



BROOKINGS STAFF PAPER

Absorptive Capacity

The Concept and Its Determinants

JOHN H. ADLER

June 1965

THE BROOKINGS INSTITUTION WASHINGTON DC

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The Brookings Institution
Washington, D. C.
June 1965

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THE BROOKINGS INSTITUTION
Published June 1965
Library of Congress Catalog Card Number 65-24353

FOREWORD

The term "absorptive capacity" appears frequently in current discussions of economic development and foreign aid. It refers to the total amount of capital, or the amount of foreign capital, or the amount of foreign aid (capital plus technical assistance) that a developing country can use productively. Thus it means different things to different people, who may also have in mind different concepts of productivity and different time spans.

Clarification of the concept is needed. Policymakers and others are beginning to take positions on whether the absorptive capacity of the less developed countries exceeds by a wide margin the resources available to them, implying a need for larger foreign aid programs, or whether the apparent dearth of "good projects" that qualify for foreign financial support implies that the resources already available for development assistance exceed the absorptive capacity of the developing countries.

As the author of this study says, his purpose is to inquire into the meaning of the concept of absorptive capacity, to determine its usefulness for policy purposes, both for the developing countries and the national and international sources of capital potentially available to them, and to discuss factors determining the limits of absorptive capacity. The result is the most searching analysis yet made of an important concept that has been used rather uncritically in the past.

The study arises out of a request to the Brookings Institution in the late spring of 1964 to initiate some research on "absorptive capacity." An informal working group of representatives of the Agency for International Development, the World Bank, the Inter-American Development Bank, and Senior Staffs of the Division of Economic Studies and of Foreign Policy Studies at Brookings was convened under the Chairmanship of Robert E. Asher. The first step, it was agreed, would be to have a technically qualified economist explore the concept and seek to breathe some meaning into it. This, Dr. John H. Adler, Director of the Economic Development Institute of the World Bank and author and co-author of various books and articles in the field of international economics, has now done.

Dr. Adler's work represents a labor of love. The Brookings Institution is pleased to include it in the Staff Paper Series as the first result of the work initiated last spring. Although not a member of the Brookings Staff, the author has frequently served as a consultant to Brookings or as a member of one of its advisory committees. The Institution is deeply grateful to him for volunteering to undertake the present assignment and to the World Bank for enabling him to add this task to his many other duties.

The Institution is also grateful to the informal working group composed of Dragoslav Avramovic of the World Bank, Hollis B. Chenery and Lester E. Gordon, then of the Agency for International Development, Jose Epstein and James A. Lynn of the Inter-American Development Bank, Harvey Perloff, then of the Alliance-for-Progress Committee of Nine, and Edward F. Denison, Richard Goode, Joseph Grunwald, H. Field Haviland, Jr., and Walter S. Salant of the Brookings Institution. The views expressed in the paper are, of course, those of the author and do not necessarily reflect those of the officers or staffs of the Brookings Institution, the World Bank, or the members of the working group.

The author wishes to express his special gratitude to Robert E. Asher, George Baldwin, Edward S. Mason, and Louis J. Walinsky, as well as to the members of the working group, for having helped him to avoid some errors and for suggesting improvements in the paper. He wishes also to acknowledge with thanks the assistance of Mr. Muhammad Yaqub of Princeton University.

Robert D. Calkins
President

June 1965

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ABSORPTIVE CAPACITY: THE CONCEPT AND ITS DETERMINANTS

Introduction

The recent literature on economic development and foreign aid is full of references to absorptive capacity. It is defined by one source as setting "a limit to the amount of efficient investment physically possible ... particularly in the short run."¹ In this quotation--and in many other references²--it is implied that absorptive capacity is a well-defined concept with an established technical meaning, like "supply," "demand," or "the propensity to import," and therefore need not be explained or analyzed any further. This is unfortunately not the case.

The purpose of the paper is to inquire into the meaning of absorptive capacity, to determine its usefulness for purposes of policy, for both the developing countries and the national and international sources of capital potentially available to them and to discuss the factors which determine the limits of absorptive capacity.

Measurement of Absorptive Capacity

Although references to absorptive capacity occasionally convey the idea that there is an absolute limit to the amount of capital that can be used, most economists recognize, explicitly or implicitly, that the measurement of absorptive capacity must be somehow related to the

¹U.N. Economic Commission for Asia and the Far East, Programming Techniques for Economic Development (1960), pp. 8-13. Quoted in Gerald M. Meier, Leading Issues in Development Economics (1964), p. 93.

²P. N. Rosenstein-Rodan, "International Aid for Underdeveloped Countries," The Review of Economics and Statistics (May 1961), pp. 107-9. A. O. Hirschman, The Strategy of Economic Development, (1958), pp. 37-8. G. M. Meier, International Trade and Development (1963), pp. 90-92. F. Benham, Economic Aid to Underdeveloped Countries (London, 1961), pp. 115-17. B. K. Nehru, "Foreign Aid from the Viewpoint of Recipient Countries," Proceedings of the Academy of Political Science (January 1962), p. 59.

"productivity" or "effectiveness" of capital.³ At first glance this is nothing other than Keynes's "marginal efficiency of capital." Absorptive capacity thus becomes a schedule relating an amount of capital to be invested to the expected rate of return.⁴ The lower the rate of return on capital which the "investor"--the economic unit making an investment decision--is willing to accept as satisfactory, the higher the absorptive capacity.

In the conceivable but unlikely event that there is an absolute limit to absorptive capacity, the marginal efficiency of capital function, with capital measured along the horizontal and the rate of return along the vertical axis, becomes a vertical line. (ABX in Chart 1.) This shape of the return on capital function is unlikely because it implies that beyond a certain level of investment (OX) there is not a single investment opportunity which would yield a positive rate of return.

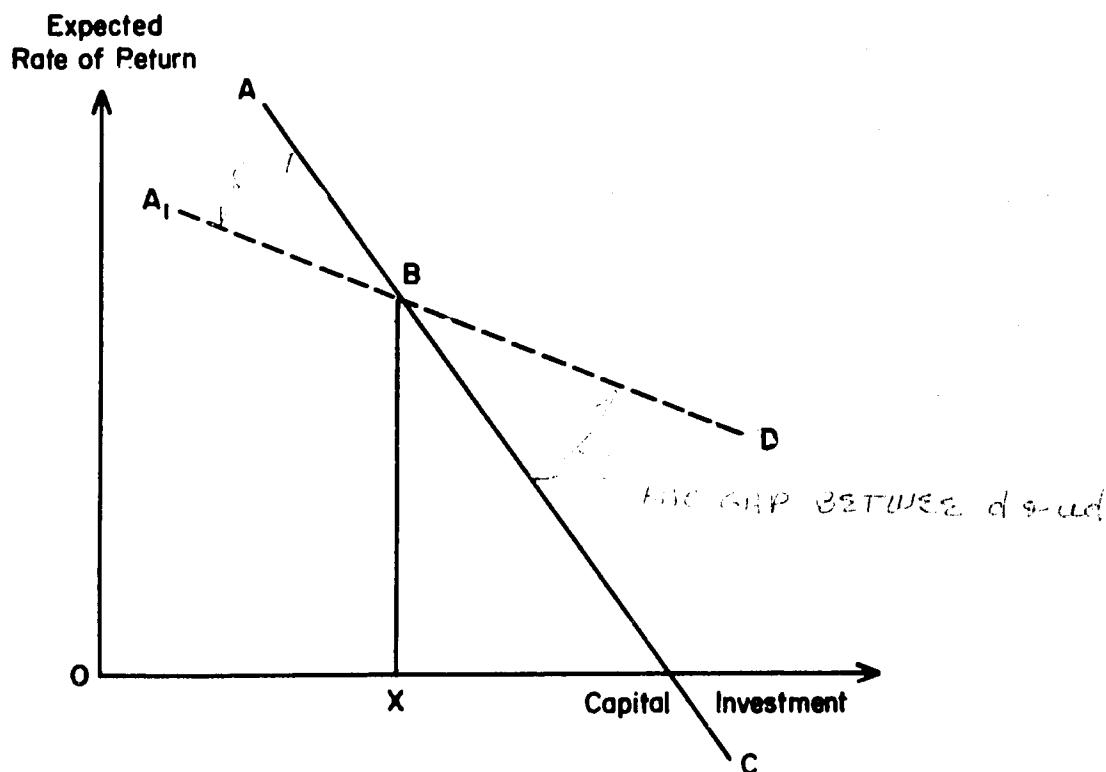
The more normal shape of the expected return on capital function is that of lines ABC or A₁BD. There are reasons to think, however, that line ABC is more typical for less developed countries than line A₁BD, which may be taken to reflect conditions prevailing in advanced countries. There is circumstantial and some direct empirical evidence that in less

³"There may be a limit to how much foreign investment can be effectively used when the investment must not only cover its cost but also yield a reasonable increase in income." G. M. Meier, International Trade and Development (1963), p. 90. "Millikan and Rostow have proposed that the developed countries of the world should make available to underdeveloped countries as much capital as they can absorb by which they mean as much as can, with reasonable assurance, be productively used." C. P. Kindleberger, Economic Development (1958), p. 263.

