309.20184
W722

PNABH879
ISN 71467

Williams College - Supply consistency in development planning...

309.20184 W722

Williams College, Williamstown, Mass.
Center for Development Economics.
Supply consistency in development planning - a generalized two-gap model.
Gordon C. Winston. Jan. 1967.
62 p. illus.
Bibliography: p. 61-62.
Contract no. AID/csd-736.
This is a draft and should not be quoted without permission of the author.

309.20184
W72 2

PN-AAH-879

Supply Consistency in Development Planning--
A Generalized Two-gap Model

Gordon C. Winston

This is a draft and should not be quoted without permission of the author.

Work on this paper has gone on long enough that the author has accumulated an impressive list of benefactors. Originally the study was supported by the Williams Research Project for the study of Import Substitution and Economic Development. Completion of the paper has been done at the Pakistan Institute of Development Economics. I have received helpful comments from many quarters, but I am in special debt to John Power, William Gates, Jr., Philip Thomas and Marvin Rozen. The computations of Part V were done largely by A.D. Bhatti of the P.I.D.E.

A.I.D. HISTORICAL AND
SCIENTIFIC REFERENCE
ROOM 1656 NS

January, 1967

ABSTRACT

Supply Consistency in Development Planning

a Generalized Two-gap Model

Gordon C. Winston

Williams College and Pakistan Institute of Development Economics

A good deal of attention is being given to the importance of certain specific kinds of capital goods that are needed in the process of development--foreign capital equipment or human capital. It has been shown that if foreign capital limits a country's growth, increases in the availability of that kind of capital will have a disproportionately high payoff--if a country has a foreign capital equipment constraint, a dollars worth of foreign exchange will add more to its growth than will a dollars worth of additional domestic saving.

But in these investigations of capital restrictions, the more general fact has been obscured that not only specific kinds of capital equipment, but total capital goods availability may constrain growth. An economy may have savings (and fiscal) propensities adequate to support a high rate of growth yet not be able to reach that level of performance because too little of its available output is in the physical form of capital goods--too little past investment has been allocated to production of capital goods.

This study, therefore, does three things: (1) it develops a simple planning model of the Harrod-Domar type that incorporates the additional (Mahalanobis) requirement that investment spending, to be productive, must be matched by available capital goods and these in turn depend on past investments in the capital goods producing sector; (2) it shows that the "two-gap" models that stress the need for capital from specific (foreign) sources (and its very high productivity) are a special type of capital constraint and may, for particular countries or particular sectors, be less important than a "two-gap" model that is restricted by domestic capital availability; and (3) it asks whether these theoretical possibilities have any relevance by examining the Pakistan economy for evidence of capital constrained growth--and finds strong indications that the very low rates of growth in the First Plan period were quite likely caused by excessive investment in consumption goods and inadequate capital availability.

Supply Consistency in Development Planning--A Generalized "Two-gap" Model

Gordon C. Winston.

This paper combines simplified Harrod Domar and Mahalanobis-type models, first to show that the internal consistency of a development plan may well depend on supply relationships that are usually ignored in aggregate planning, second, to suggest the value of a more general version of the "two-gap" model (McKinnon) and finally to see these supply relationships have influenced Pakistan's development. The argument of the paper is simple and not unfamiliar. To the extent that capital equipment is specific in what it produces and the products themselves are specific and non-substitutable between investment and consumption uses, the pattern of investment in one period may determine the allocation of subsequent income to saving or consumption and, therefore, the rate of growth of income. As this constraint is softened by trade, a foreign exchange constraint may enter. Part I sets the context by broadly contrasting the two views of growth. Part II develops a formal but quite simple model of an economy whose growth is limited by either saving or physical output constraints. Part III introduces trade as an alternative source of capital, relaxing the physical capital constraint. Part IV deals with geographical specivity of capital sources in a 'four gap model'. Finally, part V examines the Pakistan economy for evidence of supply constraint in its growth.

I

It is inaccurate, unfair, and quite useful at the outset to draw caricatures of the two models we shall use.

The Harrod-Domar view of growth assumes that the really important fact is

Keynesian saving-consumption 'preferences' (in quotes since they may be the result of taxation, income redistribution or inflation / 9, 26/. With a positive marginal propensity to save, increasing income brings increasing saving and requires, therefore, increasing investment expenditure to maintain adequate aggregate demand. The pressure for adequate demand is constantly compounded because the investment that provides necessary aggregate demand at one time, adds to productive capacity, income, saving and the need for more investment at a later time. If demand is adequate saving limits the rate of growth and saving, in turn is a function of income. Therefore any investment that increases income will increase saving and contribute to continued growth. Since no distinction is made, investments in consumption goods or capital goods are assumed to contribute equally well to the process of growth since both generate income and increased saving.

The question that Harrod-Domar ignores is the source or availability of investment goods which productive investment spending requires. The concentration on saving implies that, whatever, the level of saving generated, an equivalent physical quantity of capital goods will always materialize, no matter what the allocation of the existing capital stock.

A Mahalanobis planning model assumes that the really important fact in aggregate growth is the availability of capital goods. Capital goods can (in a closed economy) be made only by the capital goods sector and its maximum capacity depends, in turn, on its capital stock--on the allocation of previous investment to the capital goods sector. Then the growth of income is determined by the size and productivity of that sector.

Investment in the capital goods sector at one time increases its capacity, increasing future income and investment. Since capital goods production capacity is the constraint to growth and such capacity is a function of past investment in the capital goods sector, only investment in the capital goods sector contributes to continued growth. Investment in consumption goods capacity does not.

The question that Mahalanobis' model ignores is the source of saving to offset ('finance') the investment expenditures. The concentration on supply implies that, whatever the division of output between consumption and investment goods, an appropriate division of income between consumption and saving will always materialize, no matter what the level of income, the voluntary saving propensities, monetary and fiscal institutions or the dangers of inflation /2, 6/.

