coefficients related thereto. (Includes negative costs; i.e., receipts or benefits.)

I Interest.

A Amortization.

Y External loan financing.

* Economic rather than financial evaluation (equilibrium prices and accrual accounting rather than market prices and cost accounting).

Prepositional Subscripts

p Any activity.

P The last or marginal activity of all development activities, the total number of development activities.

Postpositional Subscripts

t Any year (generally within the planning period).

T The final year in the planning period.

m The year in which operation (recurring cost) of a project commences.

k The year in which amortization grace terminates.

n The year in which amortization is completed.

g The year in which nonrecurring cost terminates.

Parameters or Coefficients

r The rate of time preference in the recipient country.

ψ The interest rate on borrowed funds for a project.

e The propensity to create government revenue from externally financed expatriates' expenditures in the local economy.

B^F A coefficient relating activity-associated expatriates' local expenditures to the number of such expatriates.

λ^N The proportion of nonrecurring cost which consists of imports.

λ^R A function relating the recurrent imports of an activity to other variables such as output and specific inputs.

α The proportion of externally financed loans repayable in foreign (hard) currency, modified to the extent to which loan repayments in domestic currency substitute for foreign currency disbursements.

We may express the financial limits in the following manner:

(1) $$\sum_{p=1}^{P} {}^pE_t \leq V_t \qquad \text{for } t \leq T$$

(2) $$\sum_{p=1}^{P} {}^pBP_t \leq M_t \qquad \text{for } t \leq T$$

For each year of the planning period the sum of the impacts of the set of development activities, P, on the budget and balance of payments must not

exceed V_t and M_t respectively. The profitability criterion may be expressed as f as follows:

$$(3)\quad {}_pZ = \sum_{p=1}^{P} \sum_{t=1}^{\infty} [({}_pQ^*_t - {}_pC^*_t)\ (1+r)^t] - \sum_{p=1}^{P-1} \sum_{t=1}^{\infty} [({}_pQ^*_t - {}_pC^*_t)\ (1+r)^t] \quad > 0$$

The economically evaluated increase of output resulting from implementation of the p'th activity must exceed the corresponding economically evaluated input increase when both are appropria ely discounted. The inputs must be evaluated on the basis of opportunity costs <u>to the recipient</u> country. The activity-specific inputs financed externally are thus available at zero economic cost.

In order that the direct impacts of an activity may reflect the changes in government finance and balance of payments -- which occur not only from operation of the activity itself, but also from changes in the costs and benefits of other projects -- we define cost of an activity in what follows to include measurable changes in the prices of, or quantities of, outputs and inputs of other activities which result from the nonrecurring or recurring aspects of the p'th activity. Interdependence of financing for activities has been discussed in a general context. Specific interdependencies, particularly where a positive relationship exists between the financing for two or more activities,[2/] may have to be incorporated into the definition of financing for each activity. Thss, the treatment of such specific financial interdependencies would be analogous to that of costs.[3/]

Nonrecurring budgetary impact is the difference between nonrecurring cost and non-governmental financing of such cost. It does not appear useful

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2/ For example, only if activity "a" is implemented with donor B's assistance will donor B also provide finance for activities "c" and "d"; equally, assistance of B for activity "c" might be conditional on assistance of C for activity "c" and activity "d."

3/ By appropriately defining an activity we may minimize such interdependencies.

to attempt to specify more precisely the functional dependence of E^N.

(4) $${}_pE^N_t = {}_pC^N_t - {}_pH^N_t$$

Recurring budgetary impact may similarly be expressed as the difference between recurring cost and non-government financing with respect to recurring cost. Further, the cost function may be generally defined in relation to investment (past and present) in the activity, the desired output from the activity in the year in question, and the labor inputs into the activity.

(5) $${}_pE^R_t = {}_pC^R_t - {}_pH^R_t = {}_pE^R({}_pE^N, {}_pQ^D_t, {}_pL'_t) - {}_pH^R_t; \quad t \geq m$$

Direct budgetary impact of receipts may similarly be related to investment and output for the p'th activity. We assume it to be included in equation (5) as a negative cost.

Equations (6a) through (6d) formalize the relationship of the amortization and interest payment to the amount of borrowed financing for the p'th project. Under various conditions (loans repaid, grace period, grant financing), debt service payments are zero (equations (6a) and (6c)). Otherwise, we have assumed that loans are amortized in equal installments, and interest is paid at a constant rate on the balance of unamortized borrowings. An assumption has also been incorporated that the grace periods and amortization periods of foreign and domestic borrowings for the p'th activity coincide.