⁴Keynes defines the marginal efficiency of capital as "equal to that rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price." J. M. Keynes, The General Theory of Employment, Interest, and Money (1936), p. 135. This definition is essentially the same as what has more recently been called the "internal rate of return" which is the discount rate at which the flow of total cost, including initial capital cost, replacement and recurrent cost is equal to the flow of total receipts (plus the terminal value of the capital asset). See Joel Dean, "Measuring the Productivity of Capital," Harvard Business Review (January-February 1954), pp. 120-30; J. G. McLean, "How to Evaluate New Capital Investments," Harvard Business Review, (November-December 1958), pp. 59-69.

developed countries the return on the existing stock of capital is high and that it is reasonable, therefore, to conclude that the expected rate of return on some additional investment also is high.⁵ The evidence is the larger share of profits, rents and interest receipts in the national

Chart I - Absorptive Capacity



⁵The presumption that, in view of the high rate of return on existing capital, the return on some additional investment will also be high is even more plausible if it refers to gross rather than net investment, since gross investment includes the replenishment of the high-yielding stock of capital.

product of many less developed countries and the high rates of interest charged by noninstitutional lenders.⁶

On the other hand, the limitations on absorptive capacity, the scarcity of projects on which a high rate of return can be expected, is reflected in the steep slope of the return on capital functions. In developed countries, where absorptive capacity though not unlimited does not appear to pose a practical problem, the expected return on capital declines rather gently. Thus the problem for policy which limited absorptive capacity creates may be presented graphically as the "gap" between lines BC and BD. The objective of policy can be represented as an attempt to move the return on capital function from BC to BD. The gap closes if the supply elasticities of co-operant factors (the elements complementary to capital, such as a work force with the

⁶On return on the stock of capital, Simon Kuznets writes, "...whatever the Y for the developed countries [the yield rate on wealth other than the equity of unincorporated enterprises] there is little question that in the underdeveloped countries, at least on assets other than the equity of unincorporated enterprises, it is much higher....Even if we include, as we should, the possibly lower rates of yield reflected in the income of government enterprises and gross corporate savings, it seems reasonable to assume that the weighted yield rate in underdeveloped countries is at least twice as high as that in developed countries. If we set the latter at 7 percent, we may set the former at 14 percent." "Quantitative Aspects of the Economic Growth of Nations: IV. Distribution of National Income by Factor Shares," Economic Development and Cultural Change (April 1959), p. 20.

"For India we have a recent effort to approximate a distribution of the national income between income from assets and other components. According to Mr. Patel's calculation the share of income from assets in India is 23.3 percent. Mr. Gulati's revision would bring the share down to 19.6 percent. Another item of evidence can be found in some data for Mexico. Of net domestic product at factor cost the share of profits (after allowance for imputed earnings of the self-employed), rent and interest rose from 34.5 percent in 1939 to 47.4 percent in 1950." Ibid., p. 12.

On interest rates charged by noninstitutional lenders, see U Tun Wai, "Interest Rates Outside the Organized Money Markets of Underdeveloped Countries," IMF Staff Papers (November 1957), pp. 99-100. Rates of 23 percent to 94 percent are mentioned for India, 10.6 percent to 45.8 percent for Ceylon, and 8.5 percent to 44.7 percent for Thailand.

appropriate skills) in less developed countries are increased to the level prevailing in developed countries.

Absorptive capacity may then be defined as that amount of investment, or that rate of gross domestic investment expressed as a proportion of GNP, that can be made at an acceptable rate of return, with the supply of co-operant factors considered as given.⁷ This is not to say that the investor, or the investing authority, would not attempt to increase the supply of co-operant factors. But, in the short run, this increase is either a physical impossibility or is so costly that it increases sharply the total cost of investment or the total operating cost, and thereby reduces the return on capital below the acceptable rate.

Alternative Definitions

The preceding definition does not specify the acceptable rate of return and does not distinguish between the rate of return on domestic and foreign capital. The suggestion that for every economy there exists a threshold or cut-off rate which is the border between what is considered an acceptable and an unacceptable return, may be challenged. It is held that, given international differences in the supply of capital in relation to co-operant factors, the acceptable rate of return on foreign-owned capital may be lower than the acceptable rate of return on domestic investment. Foreign investors may be willing to invest in a country because the expected rate of return is better than the rate which they could earn at home even if it is lower than that considered acceptable by domestic investors in the capital-receiving country.

The existence of a difference between rates of return which investors of capital-exporting countries expect in capital-importing countries and rates which they can expect at home is an essential part of the theory of international capital movements. But the theory only stipulates a difference between the rates of return in the capital-exporting

⁷E. S. Mason has used the term "socially acceptable discount rate" for this rate. "On the Appropriate Size of a Development Program," Occasional Papers in International Affairs, (Center for International Affairs, Harvard University, 1964), No. 8, p. 1. On the time dimension of absorptive capacity, see pp. 36-38.

and the capital-importing countries; it says, or implies, nothing about a difference between the rate of return earned by foreign investors and the rate obtained by the domestic investors in the capital-importing countries. On the contrary, with appropriate assumptions regarding the fungibility of funds, freedom of capital movements, appropriate risk premiums, and so on, the effect of capital inflows would be to reduce the rate of return on all capital to that prevailing in the capital-exporting country. But presumably long before this happy state of equilibrium is reached, the difference between the rate of return on capital of domestic origin and of foreign ownership would be reduced or eliminated altogether.⁸

The difference between rates of return on capital in capital-exporting and in capital-importing countries, as reflected in long-term rates of interest, is presumably the basis for the proposition that using foreign capital to finance investment is justified even if the return falls below the rate acceptable in the capital-importing country. Specifically, an Operational Manual of the U.S. Agency for International Development concerned with the selection of projects in aid-receiving countries proposes that, in the determination of the benefit-cost ratio of a project, an interest rate of 3-1/2 percent should be applied to the foreign cost. Local interest rates should be applied to the domestic cost of the project or, if an accurate rate cannot be determined, a rate of 6 percent should be used.⁹ Apparently the minimum permissible rate of return on domestic

⁸In practice, however, it is more likely that a difference between rates of return on foreign and on domestic investment continues to exist indefinitely--because of the selectiveness of foreign capital with regard to investment opportunities and the extent to which foreign capital can overcome the scarcity of co-operant factors by importing them. Depending on the latter and a variety of other factors, the rate of return on foreign investment may be smaller or larger than that obtained on domestic investment in the capital-importing country.

⁹"For A.I.D. benefit-cost evaluations an interest rate of 3-1/2 percent is established for amortizing U.S. dollar costs ... the above rate is applicable only to the U.S. dollar portion of project installation costs. The local cost of project installation and the cost of future additions or replacements are to be treated on the basis of the local interest rates....In cases where local rates are unreasonably high or low or where an accurate rate cannot be determined the rate of 6 percent per annum will be used." Department of State, Agency for International Development, Office of Engineering, Benefit-Cost Evaluations as Applied to Aid Financed Water or Related Land Use Projects, Supplement No. 1 to Feasibility Studies, Economic and Technical Soundness Analysis, Capital Projects, (1964), pp. 4-5.

capital is 6 percent but only 3-1/2 percent is required on capital provided by A.I.D.¹⁰

Whatever the political justification for this rule may be, its economic rationale is doubtful. It presupposes that: (a) a project suitable for partial financing by foreign aid with a rate of return at or above the cut-off rate cannot be developed because (b) the supply of co-operant factors cannot be increased in the short run, but (c) the undertaking of the project itself will somehow stimulate the supply of the deficient co-operant factors, and (d) that this cannot be brought forth by any other method, such as import or technical assistance. Only if these four conditions obtain is accepting a lower rate of return on the foreign-financed portion of an investment justified on economic grounds, as distinct from political or humanitarian grounds. Grants or loans on concessional terms may be in order if their chief, or sole, purpose is to raise consumption or curtail unemployment (as one of the causes of an intolerably low level of consumption); but then the decision is not based upon the most economic allocation of resources.