So these two models in making contradictory assumptions about what variables can be expected to adjust with growth, point to two quite different requirements of development planning--the need for adequate saving (Harrod-Domar) and the need for adequate availability of capital goods (Mahalanobis). Of course, we don't know, in fact, which model best describes the constraint to growth in any particular country at any particular time--though certainly the Harrod-Domar assumptions are more popular in Western planning--but it seems reasonable that since both are plausible constraints, both constraints must be considered in consistent development planning. To this end, the two models and their very different requirements are combined in Part II using a system of simple inequalities that juxtapose the output-investment requirement for growth (Mahalanobis) and the income-saving requirement (H-D) . These inequalities, of course, have to refer to ex ante

magnitudes since ex post any such inequalities must have been reduced to accounting indentities--income and output, saving and investment--hiding any initial inconsistency.[1/] So ours is a disequilibrium analysis that proceeds by comparing two separate and initially inconsistent ex ante rates of growth (actually increments, in this simple treatment)--of supply and of income--and their possible adjustments to ex post identities. These adjustments in turn demonstrate the policy problems such inconsistencies create. A not inconsequential bonus from this two constraint model is that it yields a list of symptoms of the capital availability (Mahalonobis) constraint that can suggest whether in fact any economy's growth rate has been limited by such a constraint--a debatable (and debated) question in the recent past of Pakistan for one / 18, 10, 14/.

This description implies a more balanced exposition of the analysis than will follow. Starting with a neutral sort of inequality, we will assume when necessary that the output investment (Mahalanobis) constraint is 'more important' than the income-saving (Harrod-Domar) constraint in that supply composition is less likely to adjust, in reaching the ex post identity, than is the allocation of income. Since we are dealing with an essentially short run model of development planning, such a bias is defended first as an empirical judgment that income can, in fact, be reallocated between saving and consumption spending more easily than capital equipment can be switched from investment goods to consumption goods and, second, on propagandistic grounds, that problems

---

1/ It is possible of course that both requirements could be met insimultaneous equilibrium so there would be no need for ex post reconciliation of ex ante inequalities. But this is not a case of particular interest for policy purposes.

of changing the allocation of income between saving and consumption--problems of taxation, inflation, forced saving, et.al. -- are less likely to be ignored in modern western development planning /9/ than are problems due to supply spectivity. Income allocation problems do at the present stage of development planning. 2/

Finally, the analysis assumes throughout that purely voluntary saving is inadequate for the planned level of development expenditures so that there always exists pressure generated by peoples' private preferences, to consume more and save less than is required by the plan. This deficiency, of course, is offset by taxes that add involuntary saving on top of extant voluntary saving /17, 9/.

II.

Assume that all products are strictly classifiable as consumption or investment goods and that there is no substitutability between them in use at any level--in other words, things like gasoline don't exist. At this stage, we will put intermediate goods into the category of the final output that they support /2/. And assume initially that there is no explicit government (except, as noted above, that it suppresses consumption) and no trade. It is worthwhile to begin with a closed economy, not only for initial simplicity, but because much of the relevant discussion of these supply constraints in Pakistan's development have dealt only with foreign capital goods, suggesting that domestic capital capacity is relatively unimportant. It is well, for instance, to show that the supply

---

2/ This is not inconsistent with the purer 'optimum' growth paths of mathematical analysts since their optimal results require a supression of present consumption that is so severe as to be utterly impossible, leaving governments, on the practical level, with instructions to come as close as they can to that optimal level of saving--i.e., to save as much as possible/ 7, 8/.

problems attributed to Pakistan's import substitution policy /18, 10/ can exist quite apart from import substitution even if they may well be compounded by such a policy. All variables are dated and the Δ's are discrete changes between periods.

A. Harrod-Domar Constraints--Income Allocation

The Harrod-Domar side starts with the usual static Keynsian statement about income, consumption and saving, and the indentity of saving and investment,

$$(2.1) \qquad Y_t = C_t + I_t$$

$$(2.2) \qquad S_t = sY_t$$

$$(2.3) \qquad I_t = \Delta K_t$$

Here, of course, Y is income. Add to this the production function.

$$(2.4) \qquad Y_t = \sigma K_t$$

that assumes capital to be the only effective constraint on production. The equilibrium rate of growth of income consistent with these parameters is, of course,

$$(2.5) \qquad \frac{\Delta Y}{Y} = \sigma s$$

since this is a planning model, (in contrast to an equilibrium growth model) we start with a given rate of growth of income as politically or socially necessary and from that and the given capital coefficient, we derive the saving rate, s, necessary to generate that required income growth. Of course the required rate of saving s, may not be attained. But if it is not, the plan will suffer. Achieving that rate depends on voluntary saving and on fiscal and perhaps monetary policy.

These represent the income-saving constraints on the planning model--the Harrod-Domar side.

B. Mahalanobis Constraints-- Output Composition

The Mahalanobis or output-supply constraint recognizes the specivity of products. So total product in period t, Y_t, is composed, quite specifically and unchangeable, of consumption goods, Y_{ct}, and capital goods Y_{kt}. (Since they are equal in the aggregate, Y_t is used to denote either income or product but subscripts denote product of the sectors--we are not interested in the income those sectors generate) so,

$$(2.6) \qquad Y_t = Y_{ct} + Y_{kt}.$$

If each sector has its own production function (again embodying the labor surplus assumption).

$$(2.7) \qquad Y_{ct} = \sigma_c K_{ct} \quad , \quad \text{and}$$

$$(2.8) \qquad Y_{kt} = \sigma_k K_{kt}$$

Where both capital coefficients and capital stock are specified by sector and the output-capital ratios are assumed constant. These equations are substantially the same as those in Bronfenburenner's simple statement of Mahalanobis' model / 2, p. 45/. 3/

It is obvious that these supply considerations will put another constraint on the saving and investment functions in a Harrod-Domar model since saving preferences (H-D) and production patterns (M) will determine saving, investment, consumption and growth.

Since all goods are, by assumption, specific in use, consumption can only be of consumption goods. But the same thing cannot be said of investment. Investment spending can be either on capital goods or, alternatively, on inventories of consumption

---

3/ That Bronfenbrenner 's version of Mahalanobis' model does violence to the initial capital assumption of the original is of no moment here since we are concerned only with discrete investment periods /6/.

goods . Therefore,

$$(2.9) \qquad C_t = Y_{ct} - I_{dt} \qquad \text{and}$$

$$S_t = Y_{kt} + I_{dt}.$$

Consumption spending must equal the production of consumption: goods less (plus) any accumulated (used up) inventories of finished consumption goods I_{dt}. Investment spending equals output of capital goods plus (less) any accumulated (used up) consumption goods.