(6a) $${}_pE^A_t = 0; \qquad t \leq k,\ t > n, \text{ or aid granted}$$

(6b) $${}_pE^A_t = \sum_{t=0}^{g} \left(\frac{{}_pF^Y_t + {}_pB_t}{n-k}\right); \qquad k < t \leq n, \text{ aid lent}$$

(6c) $${}_pE^I_t = 0; \qquad t > n, \text{ or aid granted}$$

(6d) $${}_pE^I_t = \psi\left[({}_pE^A_t)(n-k) - \sum_{t=0}^{t-1} {}_pE^A_t \right]; \quad t \leq n, \text{ aid lent}$$

If domestic borrowed funds are available at different interest rates from foreign funds, the weighted average of the interest rates should be used for ψ. In practice, actual debt service schedules for activities which are already financed are known with some accuracy, and projections of debt service can be made without the use of such a formalized functional relationship. This is useful because financing arrangements may readily deviate from those assumed in equations (6b) and (6d).

(7) $${}_pE^S_t = e^F(\beta^F({}_pL'_t))$$

β^F is a functional relationship which subsumes two separate but interconnected economic relations: (1) the income per expatriate associated with the activity and (2) the average local expenditure/income ratio (including expenditures on housing or transportation which may be supplied free to the expatriate). e^F is the revenue/local expenditure ratio. Thus, the indirect budgetary impact is dependent on the number of expatriates associated with the activity, and it will have a positive impact on the budget.

(8) $$E_t = \sum_{p=1}^{P} {}_pE_t = \sum_{p=1}^{P} ({}_pE^N_t + {}_pE^R_t + {}_pE^I_t + {}_pE^A_t + {}_pE^S_t)$$

The balance of payments impact may be accounted for in an analogous manner.

(9) $${}_pBP^N_t = {}_p\lambda^N({}_pC^N_t) - {}_pF^N_t$$

(10) $${}_pBP^R_t = {}_p\lambda^R[({}_pBP^N + {}_pF^N), {}_pQ^D_t, {}_pL'_t] - {}_pF^R_t; \quad t \geq m$$

(11a) $${}_pBP^A_t = 0; \quad t \leq k, \ t > n, \text{ or aid granted}$$

(11b) $${}_pBP^A_t = \alpha \sum_{t=0}^{g} ({}_pY_t); \quad k < t \leq n, \text{ aid lent}$$

(11c) $_pBP_t^I = 0; \quad t > n$, or aid granted

(11d) $_pBP_t^I = \psi\alpha[_pBP_t^A(n-k) - \sum_{t=0}^{T-1} {}_pBP_t^A]; \quad t \leq n$, aid lent

Nonrecurring balance of payments impact (equation (9)) is the difference between the imported component of cost (which is assumed to bear a constant ratio to total cost in each of the years in which such cost occurs) and the external financing provided. For recurring balance of payments impact, equation (10) expresses this as the difference between the imported component of recurring cost and the external financing provided. In addition, the import component of recurring cost is specified as a function of the imported component of nonrecurring cost, the output from the activity, and the number of expatriates involved. Equations (11a) - (11d) specify external debt service as a function of the external borrowing for the activity. These equations are the same as (6a) - (6d) with the substitution of external borrowing for total borrowing and the addition of α. α is the proportion of external loans which is repayable in foreign (hard) currency, modified to the extent to which loans repayable in domestic currency substitute for foreign currency disbursements.4/

Indirect balance of payments impact is dependent on the expenditures made by activity-associated expatriates in the local economy.

(12) $_pBP_t^S = \beta^F(_pL'_t)$

(13) $\sum_{p=1}^{P} {}_pBP_t = \sum_{p=1}^{P} ({}_pBP_t^N + {}_pBP^R + {}_pBP_t^I + {}_pBP_t^A + {}_pBP_t^S)$

The total balance of payments is the sum of the nonrecurring, recurring, interest, amortization, and indirect impacts. This completes the framework.

4/ Payments made in domestic currency may be made available (as in the case of PL 480 generated funds) in part to pay for normal expenses of the donor country in the recipient country. Thus, they substitute for foreign exchange earnings. Of course, repayments abroad may facilitate new loans or repayments domestically may make possible capital export. These possible effects are neglected here.