It should be emphasized that the possibilities for increasing the supply of the co-operant factors which will eventually increase the rate of return may be an adequate reason for accepting a lower rate of return initially. However, this would follow only if a discounted cash flow analysis covering the entire life span of the project shows that the internal rate of return is at or above the cut-off rate. In that event the project is "good," and what is bad, or inadequate, is the cost-benefit analysis which does not permit systematic and rational determination of the rate of return allowing for the lapse of time.¹¹

¹⁰The text of the Manual, by proposing to apply a discount rate of 6 percent on all "domestic" benefits however comes--presumably inadvertently--to the opposite result of what it intended to do: by applying a lower interest rate on foreign cost than on benefits it has an adverse effect on cost-benefit ratios, especially if the foreign cost accounts for a larger proportion of total cost. It is understood that the Manual is being revised.

¹¹Alternatively, the project may be promoted on the ground that the supply of co-operant factors which it stimulates benefits the economy as a whole. This would constitute an example of heavy, not to say excessive, reliance on the development of external economies. See pp. 21-22.

But leaving aside this rather unlikely possibility, the willingness to consider that projects with such a low expected rate of return are qualified for foreign assistance is based on a pessimistic appraisal regarding (a) the possibility of identifying projects with a higher rate of return, or (b) the possibility of improving the supply of co-operant factors. The difficulty of finding a better project implies some sort of disequilibrium between the minimum acceptable rate of return and the "objective" availability of investment opportunities. And the pessimism regarding the supply of co-operant factors implies that domestic efforts or technical assistance to increase the supply are of no or little immediate avail. This twofold pessimism may be justified in exceptional circumstances; but it certainly goes too far to make it the basis for the general rule that projects with an expected rate of return below the cut-off rate are justified for foreign financing.

Still another definition of absorptive capacity is implied in an attempt to measure absorptive capacity by the observed increase in total investment "that can be carried out at an acceptable minimum level of productivity" over a certain period.¹² Thus it is claimed that a country's absorptive capacity may be considered as increasing if gross domestic investment has grown by, say, 10 percent one year to the next, or by 20 or 25 percent over a five-year period. Unfortunately, the apparent simplicity of this method of measuring absorptive capacity is more than offset by all the uncertainty which afflicts it. The rate of gross domestic investment may have increased because the economy managed to generate more savings for a variety of reasons or because more foreign capital or foreign aid has become available.

Moreover, the assumption that new investment can be carried out at an "acceptable" minimum level of productivity is apparently based on the observed relation of investment and output in the past. But this does not necessarily tell us anything about absorptive capacity. Investment may have been undertaken which was mistaken in the sense that it resulted in a return below the acceptable rate, while the increase

¹²Hollis B. Chenery, Foreign Assistance and Economic Development, Policy Discussion Paper No. 7, [U.S.] Agency for International Development, (1964).

in output--the "productivity" in the preceding quotation--was causally not related to the investment. And the true absorptive capacity--the amount of investment expected to yield an acceptable rate of return--may not have increased at all.

Capital, Return, and Project Defined

Capital, rate of return, and investment projects are necessary concepts in determining absorptive capacity. To begin, it may be useful to stress that the capital on which a return is expected is total capital, not merely equity capital. From the standpoint of the economy there is, of course, no difference between equity and loan capital. Both types of capital represent the financial counterpart to real resources which are to be productively employed. Leaving aside the admittedly bothersome question of external economies and diseconomies, the expected return on total investment for the economy as a whole is equal to the sum total of the expected return on all individual investment projects. The aggregate rate of return is the ratio of total returns to total investments.

To determine the expected rate of return on capital invested in a private investment project is a rather simple accounting exercise--if one disregards at this point the difficulties of forecasting capital cost, replacement cost, and prices prevailing in the factor and product market.¹³ The situation does not change materially for a revenue-producing project in the public sector. Other things being equal, it should not make any difference whether a steel mill or a railroad is in the public or the private sector.

The matter becomes somewhat more complicated in the case of projects that are not self-liquidating or that yield benefits (additional income) to an economic unit other than the investor. In the case of a highway for the use of which no toll charges are levied, the construction cost (and maintenance) are a burden on the government while the benefits (such as time saved, decrease in wear and tear on vehicles, and increases in the value of land made more accessible by the highway) accrue in the

¹³The problem of uncertainty inherent in project evaluation is discussed later, pp. 17-18.

first instance to the highway users and other beneficiaries. True, the government may "charge" for the highway investment through gasoline taxes, motor vehicle licenses, and special assessments on increases in real estate values; but, as a matter of economic or social policy, it usually will not want to recover more than the investment cost and some return on capital (usually reflecting interest charges on public borrowings); in many instances it may have to settle for less. In almost any case, a part of the return on capital accrues to the public. But even then, the return on the highway investment--in that case more appropriately called the social return--must include the properly evaluated benefits derived by all beneficiaries.

If the benefits exceed the charges levied on the beneficiaries, these excess benefits may be considered "external economies." For practical purposes, however, it may be preferable to reserve the term external economies for benefits which are so widely diffused that the beneficiaries cannot be readily identified and treating as part of the return benefits for which the economic units that "internalize"¹⁴ them can be identified.

The significance of this observation becomes clearer when it is realized that determining the rate of return (and of absorptive capacity at a given rate of return) depends very much on the "definition" or "delineation" of any specific investment project and on the causal relationship that can be established between a given investment and the increase in output (or decrease in cost) that is associated with it.

To illustrate the problem of defining a project one may think of an irrigation project that increases the supply of water to a large number of farmers on whom water charges giving a rate of return of, say, 6 percent on the irrigation investment are levied. But the 6 percent rate of return may have nothing to do with the economic rate of return of the project if the increased supply of water makes possible a substantial increase in the farmers' production. In this case the return on the project is not the increased supply of water (or the water charges levied to produce a 6 percent return) but the value of the increased agricultural production

¹⁴ The term was first used by A. O. Hirschman in The Strategy of Economic Development, (1958), p. 57.

minus the cost of the additional inputs, including the value of the farmers' additional work effort.¹⁵ Then the project is no longer defined as the irrigation works producing water but the irrigation work plus all other agricultural production improvements producing additional crops.

This integrated definition of a project which takes account of forward linkages (or backward linkages, as the case may be) must not be carried too far. There is obviously a difference between an irrigation project and a steel mill which is to produce intermediate products such as billets, shapes, and sheets. If the parallel of the irrigation project were to apply, the appraisal--and the determination of the rate of return--of the steel mill project would also have to take into account the changes (of receipts, expenditures, and the rate of return) occurring in the steel-using enterprises such as automobile plants, foundries, and razor blade factories. This would make little or no sense. It is obviously more appropriate to determine the rate of return on the steel mill investment on the basis of a comparison of the (properly discounted) revenues and expenditures, including capital expenditures, of the steel mill itself and to "cut off" the project at the factor and product markets in which the inputs are purchased and the outputs are sold.

The difference between the irrigation project and the steel mill project should now be clear: the products of the steel mill are sold in an open market in which prices and the volume of demand are determined by competitive forces (which however may be restricted by policy intervention and direct controls). In the case of the irrigation project the market is not open in any meaningful sense. It is conceivable, though not likely, that irrigation water will be sold to the highest bidders; but in all except the most unusual circumstances the price of water is fixed by public intervention and frequently individual farmers obtain (and are charged for) water whether they want it or not.

The presence or absence of a reasonably well-functioning market is important not only for defining a project but also for determining the rate of return and thus the absorptive capacity. This is particularly important in certain types of public investments where problems of

¹⁵Which may, however, be zero if the opportunity cost of this additional work effort is zero.

indivisibilities or complementarities exist. For example, a hydroelectric power project cannot be easily developed in several small stages for technical reasons, but a high rate of return can be assured for it only if a large amount of electric energy is immediately utilized (for example, the Volta project in Ghana). In this case, the market demand for electric energy will have to be supplemented by the demand resulting from investment in power-using industries, such as aluminum; for determining the rate of return and the absorptive capacity, the project must thus be redefined to embrace both power generation and aluminum production.

Similarly, with a farm-to-market road designed to open up, or make more accessible, an agricultural area, it is not enough to appraise the road project on the basis of the expected volume of traffic and to estimate the expected return on the capital invested in it. It is preferable to include also the capital and other outlays required to increase agricultural output in the area to be served and to relate these outlays to the expected increases in receipts from increased agricultural production. The integrated delineation of the project is particularly appropriate if there are reasons to doubt that the farmers near the road project will respond to the new economic opportunities of cheaper transportation. They may wish to respond but not have available the means of financing capital investment and other expenditures prerequisite to increased production. It may be essential, and not just preferable, to consider the transportation and agricultural production projects as one if the doubts regarding the automatic responses of the farmers to the new production opportunities can be resolved only by the public authorities taking on the responsibility for developing plans for increasing agricultural production and for supporting it by technical assistance, credit facilities, etc.