This asymmetry that requires us to include investment on consumption goods inventories plays a convenient role in exposition. It is assumed that inventories of consumption goods are 'already' -- i.e. in period t-1 --adequate and that accumulation of further stocks is entirely unproductive of additional income. So any further accumulation of consumer goods inventory, I_d, must be unproductive and therefore, in a rational plan, unintended.[4/] Most important is that these involuntary consumer goods inventory investments become an indicator of plan inconsistency--a way to move in the analysis from ex ante inequalities to ex post indentities. If consumer goods inventory investments do appear, ex post, they indicate both that aggregate demand has been maintained by the dubious device of generating unproductive investment (in the present period) and that investment goods capacity (in the next period) will be inadequate because this investment has been wasted. Conversely the absence of these inventory investments will be taken as the standard of planning consistency in what follows. Note, however, that under the Harrod-Domar assumption of instant availability of investment goods, this problem would not arise.

4/ This is an extreme assumption to maintain during growth when one would expect inventories to show some normal increase but it is not unrealistic for the short periods with which we are concerned. So we can ignore any marginal improvements in trade efficiency that might accrue from larger inventories.

G. The Combined Constraints

Now to put these two constraints together.

The level of saving in period t must, on Harrod-Domar grounds, be compatible with savings propensities, so

(2.10) $S_t = sY_t = S_{t-1} + s\Delta Y.$

This comes directly from (2.2). The level of saving (and investment) in period t must also, on Mahalanobis grounds, be compatible with availability of goods to invest in, so

(2.11) $I_t = S_t = Y_{kt} + I_{dt}.$

This comes from (2.3) and the necessary ex post equality of savings and investment. But going one step further the output of the capital sector in t depends on capital productivity, original (t-1) capital stock in the capital goods sector and investment there during t-1. So (2.11) becomes

(2.11 a) $S_t = \sigma_k K_{k(t-1)} + \sigma_k I_{k(t-1)} + I_{dt}.$

If there was no change in consumer goods inventories in (t-1) so $I_d(t-1) = 0$, then

$$S_{t-1} = Y_{k(t-1)} = \sigma_k K_{k(t-1)} \qquad \text{from (2.11).}$$

Since (2.10) and (2.11 a) are equal (both equal S_t) S_{t-1} $(= \sigma_k K_{k(t-1)}$ can be cancelled from both sides leaving, ex post

(2.12) $\Delta S = s\Delta Y = \sigma_k I_{k(t-1)} + I_{dt}.$

That's all that's needed. Equation (2.12) shows that the increment to saving in period t that is necessary to satisfy the planned income growth target (the first term) must, ex post, be compatible both with the Harrod-Domar savings behavior (second term) and, with the Mahalanobis composition of investment in the preceding period (third term). If not, there will be unintended and unproductive accumulation of consumer goods inventories (last term). Ex ante, the plan inconsistency that

generates these consumer goods inventories is evident simply in the inequality of incremental requirements needed to satisfy Harrod-Domar and Mahalanobis conditions, or,

$$(2.13) \qquad s\Delta Y \lessgtr \sigma_k I_{k(t-1)}$$

Note that investment in consumer goods production does not appear in any of these last three expressions--they show only investment in the capital goods sector. Previous consumption goods investment will have generated income and saving--thus influencing ΔY by the Harrod Domar route--but since it cannot have added to the economy's capacity to produce investment goods, it can have no direct influence on growth and will have dropped out of these expressions. This of course, reflects 'the Mahalanobis Paradox'--that regardless of the relative productivity of capital in the consumer goods and investment goods sectors, only that investment devoted to expanded capital goods capacity can contribute directly to growth in a pure supply model.

D. The Sequence of a Disequilibrium.

Say that in t-2 all is well--saving and output patterns are compatible so that the economy is growing along both Harrod-Domar and Mahalanobis equilibria[5/], but in

---

5/ The previous assumptions yield a unique 'correct' allocation of investment derived from the incremental saving required on the income side,

(i) $\Delta S = s\sigma I_{(t-1)}$

and the product side

(ii) $\Delta S = \sigma_k I_{k(t-1)}$

so that for both to be satisfied,

(iii) $s\sigma I_{(t-1)} = \sigma_k I_{k(t-1)}$

or, rearranged, $\dfrac{I_k}{I} = \dfrac{\sigma s}{\sigma_k}$ (continued bottom of p. 11)

period t-1, while the level of total investment is still correct, too high a proportion of that investment is allocated to the consumer goods sector. The Harrod-Domar conditions of adequate aggregate demand are being met in t-1 and there is still adequate capacity in the capital goods sector. Nothing appears to be awry. The Mahalanobis condition however is being violated and must reduce income growth--in the next period. The reason, of course, that no difficulties are apparent in (t-1) despite misallocation of investment, is simply the gestation period--that (t-1) capital goods capacity depends, not on investment in the same period, but on the pattern of investment in the previous period, (t-2) and that was adequate by assumption. In t, the inappropriateness of investment allocation in t-1 becomes apparent. In period t, the problem of the preceding period becomes evident through the inadequacy of output in the capital goods sector. Insufficient investment during (t-1) reduces incremental capital goods availability in period t, and this appears either as an ex ante inequality in (2.13) or as a positive accumulation of consumer goods inventories ex post in (2.12).

So long as everything on the right hand side is assumed constant, the proportion of investment allocated to the capital goods sector is constant too. (see Bronfenorenner and Ezekial on the question of constancy versus increasing growth rate in the Mahalanobis model /2, 6/).

This expression quite sensibly says (a) that a larger saving propensity would require that a larger proportion of new investment be devoted to the capital goods sector and (b) that the greater is the productivity of the capital goods employed in the consumer goods sector (i.e. the difference between δ and δ_k) relative to its productivity in the capital goods sector, the larger is the required proportion of investment in capital goods. In contrast the 'pure' Mahalanobis view, a higher capital productivity in the consumer goods sector does influence the optimal allocation of investment because it increases income and saving (through the Harrod-Domar connections) hence the needed of capital goods.

This allocation of investment of for a double equilibrium is taken as the standard against which investment in the capital goods sector is considered 'too large' or 'too small'.

Of course, this sort of discrete, halting sequence is not to describe reality, but to emphasise the lag in the appearance of the symptoms of supply inconsistency if capital goods have some positive gestation period and to show that the longer the gestation period--the longer the period, t--the longer it will take to know of the original investment misallocation.

This sequence dealt only with insufficient capital sector investment. To look at the other possibility briefly, if there is inadequate investment in the consumer goods sector in (t-1), a problem will, again be created but, again, it will not appear immediately because the Harrod-Domar conditions are initially met with an adequate level of aggregate investment. In period t, however the inequality in (2.13) will indicate that the incremental output of the capital goods sector is greater than the increment to saving or, put the other way around, incremental consumption spending is not met by availability of additional consumption goods. This, of course, is the condition typically described by a pure Mahalanobis model and explains why it is labled a "nso-Marxiss" or forced draft model. In its most totalitarian form a higher rate of growth will be achieved simply by increasing capital goods capacity, since incremental saving must rise to ex post equality with incremental capital goods production. There simply are no consumption goods to consume. It has been alleged that a higher saving rate for East Pakistan was due to their production of relatively fewer consumption goods than West Pakistan /10, 10/.[6/]

6/ And an appreciation for the support for forced saving than can come from control over the composition of output is evidence in the Third Plan /17/.

E. Excessive Consumption Investment and Corrective policies

Putting aside Soviet models for now, we have assumed that the most likely error in most planning methods is that which arises when a Harrod-Domar model overlooks investment allocation; when planned saving is greater than planned investment goods availability. The situation is described by the inequality (2.13) in which ex ante saving--needed to fulfill planned growth--is greater than that which the capital goods sector can support, so

$$\Delta S = s\Delta Y > \sigma_k I_{k(t-1)}$$

The inequality, of course, suggests not only the problem but its possible solution. Clearly, the (necessary) reconciliation of the ex ante inequality with the expost identity of (2.12) can come about in either of two general ways:

1) through investment in consumer goods inventories, I_d. which allow it to remain an inequality or

2) through elimination of the inequality itself. This, in turn, can be accomplished by any of the following (working from left to right)

a. A reduction of the saving rate, (S)

b. a reduction in income growth, (ΔY) so that even a constant rate of saving generates less incremental savings.

c. an increase in capital productivity, (σ_k)

d. retrospectively, by anticipating the problem in the investment goods sector ($I_{k(t-1)}$).

The way these different possible adjustments would manifest themselves in an economy is suggestive, of some policy responses to and of some empirical tests for the sort of inconsistency examined here.

The first general alternative--consumer goods inventory accumulation--we have treated as unrelievedly unattractive. But it has one interesting implication for short run policy. Ignoring difficulties (which could not be long ignored in fact) with perishability and storage costs, the government's accumulation of consumer goods inventories during one period would allow 'excessive' incremental investment in the capital goods sector in subsequent periods. Faced with the problem of too many consumer goods generated by excessive past investment in that sector, the government might, itself, accumulate inventories of excessive output to allow a correction of the investment pattern by subsequently 'excessive' investment in the capital goods sector. Thus, consumer goods inventories would allow even a non-totalitarian government to pursue temporarily the "Soviet alternative"--a temporary imbalance of new investment in favour of investment goods could be offset by drawing down consumption goods inventories accumulated in the past. Of course, the extent that particular consumption goods are highly perishable or have high storage charges, this policy would be denied the government. And this policy has ramifications for price incentives to which we shall return below.

The second broad set of alternatives is more interesting.

The first of these--a reduction in saving--is most insideous since, ex post it is indistinguishable from a shift in the savings function or, recognizing that some of these savings are involuntary, a change in ability (or desire) to tax. It has been suggested

that a predictable response of a government faced with excessive consumption goods capacity--in light of required savings--will be a reduction in taxes, especially those on income and excise taxes repress consumption /10, 18/. Less officially, consumption goods manufacturers will likely increase advertizing and marketing pressures for consumption. Either of these, if successful, will liberalize consumption, reducing the saving rate and therefore the rate of growth.

In the second alternative adjustment, the planned saving rate, s, is maintained in face of too much consumer goods capacity while incremental saving is reduced through a fall in incremental income. Consumer goods manufacturers could be expected to cut back production and employment of both people and capital equipment in order to avoid unintended inventory accumulation in the face of inadequate (i.e. successfully repressed) aggregate demand for their products. The ex post indentity of (2.12) would be achieved by reduced saving due to reduced income. This suggests the existence of a very effective set of fiscal institutions and a determined voluntary saving behavior along with a relatively powerless group of consumer goods entrepreneurs who are unable to influence either the consumers' preferences or government's policy. Note too that this form of fiscal austerity produces a very advanced-country phenomenon of idle capacity, but in context of acute capital shortage and, further, that this policy reduces growth through both the Harrod-Domar and the Mahalanobis sides. It is clearly the most destructive of continued growth.

Of the final two suggestions, the first--that capital productivity be increased-- is not very interesting since, in a capital-poor, low income country, an increase in capital productivity is always a GOOD THING and little is added to that judgment by this

analysis. The second--anticipation of the problem and its avoidance through retroactively 'correct' investment allocation--is simply a restatement of the purpose of this analysis since it implies an adequate anticipation of supply consistency in the first place.

Finally, our very fornal method of describing the manifestations of a disequilibrium and possible policy measures--by discussing successive terms in the inequality--leaves the erroneous impression that these are truly alternatives in that one will, while the others will not, appear with a capital constraint. In all likelihood, the sort of disequilibrium described here in which too much productive capacity has been committed to consumer goods production and too little to investment goods would show up in all of these ways at once--there would be some 'stock piling' by the government and producers, there would be some change in saving rates through advertising and through tax leniency and there would, finally, be some idle plant capacity created by fiscal austerity. It is important to remember, too that in contrast to nicely static models, in a growing economy, these manifestations of disequilibrium will take the form of lower rates of increase rather than the more obvious form of absolute declines. The diffused effect of such supply inconsistencies and their manifestation in reduced incremental of growth makes this a particularly difficult subject for clear empirical testing.