The preceding observations indicate that there is a close connection between the validity of the rate of return as an indication of absorptive capacity on the one hand and the existence of markets with a responsiveness by individual economic units to market opportunities and market incentives on the other. There is more discussion of this subject later. At this point, it may be useful to add that it follows that a meaningful assessment of absorptive capacity, based on an estimate of the expected rate of return on specific projects, becomes the more difficult and complex the more limited the development of markets and responses to markets.

This difficulty may be faced in economies where markets are deficient and the response to market forces is underdeveloped or impeded by institutions or controls or in sectors of economies where these conditions prevail, as in subsistence agriculture. Absorptive capacity, based on an appraisal of narrowly defined projects, may appear to be low, or, at any rate, lower than a more comprehensive assessment of absorptive capacity may indicate. In such "primitive" circumstances the interaction of individual projects with the rest of the economy cannot be left to imperfectly functioning markets. It must be brought about consciously by providing for the coordination and joint implementation of several projects. Or, more generally, the pattern of investment is itself a prime determinant of absorptive capacity. This is so because the pattern is brought about by the response of the economy to opportunities and incentives, or, if these forces are weak or weakened by institutional constraints, by coordination and planning.

In the graphic presentation of Chart I, this means that the position of line ABC is not unique. It refers only to a particular pattern of investment, or investment plans, and that with another set of investment plans the line may shift to the right or left and its slope may be changed. To recognize this problem unfortunately does not solve the innumerable practical difficulties besetting the comprehensive programming approach which this suggests. And it does not do away with the limitations of absorptive capacity. It is not enough to realize that the success (a satisfactory return) of project A depends on the simultaneous or subsequent carrying out of project B--if lack of technical knowledge, inadequate administrative competence, or simply paucity of information threatens the viability of project B.

Complementarity and Indivisibility

References to complementarity and indivisibility and to the need for joint appraisals lead to the conclusions that with these factors present it may happen that the rates of return on new investment--and therefore the absorptive capacity of the economy--are smaller for a smaller amount of proposed investment than for a larger amount. Chart II may be taken to illustrate either the power-with-aluminum or the irrigation-with-agricultural investment case. A given volume and pattern of intended investment including the power project gives a return r_1 on capital

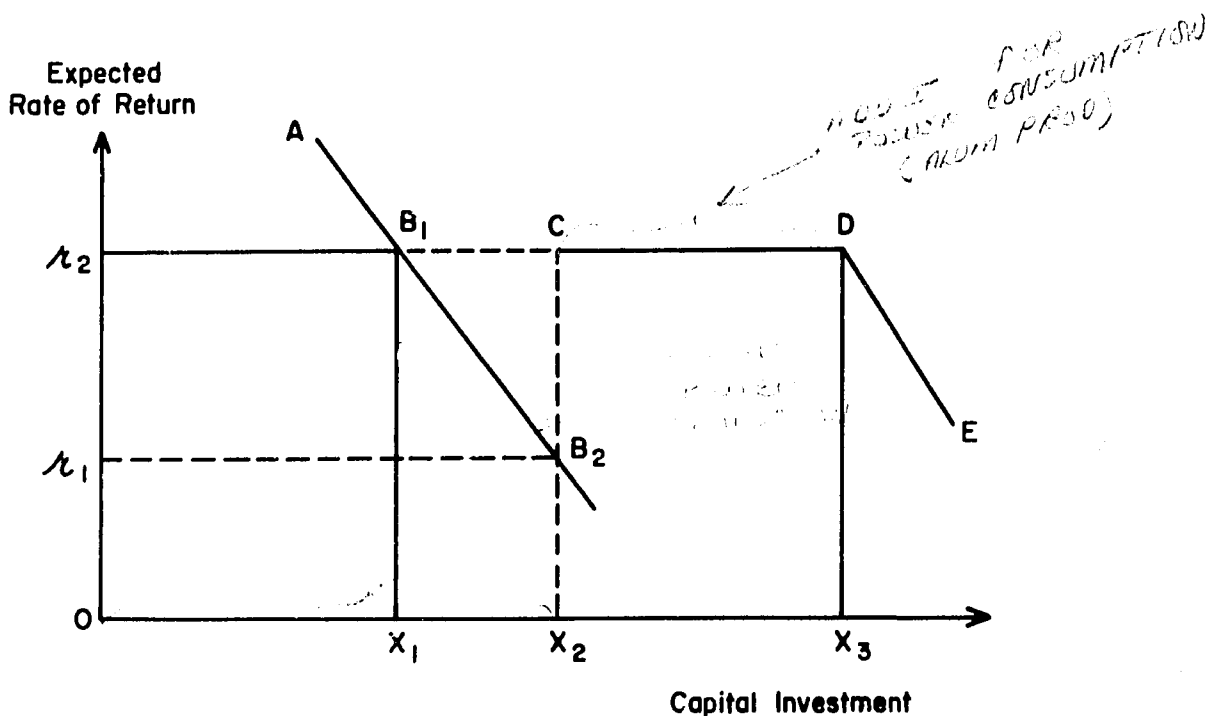
function AB_1B_2 . Return r_1 , corresponding to an aggregate intended investment of OX_2 may be below the rate which the economy is willing to accept. If, however, the volume of investment is increased by the addition of a power-consuming industry which requires capital expenditures X_2X_3 , the aggregate rate of return increases to r_2 . This presentation implies that the power investment is at the lower end of the line of AB_1B_2 . If it had a higher rate of return, then investment X_1X_2 would be dropped and replaced by X_2X_3 , and the line CD would be spliced onto the line AB_1B_2 at the level of r_2 . Total investment would become OX_3 minus X_1X_2 .

In other circumstances the return on capital function may not be as discontinuous as shown in the chart. If there is a choice between various patterns of investment, involving different amounts of investment, it is conceivable that the return on capital function may move down and up, intermittently falling below the socially tolerable minimum rate of return, but re-emerging above it with additions of capital.

The argument and the examples given in the preceding section indicate that in some cases the expected rate of return on an investment project is likely to increase if the project is not considered in isolation but together with a related project or several related projects. The proposition that a larger amount of investment may under certain circumstances yield a higher rate of return than a smaller amount is nothing new. It is basic to the theory of the "big push" and an essential ingredient of the theory of "balanced growth."¹⁶ But the discussion (and the very concept of limited absorptive capacity) suggests also that in many less developed countries the possibilities of a truly "big push"--beyond the complementarity of a small number of projects--are definitely limited by the low supply elasticities of co-operant factors.

¹⁶See P. N. Rosenstein-Rodan "Note on the Theory of the Big Push," Economic Development for Latin America, H. S. Ellis, editor, (1961), pp. 57-81; R. Nurkse, Problems of Capital Formation in Underdeveloped Countries, (1955), pp. 11-17 and pp. 22-23.

Chart II - Absorptive Capacity with Complementary and Indivisible Projects



The Causal Connection Between Capital and Return

Throughout the discussion it has been assumed that there exists a causal relation between the investment and the activity expected to bring a return. For most projects this relation may be taken for granted. There are instances, however, in which it is difficult to decide whether there is a direct causal connection between the investment and the flow of income.

Two examples may be enough to illustrate the point. In a number of countries, recent proposals for rehabilitating railway systems envisaged large capital outlays for the modernization of rolling stock, of repair shops, and other physical facilities. They also suggested closing down branch

lines which had become--or always had been--unprofitable and expendable in view of the growth of motor transportation. In some cases rehabilitation of the railways also involved the dismissal of railway employees either because their services had become unnecessary with the introduction of more modern equipment or because their numbers were excessive to begin with as a result of mismanagement, political pressures, etc. The analysts who determined the return on these projects related the financial results of all recommendations to the recommended volume of investment. This is correct if for some reason--technical, organizational, or "institutional"--the various cost-saving parts of the proposal (dismissal of redundant labor, closing of unprofitable lines) are impossible without the capital investment in the proposed magnitude. If, however, changes in current costs (and changes in receipts) can be brought about without capital expenditures, it is obviously wrong to attribute the resulting changes in revenue to the proposed investment.

The situation may be similar in a hypothetical irrigation project which is expected to yield a high return because it involves, among other things, a change in the cropping pattern and improvements in marketing and warehousing of the produce of the affected area. If changes in the cropping pattern and in other activities could not take place without additional water, then attributing the total increase in agricultural income to the irrigation project is justified. If, however, improvements in the cropping pattern, in warehousing, or in transportation could be accomplished without irrigation, then it would clearly be inappropriate to attribute the gains derived from these measures to the irrigation project.