F. Price Incentives and Fixed Coefficients

Finally, we must ask the question that is always pertinent to fixed-coefficient analysis, "why don't relative prices prevent or correct the problem of disequilibrium in the first place?" The question is valuable both as a check on the validity of fixed coefficient analysis and, second, in emphasising relative prices to see if government policies directly or indirectly establish price incentives that tend to compound, rather then remove, the problem.

The answer to the general question is the usual one--that changing relative prices should, indeed, tend to correct the situation but they are probably neither flexible enough nor do they induce a sufficiently fast response to be heavily relied upon in place of more direct policy measures. And in the present case this usual answer is made more compelling not only because investment response to present rather than future prices and conditions /22/ but also because of the inevitable lag in the appearance of the evidence of the investment misallocation that we have stressed in the discussion above.

More specifically, with either direction of disequilibrium, the price level of the scarce commodity would rise relative to that of the abundant commodity. In the case of excessive output of capital goods of the Soviet model,- excessive relative to saving preferences plus fiscal devices--the inflationary rise in consumer goods prices has been widely marked as the consequence of the policy. Indeed, the price rise coupled with either money illusion or a particular lag structure in changing prices and wages that redistributes income is necessary to reduce consumption demand. The result of this price rise, however, is an increased relative profitability of consumer goods production and therefore market pressure to reduce the proportion of investment allocated to capital goods. Such pressure makes the 'administrative' maintenance of the capital-baised investment allocation more difficult--as with the Soviet's own problems and apparently some of the 'bootleg' industrial development in Pakistan /5/. What we have is another instance, like supressing luxury consumption by the banning of luxury imports, in which administrative fiat creates price incentives that make the administration of that fiat increasingly difficult--though not necessarily either undesirable or impossible.

On the other side, where there has been excessive investment in the consumer goods sector, there is little doubt that it would, in time, tend to bring rising relative profits in the capital goods sector which would tend to correct the misallocation, by making investments there relatively more attractive (though it is impossible to guess what the effect of falling relative consumer goods prices would do to saving). The difficulty with a simple council of patience in this case not only that of timing mentioned above, but more importantly, that development policies themselves are likely to interfere with the process by which excess consumer goods capacity brings lower relative prices /18/.

This leads to other parts of the question on relative prices--whether misguided development policies may themselves actually create the problem of investment misallocation by creating and maintaining perverse price-profit incentives to investment allocation.

Even with this simple model, it is clear that those policies that seek to keep the price of capital goods low both to the buyers and to the producers serve not only to induce an inefficient factor mix among users of capital goods, but perhaps more important, to discourage capital goods sector investment by depressing real relative profitability of such investment. This is certainly a government policy that distorts relative prices tending to create the problem of inconsistency we have described. But, since trade does, in fact, perform a central role in most development policies, this cannot be adequately treated in a context of a closed economy so we shall have to return to the question in the next section.

III

Undoubtedly, in actual practice the major justification for the Harrod-Domar assumption of instant capital goods is foreign trade--that to the extent that there is a foreign market for a country's products, they cease to be specific in use and can be transformed, through trade, into either consumption or capital goods at will--wheat simply becomes machinery. So for an economy with ample trade opportunities, the whole question of specivity of investment in part II need not come up. That economy could invest entirely in consumer goods capacity and still avoid problems of consistency if those consumer goods were exported in exchange for capital goods. Mahalanobis has been widely criticised for depending so heavily on a closed model /2/. But the restrictions on unfettered trade that appear for the typical developing country seem sufficiently serious to allow us to introduce trade in a rather restrictive way at first, assuming that there is a fixed proportion of total domestic output that can be traded hence it is not variable either cyclically or over time.

A. The simplest model of an open economy

In modifying the model of Part II for an open economy, there are two major changes to be made. First, the income indentity becomes

$$(3.1) \qquad Y_t = C_t + I_t + X_t - M_t$$

and second, another category of production must be introduced to indicate that production for export, too, is specific in its use so that total domestic product is composed of

$$(3.2) \qquad Y_t = Y_{ct} + Y_{kt} + Y_{st}$$

where Y_{st} is production for export, with a production function like those for consumption

and capital goods,

$$(3.3) \qquad Y_{st} = \sigma_s K_{st}$$

And, assume that there is external trade balance so that

$$(3.4) \qquad X_t = M_t$$

This is an assumption that denies for the time being either saving by export surpluses or dissaving by capital inflows.

Now the pattern of use analogous to that in Part II is a bit more complicated since

$$(3.5) \qquad C_t = Y_{ct} + (1-a)\, Y_{st} - I_{dt} \qquad \text{and}$$

$$S_t = I_t = Y_{kt} + aY_{st} + I_{dt}$$

where a is the proportion of imports that are taken in the form of capital goods. As in the closed economy model, the marginal (and average) saving rate derive from the Harrod-Domar side is s and σ_s is the rate of growth of income in the plan.

Assuming, as before, that there was no consumer goods inventory investment in period t-1, required planned savings will be the same as in Part II. But the production constraint on saving becomes

$$(3.6) \qquad I_t = Y_{kt} + aY_{st} + I_{dt}$$

$$= \sigma_k K_{k(t-1)} + \sigma_k I_{k(t-1)} + a\sigma_s K_{s(t-1)}$$

$$+ a\sigma_s I_{s(t-1)} + I_{dt}$$

Since saving in time t-1 will cancel from both (3.5) and (3.6), it will leave

$$(3.7) \qquad \Delta S = s\Delta Y = \sigma_k I_{k(t-1)} + a\sigma_s I_{s(t-1)} + I_{dt}$$

as the increment to saving required to adhere to the planned rate of growth of income.. Again, the required saving function constraint is on the left hand side. But now the constraint on the right hand side includes both production and trade. Note, too, that since we deal with growing domestic income, hence expanding export production we must assume unchanged terms of trade.