The preceding examples indicate the complexity of the problem of attribution which must be resolved if an appropriate measure of the expected rate of return of a project (and of absorptive capacity) is to be found. In practice the solutions are difficult because the questions raised frequently cannot be resolved by a decision to include or not to include increases in income in the return on the proposed investment. In most cases it may be more appropriate to include only a part, and it is difficult to decide which part should be and which part should not be included.

Uncertainty and Absorptive Capacity

It is a basic characteristic of the appraisal of investment projects that it involves the assessment of future events and the evaluation of factors which are uncertain. The cost of an investment project is not known until the last machine is in place; the cost of operation depends on many factors not fully known at the time when the appraisal is made. The suitability of a productive process is uncertain until it has been applied in the specific circumstances of the project. Factor costs may suddenly change; the market for the goods or services to be produced depends on future events beyond the control of the investor; and so on. Lack of knowledge is an important factor limiting absorptive capacity. So are the constant changes that go with growth in an underdeveloped economy, the importance of the export sector with its peculiarly uncertain outlook, the inexperience of management in coping with changes. All are factors which make for more uncertainty in underdeveloped countries than in advanced countries.

Two types of uncertainties may be distinguished. One pertains to a specific project or to a particular aspect of a project--such as the uncertainty whether a new technical process will work, what price the products to be produced will fetch, etc. The other uncertainty besets the economy as a whole: What will the growth of income be in the next five or ten years? How fast will traffic expand in a particular area? At what rate will industrial production increase? How will changes in the distribution of income affect consumer demand?

These uncertainties may be considered another kind of limitation on absorptive capacity if they serve as a basis for discounting expected rates by the risks which they entail. But, more important, these uncertainties are probably the most important basis for disagreeing about the appraisal of future returns and the limits of absorptive capacity. Proponents of a project may play down some of the uncertainties and take the sanguine view that in the end everything will turn out all right. Lenders and sources of foreign aid, on the other hand, may take a more cautious, perhaps an overly cautious, attitude about these uncertainties. Because they may not be used to dealing with the uncertainties peculiar to underdeveloped countries, they may be inclined to underrate the future rate of return and absorptive capacity.

Uncertainties about the rate of growth of the economy as a whole may be particularly significant for industries in which the scale of operations is important. Frequently the expected rate of return on a power project depends on the time it takes for demand to rise to the full generating capacity. Similarly, decisions about investment and transportation depend very much on the growth of demand and supply of movable goods which reflect in turn the growth of the whole economy. The effect of high aggregate growth rates on expected rates of return is one reason why such high rates seem to resolve the concern with the adequacy of particular returns. If Gross National Product (GNP) grows at 7 percent per year and the industrial and utility sector increases about 10 percent, many more investment projects appear to be sound than if the projected rates were, say, 4 percent and 6 percent respectively.¹⁷

The importance of uncertainty in determining rates of return and absorptive capacity brings out the significance of coordination and planning. A well-conceived plan in which investments in various projects are interrelated can go a long way toward eliminating uncertainties. Thus it can also raise absorptive capacity.

The Price System and Absorptive Capacity

So far the rate of return as a measure of absorptive capacity has been discussed without relating it to prices of factors of production or to comparisons of prices prevailing in the economy with those in the rest of the world. There would be no need to bring factor prices and international price relations into the argument if they reflected relative economic scarcities. But it is generally recognized that in less developed countries prices reflect resource scarcities much less adequately than in more advanced market economies and thus do not lead to an optimum resource allocation.¹⁸ The concept of shadow prices which reflect more accurately

¹⁷The high growth rates have still another important effect: a high growth rate promises a rapidly rising rate of saving which in turn permits a high rate of investment and so on.

¹⁸Jan Tinbergen, The Design of Development (1958), pp. 39-41, 76-78. This was the first systematic exposition of the inappropriateness of market prices and of the use of shadow or accounting prices instead.

the relative scarcity of resources has become generally accepted; however, many problems of practical application remain unsolved.

There is no need to discuss in detail the conceptual and practical problems arising with the use of shadow prices in this context. For the purpose on hand it is sufficient to point out that, in the opinion of most exponents of the use of shadow prices: (a) the shadow price of capital is usually higher than the market price; (b) the shadow price of unskilled labor is generally lower, and frequently much lower, than the market price; and (c) the shadow price of imports and exports is frequently higher than their market price, reflecting either an overvalued domestic currency or the need to achieve a "structural" balance-of-payments equilibrium through export promotion and import substitution. (a) and (b) will be discussed in this section and (c) in the next (see page 26).

Proposition (a) rests on two contentions. One is that in many countries the interest rates charged by financial institutions, or paid by government, and the rediscount rates of central banks do not adequately reflect the scarcity of transferable capital and the return on capital which private entrepreneurs expect and obtain. The second contention is that the expected rate of return on (public or private) investment projects is low because it is adversely affected by an inadequate supply of such complementary elements as management and skills, by the high cost of other inputs (such as transport cost) or by the diseconomies of small-scale operations. In other words, absorptive capacity is limited unless the supply of co-operant factors is increased or made cheaper or the technique of production is modified, or demand is increased to overcome diseconomies of small scale on the supply and on the demand side. However, this does not show whether the market or a higher shadow rate of interest should be used to determine what constitutes a reasonable rate of return that can be used to establish a cut-off rate and absorptive capacity.

The level of institutional interest rates is only indirectly relevant for the purposes of our inquiry. It determines only the distribution of the return on capital between equity holders and lenders. This rate (as distinct from the rate on total capital invested in a project) is important only if the supply of risk takers and other entrepreneurial talents is increased by low institutional lending rates and, as a consequence, absorptive capacity is increased.

Institutional interest rates that are "too low" are also important if they are used as a basis for price setting (rate making) in such quasi-monopolistic industries as electric energy or transportation particularly in the public sector or if the prices charged by privately owned enterprises are controlled. Low power or transportation rates resulting from low interest charges may have adverse effects on total savings and on the economic allocation of resources because they may induce the excessive use of electricity or transport services and reduce that of other factors. They may also lead to the wrong location of productive facilities that depend on power and transportation services and the wrong utilization of investable resources. In other words, "wrong" industries may be started. As a consequence wrong (more capital intensive) techniques of production may be chosen, and other factors of production (such as labor) will be underutilized. This situation may adversely affect the level of investment and the growth of output.

But the price of capital and the difference between its market and its shadow price cannot be considered in isolation. They must be related to the prices of other inputs. In economies in which the shadow price of unskilled labor is significantly lower than the market price,¹⁹ part of the labor force will remain unemployed, and the return on capital will be smaller than it would be if lower wages were paid. In underdeveloped countries widespread unemployment in industrial centers and underemployment in rural areas offer indirect but strong evidence of the existence of a spread between market and equilibrium prices of unskilled labor; however, it must be noted that this proposition pertains only to unskilled labor and not to labor in general. In fact, there is considerable evidence that technical skills are scarce--frequently scarcer than the wages for foremen, craftsmen, and managerial employees indicate. Thus the discrepancy between the shadow and the market price of all labor may have less effect on the return on capital than is suggested by the argument that the market price of unskilled labor is too high.

Some economists have used this argument not only as an explanation for the existence of unemployment and underemployment and for the low

¹⁹For an at least partial explanation of the rationale of paying higher than equilibrium wages to unskilled workers, see H. Leibenstein, "Underemployment in Backward Economies," Journal of Political Economy (April 1957), pp. 91-103.

return on capital investment projects but also as the basis for proposing that entrepreneurs be somehow compensated for this difference, presumably by a government subsidy.²⁰ Proposals of this sort in essence convert the investment problem into a fiscal problem. The taxable capacity of underdeveloped countries is so limited, and the claims on the public treasury to finance other developmental activities are so many and varied that it is not surprising to find that schemes of this sort have not been put into effect.

The difference between market and shadow prices for unskilled labor is frequently used as justification for the low rate on publicly owned enterprises. This justification overlooks the simple fact that low earnings of state enterprises pose exactly the same fiscal problem as subsidies which would be paid to private enterprises; in some ways they are even worse. The consequence of low returns on state enterprises, aside from the distortion effects already mentioned, is either the need to increase public revenues or to curtail public expenditures elsewhere. They are worse than public subsidies paid for low earnings on private investment (justified by differences between the market and the shadow price for unskilled labor) because the payments to private entrepreneurs may be saved for them and augment the flow of investable resources. Low earnings of public enterprises are revenues foregone and are more likely to result in more consumption rather than in more investment.