The central policy question, once again, is what happens if, ex ante, the saving rate required for Harrod-Domar planned growth is greater than that allowed by the pattern of past investment, or

$$(3.8) \qquad \Delta S = s\Delta Y > \gamma_k I_{k(t-1)} + a\gamma_s I_{s(t-1)} \quad ?$$

Since there are now more terms on the right hand side of the inequality, there are more ways--more policies--to avoid the despised alternatives of accumulating consumer goods inventories or of reducing the left hand side and sacrificing the plan. Specifically, in addition to those of Part II, there might be

e. a reduction of the proportion of imports in consumer goods --an increase in a.

f. a shift of resources between capital goods and export sectors (even though the amount of investment allocated to them in sum remained constant) if there were a difference in capital productivity in the two sectors. It would pay to shift from export to capital goods if $\gamma_k/\sigma_s > a$ and the other way if not. Note that this puts an extra strain on the assumption of constant terms of trade since a decline in terms of trade could offset any advantageous increase in exports. Too, since, given a, both sectors are growth-productive in Mahalanobis' sense, it does matter how investment is allocated between them.

The other alternatives (a) through (d) from Part II remain except that we now consider increasing either σ_k or σ_s under alternative (c) and retroactive increase in the combined level of investment ($I_{k(t-1)} + I_{s(t-1)}$,) would imply a decrease of $I_{c(t-1)}$ in alternative (d).

B. Power-Khan on Import Substitution

This is the simplest statement of trade in the model, but it is adequate to illustrate the Power-Khan analysis /10, 18/ which has been important in influencing Pakistan's planners and, more generally, as a pursuasive application of a Mahalanobis model to the currently very important question of import substitution policies. Briefly they hold that a policy of import substitution, by inducing investment concentrated on consumption goods and further encouraged by low cost imported intermediate and capital goods, brings about an increase in total consumption goods availability (domestic absorbtion) and a deficiency, therefore, in domestic absorbtion of capital goods. In other words, the excessive domestic investment in consumption goods capacity (both as I_c and indirectly as $(1-\alpha)\ I_s$) through import substitution explains the inequality--the result is 'consumption liberalization' and reduced growth.

But the fact that aggregate inequality (3.8) serves to emphasise is that an import substitution policy that increases domestic consumption goods production cannot, by itself, create the problem of deficient capital goods capacity. The description of capital availability on the right hand side of (3.8) shows that capital goods can be had either by domestic investment in the capital goods sector as in Part II or by increasing the proportion of capital goods in imports. So the import substitution policy of Power-Khan and its excessive consumption goods availability needs <u>both</u> increased total domestic

production of consumption goods and failure adequately to offset that increase through shifts in α, the trade pattern. The important relationship, even in the import substitution analysis, is that of total consumption and capital goods relative to planned saving.

This emphasis on the total availability of capital goods helps to put the Power-Khan analysis of import substitution into the context of the general model. In order for the problem they describe to develop, it is necessary not only that there be an 'import substitution policy' that encourages domestic manufacture of consumption goods, but also that there be a complementary failure of trade and fiscal policy. If either (1-α), the proportion of consumption goods in imports (including intermediate inputs to domestic consumption goods, remember) or the availability of other, non-import-substitution domestic consumption goods were reduced, these could offset the increase in consumption goods brought about by the import substitution policy. What is important in forcing a violation of the planned saving targets is total domestic absorbtion of consumption and capital goods and not simply the behaviour of a part of the total.[7/]

7/ The corollary to this that we shall not pursue further is that studies of the domestic production (or absorbtion) of isolated consumption items can be suggestive of the Power-Khan phenomenon of consumption liberalization, but so long as they represent a small part of total consumption, they don't say much and only analysis of the total consumption pattern can. If we knew from other evidence in a particular case that unavailability of capital goods planned growth, then these individual commodity studies might suggest where the excessive consumption had been concentrated. But they can't be used the other way around to establish that, because domestic absorbtion of some consumption commodities increased greatly, there was therefore aggregate consumption liberalization and the planned growth was sacrificed through excessive consumption goods--unavailability of capital goods. A particularly heroic suggestion is that from growth of domestic absorbtion of isolated consumption goods the sacrifice of aggregate investment can be estimated /on these, see 4/.

In seeking generality, however, this view of the Power-Khan phenomenon goes too far. They were working in a real institutional setting--one that may be quite typical of the developing country--in which a shift from imports to domestic production like that induced by the import substitution policy may in itself influence the government's ability to control the domestic absorbtion of consumption and capital goods. This is, institutionally, the more important part of their argument. If the government had equal ease in controlling the pattern of absorbtion, regardless of the source of goods, then their analysis would be either vacuous or misleading--domestic production of a formerly imported consumption good should leave total absorbtion unchanged. But trade, itself, may be a control device. If it is easier for government to control availability of commodities that enter trade than of commodities from domestic production, then the shift in source of supply like that of import substitution will definitely change domestic absorbtion. If we accept the usual view that the fiscal mechanism that represses consumption is worked to its limits (given the political and social status quo), /9, et. at./ then any shift of supply from an easily controlled sector to a more intractible sector will lessen the government's over all control over consumption, hence decrease saving.

C. Control of Domestic Absorbtion through Trade.

Since the Power-Khan analysis has developed one of the most influential views in Pakistan planning (as well as in other recent studies of import substitution) and it represents one of the most effective uses of the Harrod-Domar/Mahalanobis models to date, it is worth a short digression on this central assumption of their analysis--the control of the composition of domestic absorbtion through trade. The question, of course, is not simply whether the composition of domestic absorbtion can be influenced

by trade policies per se, but, rather, what asymmetries make it easier for a government to control domestic absorbtion through trade than domestic channels. And, crucially, we are dealing with 'control of domestic absorbtion' as surpression of domestic absorbtion of consumption goods, as the previous analysis suggests.

The most important reason that traded goods are more easily controlled is, simply, knowledge. Trade transactions are more obvious to government agencies both because they involve (net, at least) an exchange transaction and because they are channelled through very specific locations, both physically and administratively. A State Bank is often the sole (legal) transactor in foreign exchange. Physically, there is a limited number of port, rail and air facilities through which significant volumes of goods can enter or leave the country. As for commercial channels, administration of foreign trade--rife as are international transactions with cumbersome security measures--is very often left to the few experts whose volume of business is sufficient to justify their specialized knowledge.

Chauvinism too probably plays a significant role in collecting information. The individual who would willingly concede the government's right to know of his purchase from a foreigner-- an outsider--may get strongly resistant and resent a requirement that he inform the state of transactions with his fellow citizens.

There is no doubt that black market currency exchange and smuggling play a part in the trade of many developing countries, but in very few is it likely that these produce a foreign trade sector as difficult to record in total as is domestic internal trade.

Chauvinism enters more importantly in the imposition and dicipline of

restrictions on freedom of action. Consumption suppression--whether through quantitative controls or through tax-tariff measures--involves a violation of preferences, an exercise of state coercion. On either simple grounds of democracy--since foreigners don't vote--or on more intangible grounds of a relative absence of compassion for foreigners, it is politically more feasible to tax or restrict foreigners than citizens. It's true, of course, that there are two parties to the foreign trade transaction and one of them is always a citizen who is made worse off, but he would loose with suppression of domestic production, too, so that leaves only the supplier. In foreign trade, the supplier is an outsider without vote or voice; in domestic production he is a citizen with vote and, possibly, a commanding voice. (This conveniently ignores questions of imperialism and international political-economic power).

Another important asymmetry between import and domestic controls lies in the easy use of quantitative restrictions on imports--the ability to specify imports by commodity. We have become so used to the fact of quantitative restriction, that it is worth pointing out that its effectiveness is dependent on the maintenance of an overvalued domestic currency. Only when there is excess demand for imports in general can their composition be arbitrarily changed by government policy in violation of preferences--if imports of consumption goods are to be surpressed within a given quantity of total imports, there must be excess demand for capital goods (given elastic world supplies of imports). The demand curve for foreign exchange will shift down and to the left as restrictions are increasingly placed on the uses to which that foreign exchange can be put. With a fixed supply of foreign exchange any overvaluation of the domestic currency could be eliminated by a sufficiently inappropriate (vis-a-vis

preferences) composition of allowable imports--if only lathes could be imported, there would be some demand for foreign exchange, but it would be much less than with free access to foreign goods. The corollary to this is that if a government has been using import controls as a way to control domestic absorbtion hence saving (in violation of preferences) an increase in export earnings should weaken this control over absorbtion and appear in the aggregate, ceteris paribus, as a reduction in savings even while domestic incomes were increased by the increased exports. This appears to have been the case when Colombia's coffee earnings increased sharply /23/.

A final reason that domestic absorbtion may be controlled more easily through controlling imports than through domestic controls is the feedback of an import substitution policy on the composition of imports. In its simplest form, an import substitution policy that invests only in consumer goods in the 'finishing touch' stage requires an import of intermediate goods almost as large as the 'substituted' consumer goods imports in order to support the now-domestic finishing touch industry. But on a naive scheme of classification, these would now be called intermediate goods and not consumption goods so that their suppression would no longer appear necessary. If intermediate goods were assigned to the category of final production they supported, this would not be a problem because their classification would not change. But the problem of "essentiality" would still exist. As consumption goods imports are replaced by imports of intermediate goods to support a domestic consumption goods industry, the imports become more "essential"--and properly so--in the eyes of regulators of trade. Thus an import substitution policy makes consumption goods complementary to domestic income and employment and makes aggregate consumption spending more difficult to control. A plastic hair curler is simply an item of consumption,

but polyethelyne cubes to make domestic hair curlers support domestic income and employment in the hair curler factories. In short, import can be treated harshly while domestic production of the same goods cannot.

On the export side, in the simple open model above, we left the product of the export sector quite vague--stating that it was neither consumable nor available for domestic capital formation, but could only be exported. This is in keeping with our assumption of absolute specivity of output. In fact, of course, export goods will be useable either as consumption goods or as capital goods (more generally, non-consumption goods, perhaps due only to absence of processing). Then the discipline of the Soviet forced draft model becomes pertinent once again. In the aggregate, people cannot consume if only capital goods are available. There can be no domestic absorbtion of exportable output for consumption purpose if the exportable output is not in the form of consumption purpose if the exportable output is not in the form of consumption goods. Production of beef for export is therefore more likely to increase domestic absorbtion of consumption goods (Argentina) than is production of raw jute (East Pakistan). In this case, the composition of output has an influence on the quantity of tradeable goods.

D. Prices

The price behavior that is to be expected if consumption goods capacity has been overexpanded in a closed economy has been described in Part II. This behavior is modified by an open economy in two ways: relative prices are influenced by national trade policies--tariffs and quantitative restrictions--and relative prices can be expected to change with changes in dynamic comparative advantage.

Certainly a policy of import substitution can affect relative prices of consumption and investment goods if it starts with the imposition of protection either through tariffs or through quantitative restrictions. These must raise domestic prices. If import substitution stresses protection of consumption goods, consumption goods prices will be raised initially relative to the prices of capital goods. In the closed economy, we could say that if there had been excessive consumption goods investment, one evidence of this would be a fall in the relative prices of consumption goods. But that no longer holds since the policy that induces the excessive investment in consumption goods in the first place may do so by raising prices. So we don't have any clearly implied direction of price movement. Only if the import substitution policy were carried out in nicely discrete stages--higher prices due to protection in Stage I, falling prices due to excessive supply in Stage II--would a well behaved pattern emerge.

The other problem--that of dynamic comparative advantage-- is simply that over periods sufficiently long to allow change in the investment composition, relative prices may change due to the working off of infant industry inefficiencies in an import substitution industry. Lower costs and greater overall efficiency may explain the fall in relative price /Lewis' Ch. I/ and not the industry's response to excessive capacity. So--to put it the other way around--neither increased efficiency nor excessive supply can be inferred with certainty from a decline in the relative price of consumption goods, considered alone. It is necessary to know, too, what has happened to relative inventory levels, to operating rates and excess capacity to determine which has the most important explanation of the relative price change.