Another justification that is frequently used for accepting low returns on investment in publicly owned enterprises (and thereby apparently stretching absorptive capacity) is the argument that additional returns benefit the rest of the economy in the form of external economies which lower cost and/or increase returns to their beneficiaries and thus contribute to capital formation and growth. There is no need to deny the importance of external economies in the growth process, although by their nature their quantification is difficult; and there is no need in this context to become involved in arguments about external economies and the extent to which they are offset by diseconomies. Only one aspect is relevant. It is clearly

²⁰ Jan Tinbergen, op. cit., p. 53.

a misuse of the concept of external economies to use it to justify a low "internalized" return on capital.²¹

The practical effect of using the discrepancy between market and shadow prices of unskilled labor (and of other inputs) as a reason for accepting low returns on capital as an indication of absorptive capacity is a lowering, immediately or gradually, of the rate of savings in the economy. More exactly, since private entrepreneurs are not likely to be willing to accept low rates of return in the first place, it would tend to lower public capital formation. This in turn may affect tax policies and lead to an increased tax burden on income which would be available for private capital formation. To accept a low return on capital, therefore, would increase the scope for public investment (and absorptive capacity), but at the same time it would curtail the rate of capital formation and impose on the economy the constraint of inadequate savings instead of the limitations of absorptive capacity.

Closely related to the argument that low returns on capital are not an indication that the limits of absorptive capacity have been reached is the argument that investment expenditures are justified as long as the economy shows a rate of growth, that is, as long as there is a positive capital output ratio.²² Although this proposition appears plausible at first glance, its implication is that the rate of return somehow reflects only the appropriateness or optimization of the allocation of capital. The implication is particularly plain if it is related to the market-prices-versus-equilibrium-prices argument. This is, of course, a misreading of the essence of economic theory. The maximization of the return on capital is also a measure, or proof, of the rationality of the allocation of all resources. In other words, a low rate of return does not prove per se that capital is plentiful compared to other factors. In underdeveloped countries where

²¹It would be equally reasonable to argue that capital formation in any economy would be enhanced if somebody took money out of his savings account and used it for making bets on horses because even if he did not win some other bettor would benefit from them. E. S. Mason writes, "So frequently does it happen that low-yield projects are accepted with an airy reference to undemonstrated and undemonstrable 'external' economies that I am tempted to observe, paraphrasing Dr. Johnson, that an external economy is the last refuge of a scoundrel." op. cit., p. 18.

²²Jorge Ahumada, "Investment Priorities," Economic Development for Latin America, edited by H. S. Ellis (1961), pp. 366-396.

the presumption that capital is scarce seems amply justified by the low rate of capital formation, a low rate of return on any particular project is evidence that the allocation of capital and other resources is deficient and could be and should be improved. A low rate of return on investment is an indication that absorptive capacity has been reached and that the growth rate of the national product can be increased by devoting resources to increase the supply of co-operant factors rather than capital formation.

Foreign Exchange Supply, Exchange Rates, and Absorptive Capacity

There is also a relation between an economy's absorptive capacity and its balance of payments. The effects of the international transactions of an economy on its development effort are rather obvious. Exports provide the foreign exchange to purchase goods and services from abroad to supplement the goods and services available from domestic sources. Since the international range of goods and services is infinitely wider than that of domestic products, access to foreign resources through foreign exchange earnings, foreign capital, and foreign assistance greatly extends the possibilities of factor combinations.

The lower an economy's level of development the smaller is the range of goods and services which it produces. One of the characteristics of most underdeveloped countries is the absence, or virtual absence, of capital goods industries. So investment activities require a certain amount of imported goods which may have to be supplemented by imported technical and managerial services. Moreover, as was pointed out by Felipe Pazos,²³ the import content of consumption is frequently much lower than the import content of investment. Therefore, a policy aiming at a curtailment of consumption and an increase in savings and investment may lead to a balance-of-payments deficit, unless the flow of foreign exchange can be increased.

²³“Desarrollo Economico y Estabilidad Financiera,” Tercera Reunion de Tecnicos de los Bancos Centrales del Continente Americano (Havana, 1952), pp. 365-406. See also Celso Furtado, “Capital Formation and Economic Development,” International Economic Papers, Vol. 4 (1954), pp. 124-144.

What matters for the development effort, however, is not the total availability of foreign exchange but only that part which can be used for investment purposes. A country may have large foreign exchange earnings relative to its national product and still be unable to mount a major development effort. It may suffer from inadequate foreign exchange because it has to use all its foreign exchange earnings to import food, fuel, and raw materials, or it may feel compelled to use a large part of foreign exchange earnings to purchase military equipment. This underlines the importance of foreign capital and foreign grants. Foreign capital and foreign aid supplement the flow of domestic capital formation, and because of the unlimited variety of goods and services which can be provided by them, they are worth more than their nominal amount.²⁴ As Chenery has pointed out, countries supplementing their domestic capital formation through foreign capital and foreign assistance generally experienced a significantly lower marginal capital/output ratio than countries which choose to, or must, "go it alone." Similarly, the availability of foreign exchange to purchase any capital (or current) input not available from domestic sources, or available only at a high cost, is bound to permit a higher return on capital.

¹¹ Given the positive effect on the rate of return and thus on absorptive capacity of having foreign resources available to supplement domestic resources, it is surprising at first to find that the concept of absorptive capacity has frequently been applied chiefly and sometimes exclusively to foreign capital and foreign aid. This is in clear contradiction to the proposition that limits on the availability of foreign exchange themselves are liable to restrict absorptive capacity.¹¹

¹¹ On second thought, however, applying the concept of absorptive capacity to foreign capital and foreign aid is meaningful. If foreign capital and foreign aid are considered in strict mathematical terms,

as supplementing resources available for investment, the limit of absorptive capacity is determined by the inflow of foreign capital since it represents the marginal amount of total capital.

In practical terms, the idea that the absorptive capacity for foreign capital is limited makes more sense if the use of foreign capital is restricted for specific purposes either by the sources of foreign aid or by the recipient country than it would if foreign funds were obtained for unlimited uses.¹ The absorptive capacity for funds which can be used only to finance foreign capital equipment may be limited by the ability of the recipient to mobilize domestic resources to finance domestic investment expenditures for the same project. This is not necessarily a problem of increasing total domestic capital formation, but rather one of channeling domestic savings into the specific sector or project for which foreign financing is available. This kind of limitation on absorptive capacity is usually significant in countries where governments are unable to increase fiscal revenues or to borrow savings from the private sector. In such a situation the availability of foreign financing for public investment and the limited availability of domestic financial resources may lead to a warping of the investment pattern because projects with a large foreign exchange content get preference over projects for which large amounts of domestic resources are required.²⁵

The situation is similar when, for some reason, a country which capital exporters consider as a promising place for investment does not permit the importation of co-operant factors in the form of managerial, technical, or supervisory personnel and these personnel are locally in short supply. The absence or inadequate supply of these factors lowers the rate of return and absorptive capacity. Import restrictions of this sort presumably limit the flow of private direct investment in a number of Latin American and Asian countries. Arguments advanced in defense of these restrictive measures are either that they will accelerate the

²⁵The situation is exactly the opposite when foreign exchange resources are insufficient. In that case the investment pattern will be warped in favor of a pattern of investment relying as much as possible on domestic resources.

training of local personnel or that they save foreign exchange. By contrast, the absorptive capacity for petroleum investment in uninhabited parts of the Sahara or of the Arabian peninsula may be unlimited as long as oil companies are allowed to bring in not only capital equipment but all other factors necessary to exploit the oil resources.

One other aspect of the relation of the absorptive capacity of an economy to its international transactions remains to be explored. As indicated before,²⁶ it is frequently argued that, in determining the rate of return, shadow exchange rates should be used instead of the existing "market" rates either because the balance of payments is in actual disequilibrium or because it is liable to get out of equilibrium on account of an expected adverse development of export earnings. This argument is valid insofar as balance-of-payments difficulties are unavoidable; but when they are the consequence of mistaken policies, the discrepancy between actual and shadow prices of imports and exports are but the reflection of these policies. The use of shadow prices is not a substitute for proper corrective action.

On theoretical and empirical grounds the argument that an economy mounting a determined development effort is liable to experience pressures on its balance of payments may be readily accepted. To accept the possibility or even the probability of balance-of-payments difficulties is but another way of emphasizing the important role which foreign exchange resources play in the development process. But in practice this line of reasoning frequently disregards two problems. One is a question as to the appropriateness of the existing exchange rates. In many developing countries the exchange rate is not a market price but an administered price which is maintained by exchange controls at a level that overvalues the domestic currency. The effects of an overvalued currency on the balance of payments of a developing country are well known and need not be elaborated at length here. An overvalued currency adversely affects activities and investment in the "traditional" export sectors and prevents the development of new export products; thus it aggravates the balance of payments disequilibrium. On the import side it raises the demand for imports of all kinds and makes the efficient

²⁶See p. 19 above.

allocation of exchange earnings more difficult. If it is accompanied by policies aiming at the development of import-substitution industries, it may draw resources away from the export sector and thus aggravate, and not cure, the balance-of-payments problem. The indiscriminate protection of import-substitution industries by the prohibition of competing imports will probably lead to an increase in the domestic price and cost structure and thus further accentuate the balance-of-payments difficulties.

What is required under those conditions is not a resort to shadow prices in the evaluation and selection of investment projects, but, in the first instance, an adjustment in the rate of exchange to reflect more adequately the prevailing balance-of-payments conditions. This is not to say that an adjustment in the exchange rate will cure all balance-of-payments difficulties; some form of direct controls over international transactions may be unavoidable. But there is no doubt that the rational allocation of resources can be greatly enhanced by exchange rate policies which more accurately reflect the scarcity of foreign exchange than exchange rates now prevailing in many underdeveloped countries.

If overvalued exchange rates are adjusted, the case for using shadow rates in the evaluation of projects becomes much weaker, although it would not be entirely eliminated. Whether or not shadow rates should be used in the determination of the social rate of return on investment depends largely on what measures can be devised to make the shadow rates effective. Devaluation itself may go a long way toward increasing the profitability of investment in import substitution and in export promotion industries, even if the cost of imported equipment increases as a result of the devaluation. It may also enhance investment opportunities in the production of raw materials and semi-manufactured goods which are inputs in import-substitution industries. But beyond that, the shadow prices of imports and exports may have to be made effective by fiscal and other measures which permit rates of return in export and import-substitution industries to be at or above the socially tolerable cut-off rate.

The preceding discussion of the shadow exchange rate indicates the true relevance of the concept of shadow prices. If it is found that the actual prices in an economy do not even approximately reflect the relative scarcities of factors and thereby distort the allocation of resources, then efforts must be made to correct the inappropriate market prices by

changes in policies and controls. Shadow prices are not a reason for engaging in investment activities in which the effective rate of return on capital is low; they are an indication that causes of the distortions must be eliminated insofar as possible. This applies not only to exchange rates but also to institutional rates of interest, to the prices charged by utilities, and to the whole range of administered prices of goods and services. In many countries the discrepancies between market and shadow prices are not so much a phenomenon of underdevelopment as the result of restrictions imposed on the price system. If these restrictions are eliminated, the market rates of return may well be taken as a reasonably accurate indication of a rational allocation of resources and of absorptive capacity.

Time Dimension of Absorptive Capacity

The absorptive capacity of an economy depends on the time that is allowed for adjustments in the factors determining its limits. The more time is allowed to overcome the lack, or inadequate supply, of the co-operant factors, the greater absorptive capacity becomes.²⁷ Like the price elasticity of supply, the short-run absorptive capacity is smaller than the absorptive capacity in the medium- and the long-run. The short-run absorptive capacity is determined by the extent to which co-operant factors are underutilized, or in excess supply, and can be combined immediately with additional capital; the medium-run absorptive capacity would be determined by the extent to which the co-operant factors which are initially deficient can be mobilized and applied in the course of, say, three or four years; and the long-run absorptive capacity may be defined as that absorptive capacity which prevails after the supply of the limiting co-operant factors has been further increased.

Though conceptually unassailable, this distinction suffers from one serious flaw. It disregards the fact that the process of absorption,

²⁷On occasion, absorptive capacity may also deteriorate--as a result of a decline in administrative efficiency or political disturbances. For example, in some former French-controlled parts of Africa, absorptive capacity may have declined.

the investment activity itself, has a time dimension and that within the investment process itself various phases can and must be distinguished. In practice, short-run or instantaneous absorptive capacity may, therefore, be more appropriately defined as the ability to undertake investment projects which are "ready to go," projects which have been completely engineered and appraised and reported to be viable. Medium-term absorptive capacity then refers to the availability of investment projects which have been determined to be "feasible;" it has been found that their return is likely to be above the cut-off point, but their engineering has not yet reached the blueprint stage. An important variant of the same concept of medium-run absorptive capacity (which is, in practice, of considerable importance and has on occasion given cause for concern) is the availability of projects which have been found to be technically feasible but which have not yet been investigated as to their economic and financial viability.²⁸

It is somewhat more difficult to give practical meaning to the concept of long-run absorptive capacity because the ability to make effective use of additional capital in the long run depends primarily on the progress of economic development itself. The inadequate supply of co-operant factors such as the ability to appraise and engineer investment projects and to manage enterprises is itself an aspect of underdevelopment and the growing supply of co-operant factors is part and parcel of the development process itself.

Sectoral Versus Aggregate Absorptive Capacity

Since the limit of absorptive capacity is reached in each specific case by a lack of specific co-operant factors, the absorptive capacity of a particular sector of the economy may be smaller than in other sectors or in the economy as a whole. That is to say, a rate of return below the cut-off rate is reached when the ratio of gross investment to the value added of the sector is smaller either than the ratio in other sectors or

²⁸The distinction between technical feasibility on the one hand and economic and financial feasibility on the other is much less clear in practice than in theory since the engineering, the choice of technology, the scale of the project, etc. depend on economic considerations.

the rate of gross investment to the gross national product.²⁹ This is not simply a reflection of the principle of diminishing marginal productivity of factors in any specific use; it is also the result of the limitations of factor mobility. The absorptive capacity for investment in, say, highways is likely to be limited by the number of engineers in the planning office of the highway department, by the amount of information available about present and future traffic in particular locations, etc. But when the absorptive capacity for highway construction is reached, the absorptive capacity for irrigation projects or for investment in industry or for housing may still exceed the volume of investment taking place in these sectors. Similarly, within a particular sector the absorptive capacity for small projects which do not require elaborate engineering and other preparations may be greater than the absorptive capacity for major projects.

This rather obvious proposition is of considerable practical significance when decisions have to be made as to the allocation of total investable resources between the public and the private sectors. Investment in the public sector may be impeded by the difficulties of transferring co-operant factors from the private to the public sectors--because of inadequate salary scales, the bad reputation of the government or government agencies as employers, etc. The flow of investment in the private sector on the other hand may be limited by the inability to provide technical assistance and advice from public sources to private investors. This is probably one of the most important limitations of international technical assistance activities since much of technical assistance inevitably takes place on a government-to-government basis and the benefits of such assistance accrue in the first instance to public authorities. Public authorities in turn may find it impossible or may not be inclined to transmit technical assistance to the private sector. The result, quite common in underdeveloped countries, is that investment in new industries takes place in the public sector although the private sector may well be

²⁹Since the limits of absorptive capacity pertain to replacement investment as well as new investment, it is the ratio of gross investment to value added (or, in the aggregate, to gross national product) that is relevant, not net investment.

better equipped to undertake such investment if it had ready access to foreign technical assistance.

The difference between sectoral and aggregate absorptive capacity points up once more the interdependence of projects in aggregate investment. Coordination, or the joint preparation and evaluation of projects in two or more sectors, raises the limits of absorptive capacity. In the formulation of a development program, the limitations of absorptive capacity in the various sectors must be taken into account in order to achieve "balance" and thus maximize aggregate absorptive capacity.

Specific Limitations

The preceding sections have shown that absorptive capacity is a rather simple and straightforward concept. They have also shown, however, that the limitations on absorptive capacity can take so many forms that it is not very meaningful in practice to propose policies to increase absorptive capacity in general. The only way to come to grips with the practical limitations of absorptive capacity is to devise specific measures to raise specific limitations.

The following comments may be considered a rudimentary (and presumably incomplete) typology of the limitations on absorptive capacity. Such a typology could be based on a variety of criteria. It would be possible, for example, to distinguish limitations on pre-investment activities, on investment activities, and on the management of the newly established facilities; alternatively, distinctions could be made among limitations that can be easily removed, those that can be overcome with some difficulty, and those that are likely to prove obstinate; or it may be useful to distinguish between those limitations that are susceptible to foreign assistance and those that are not.

In the list that follows the various factors limiting absorptive capacity have been grouped under headings reflecting the distinctions normally made among the various co-operant factors of production.

(a) Lack of Knowledge. Lack of knowledge limits absorptive capacity particularly if it pertains to natural resources and to the availability of technology. Information about mineral resources, the composition of soils, rainfall, river flows, temperatures, etc. are prerequisites for most projects in agriculture, mining, and power. It is useful, though perhaps not essential, for projects in other sectors.

In many cases, the lack of data cannot be immediately overcome since it takes time and effort to organize the gathering of data and to analyze them.

Lack of knowledge of the best technology may well be one of the limiting factors most difficult to overcome--since it takes time and effort and expense to devise a new technology or to modify an existing one. The difficulties which have been encountered and continue to be encountered in attempts to make effective use of tropical woods for the production of newsprint are a good example of the problem of inadequate knowledge of technology.

(b) Lack of Skills. Lack of skill or expertise is generally recognized as one of the more important characteristics of underdeveloped economies. In relation to absorptive capacity it may be convenient to distinguish among (i) the skills necessary to prepare investment projects, to do the engineering and economic and financial appraisals; (ii) the skills necessary to carry out investment projects once they have been found to be feasible; and (iii) the skills necessary to perform the manufacturing and clerical tasks of new enterprises.

For many years the lack of skills in the preparation of projects has been a major concern to national and international lending agencies and other sources of financial assistance. It has been considered one of the prime limitations on absorptive capacity. The difficulties of preparing and appraising investment projects are compounded by the fact that there is no generally accepted methodology for these tasks. Numerous requests for assistance in project preparation and appraisal have been addressed to national and international institutions, but these skills are in short supply in advanced countries as well. In order to overcome this limitation on absorptive capacity, it may be necessary to train personnel both in underdeveloped and advanced countries.

The skills required to carry out investment projects, the engineering and organizational efforts required in the physical investment process, are also scarce in most if not all underdeveloped countries. But in this field the supply of engineering firms, technical consultants, and advisors from abroad is more ample. Therefore this limitation can in practice be overcome. Finding foreign personnel skilled in the execution of investment may be an inappropriate solution, however, for small projects which cannot stand the cost of foreign technicians.

The lack of skills in the preparation and execution of projects is likely to increase the cost of investment; the lack of skills to operate new enterprises is bound to affect adversely the cost of operation and thus the rate of return. To overcome this absence of skills, training facilities for foremen and workers must be provided. This is an expensive and time-consuming task in which foreign assistance may be of some help.

(c) Lack of Management Experience. The reason for distinguishing between the lack of skills and the lack of managerial talent and experience is that skills can be acquired by training, but it is doubtful whether "management" can be made the subject of systematic training. Effective management requires a basic understanding of the techniques of production and the skills required, the elements of business finance, and the social environment in which an enterprise operates--plus ingenuity and competence to deal with unforeseen problems which arise in any business enterprise.

The task of management can be entrusted to foreign managers but only enterprises over a certain size can afford the high cost of foreign management. Foreign management is not a solution for the numerous smaller enterprises which are poorly managed and therefore show small returns.

The absence of efficient management is of particular importance in the case of state enterprises which for political reasons find it difficult to accept foreign management. By experience, training, emotional inclination, and aversion to taking risks, successful civil servants who frequently are entrusted with the management of state economic enterprises are not good business managers, notwithstanding the fact that many of them have much technical competence. The confusion between technical skills and managerial competence, frequently observed in less developed countries, is one of the prime causes of the low rate of return from state economic enterprises and thus limits absorptive capacity.

(d) Institutional Limitations. Limitations at the enterprise level can be overcome by action at the enterprise level. There are, however, limitations of absorptive capacity which cannot be eliminated by improvements of any particular investment project, since by their nature they affect the economy as a whole and make it difficult for all economic units to operate with the prospects of an adequate rate of return on capital. Inadequate measures to maintain law and order are an example of such institutional limitations. The threat of riots, disorder, banditry, or other

forms of lawlessness not only limits the absorptive capacity for foreign private direct investment; it also makes it difficult or impossible for domestic investment to proceed.

There are many underdeveloped countries in which law and order are well maintained but institutional constraints of another kind limit absorptive capacity. The administrative procedures of government may be so cumbersome and so time-consuming that they make it difficult for investors, foreign or domestic, to carry out projects which they consider promising and profitable. In the public sector the slowness of the decision-making process, the difficulties of achieving coordination between various parts of the government, or the lack of communication between government departments adversely affect the rate of return on public investment because they all increase the cost of investment and the length of the physical investment process.

The adverse effects of administrative inefficiency become the more serious the greater the extent of direct controls. If private and public investment decisions and the management of public enterprises are constantly subject to government sanction through licenses, allocations, etc. and if the licenses, allocations, and permits of one kind or another are not readily forthcoming, the rate of return on new investment is bound to be smaller and absorptive capacity limited.

(e) Cultural and Social Constraints. The various types of limitations on absorptive capacity commented on in the preceding paragraphs are only the specific forms in which both cultural and social constraints assert themselves in underdeveloped countries. The lack of skills reveals frequently not just the underdevelopment of the educational system but, beyond that, the reluctance to acquire new skills. Even where optimum techniques have been devised for some kind of production, their introduction may run into opposition because of cultural factors, the unwillingness to accept the discipline of controlled working hours, supervision, etc. of an industrial society.

There is no point here in elaborating the differences in social structure and cultural values between advanced and underdeveloped countries. It is enough to stress that, unlike the other limiting factors, cultural and social factors are not directly amenable to technical assistance or concerted action. They can be overcome only by the process of development itself.

The Role of Technical Assistance

Throughout this paper references have been made to the possibility that technical assistance could be instrumental in increasing the supply of those co-operant factors whose shortages impede the effective utilization of capital. The term "technical assistance" has been intentionally used ambiguously. In some instances technical assistance itself constitutes the co-operant factor in short supply. For example, foreign consulting firms engaged to make feasibility studies or prepare the economic or financial appraisal of a project may be said to provide technical assistance. So may a foreign firm taking on the technical or commercial management of an enterprise under a management contract. But frequently technical assistance itself does not constitute the missing or inadequate co-operant factor but is designed merely to increase the supply of these factors from domestic sources. Training of personnel, either abroad or in the country; and advice given on how training is to be organized and conducted; and, more generally, how shortages of co-operant factors can be overcome fall into this category of technical assistance.

Little would be gained by attempting to draw a sharp distinction between these two types of technical assistance. In practice all arrangements which would fall under the first "direct supply" type inevitably include an element of the second type. Conversely, technical assistance personnel employed to provide education, training, and advice are frequently called upon to help with some specific tasks; or they may choose to give a demonstration of the skills and expertise which they are expected to teach.

There is, however, an important difference in the availability of technical assistance between the factors limiting absorptive capacity which fall into categories (a), (b) and (c) and those included under (d) and (e). Broadly speaking, the factors listed under the first three headings are replaceable by, or in various degrees amenable to, technical assistance. But deficiencies in factors limiting absorptive capacity enumerated under (d) and (e) cannot be made good by technical assistance, at least in the short run. True, technical assistance to help overcome institutional limitations can be provided, but it inevitably takes a long time for technical assistance in this field to become effective. Moreover, it cannot be brought to bear at the project level but only for the economy as a whole, or at least for an entire sector. Technical assistance is of no avail to

alleviate the cultural and social constraints limiting the supply of co-operant factors.

It is for that reason (and because of the time it takes for technical assistance to overcome the lack of knowledge, the lack of skills, and the lack of managerial experience) that one may speak of the limited absorptive capacity for technical assistance itself. It is the variety of limitations on absorptive capacity which makes the limitations on the capacity to utilize capital resources effectively the more real and important.

Summary and Conclusions

Since this paper has dealt with a variety of aspects of the concept of absorptive capacity and touched upon many issues arising in the course of economic development, it may be useful to list the most important conclusions that have emerged from the discussions.

1. Absorptive capacity is a meaningful concept if it is related to the rate of return on capital which an economy finds socially acceptable. Because one of the major characteristics of underdeveloped economies is the lower rate of capital formation (and the smaller size of the capital stock) the socially tolerable rate of return may be well above the rate which is acceptable in more advanced countries.
2. The array of rates of return and absorptive capacity can be increased by the coordination and orderly programming of investment projects.
3. Absorptive capacity must pertain to total capital, not just to foreign capital. The availability of foreign capital itself is likely to be an important factor increasing absorptive capacity.
4. The evaluation of absorptive capacity is beset by much uncertainty. It is the uncertainty of the expected rate of return on capital which is probably the most important reason for the wide differences in the appraisal of absorptive capacity of underdeveloped economies.
5. Because the rate of return on investment is limited in each specific project by specific factors, general prescriptions for raising absorptive capacity are not likely

to be meaningful. It is possible, however, through the proper identification of the factor or factors limiting the rate of return and absorptive capacity in each particular case to raise these limitations; in this connection technical assistance can play a major role.