Despite these problems of empirical inference from relative prices, one element of a Power-Khan import substitution policy emerges clearly--that it operates by making consumer goods prices unduly high and through excessive profits, induces excessive consumer goods investment--in other words, it complements and compounds the policy of 'keeping capital goods cheap' by further distorting investment incentives between the two sectors. Both policies belong clearly in that category of government actions that, through establishing rigged price incentives, tend to induce defficient capital goods capacity. It is worth noting, too, that even if infant industry cost reductions eventually lower the prices of these consumer goods, thus 'justifying' the import substitution policy on that score /12, Ch. I, again/, the consequent reduction in relative availability of capital goods may yet make it an ill advised policy.

IV

Part II developed a general model of consistency between saving and output requirements while Part III made the simplest modifications of the model consistent with an open economy and showed that the Power-Khan view of import substitution is theoretically only a variant of the general model--though pragmatically, it rests on apparently justified asymmetry in control of domestic absorbtion between imports and domestic output.

What is lacking in the open economy model of Part II, of course, is the further restriction on capital of the two-gap model--the recognition that there is a difference in the technical character of capital equipment according to its source, domestic or international. With this, the simple model of Part II can become a generalized two-gap model. If only foreign capital is required in fixed (or minimal) proportion of total investment, we have a McKinnon type two-gap model. If domestic capital is required in some minimal proportion, we have an analogy to the Tinbergen concept of national capital goods and the constraint they put on growth /21/. And in its most general form, we have

a 'four gap' model in domestic saving, foreign capital availability, domestic capital capacity or total capital availability can constrain growth. The happy confluence of all four of these in one grand equilibrium is, of course, still an uninteresting possibility.

A. The General Four Gap Model

The simplest and most useful way to describe these alternatives is in the notation and context of the models of Parts II and III. What must be added is specific technical requirements for capital equipment according to source.

Say that there is a minimum proportion, m, of productive (note) investment that must be, for technical reasons, in the form of foreign capital. Actual imports of capital goods will then have to be equal to or greater than that proportion so

$$(4.1) \qquad m \leq \frac{\alpha Y_{st}}{Y_{kt} + \alpha Y_{st}} \qquad \text{so that}$$

$$(4.2) \qquad m(S_t - I_{dt}) \leq \alpha Y_{st}$$

since $S_t = I_t = Y_{kt} + \alpha Y_{st} + I_{dt}$. Unproductive investment is supplied outside the two capital goods producing sectors.

In the same way, we can represent a minimum necessary proportion, n, of investment that must come from 'national capital' --that which must be domestically produced. By the same arguments,

$$(4.3) \qquad n(S_t - I_{dt}) \leq Y_{kt}$$

In these inequalities, again, the left hand side represents the technical and demand requirements (Harrod-Domar) while the right hand side embodies the restrictions on availability of capital (Mahalanobis) now specified as to source.

If, as in the McKinnon two-gap model, imported capital is the assumed constraint on growth, it means that, with $I_{dt} = 0$ and saving as required by the plan, the left hand side of (4.2) will, ex ante, be greater than the right, or

(4.4) $$mS_t > aY_{st}$$

In order for this to come to the necessary ex post inequality (4.2), the left hand side of (4.4) must be reduced or the right hand side increased or both. This suggests:

a. reduced dependence on foreign capital m, by changing technology

b. reduced saving, S_t so that less total investment takes place--which means sacrificing planned growth

c. increased inventory investment in consumer goods I_{dt}, since by assumption it has no foreign capital component--but this, of course, has all the disadvantages earlier attributed to it.

d. increased use of imports to acquire capital goods, a higher a

e. increased export earnings, Y_{st}.

Domestic saving capacity, S_t, is not the limiting factor here, nor is domestic capital goods capacity. If there is no substitutability between capital goods from two sources, $m + n = 1$ and the fact that $m(S_t - I_{dt}) > aY_{st}$ of necessity implies that $n(S_t - I_{dt}) < Y_{kt}$. Further if $m + n = 1$, then the only way that domestic saving can be the constraint is if m and n are, in fact, simultaneously satisfied--if capital is available in exactly the appropriate proportions. So assuming fixed domestic capital requirements along with fixed foreign capital requirements and giving the model no substitutability in either direction yields a reductio and absurdum of a two-gap model in which the domestic saving constraint can operate only under the very peculiar circumstances of a simultaneous three way equilibrium growth.

This is usually avoided, of course, by implicitly assuming an asymmetric substitutability--that foreign capital could always substitute for domestic capital, but that there is a limit to the degree of substitutability in the other direction /15/. Since we choose not to emphasise such an assymmetry, the substitutable proportion of capital can be represented by so that $m + n = 1$. Now, the domestic saving constraint can be binding--with such substitutability--so long as both

$$m(S_t - I_{dt}) < aY_{st}$$

$$n(S_t - I_{dt}) < Y_{kt}.$$

Even so, domestic saving may not bind since we are back to the simple open economy model of Part III which had not specification on the required sources of capital but did recognize that two sources exist. So the smaller is (m+n) and the less demanding is either capital source specification, the more likely that we will have a saving constraint with any given investment goods availability. But even if capital availability by source doesn't bind, the total availability of capital relative to total saving required for the planned growth still determines whether domestic saving or (total) capital availability is to be the constraint.

This is the essence of the 'four gap model' as a general phenomenon. More particularly, four familiar cases can be distinguished.

1. If $mS_t < aY_{st}$

   and $nS_t < Y_{kt}$

   while $S_t \leq aY_{st} + Y_{kt}$

then either domestic saving is the constraint growth or, under the harsh assumptions of absolute product (not capital source) specivity used in Part II, domestic saving is

forced up by the Soviet forced draft method of denying consumer goods.

2. If $m(S_t - I_{dt}) < aY_{st}$

and $n(S_t - I_{dt}) < Y_{kt}$

while $S_t > aY_{st} + Y_{kt}$

then domestic saving is adequate and the specific capital requirements are satisfied, but total capital availability constrains growth. As in earlier descriptions, $I_d > 0$ allows this to happen ex post. This is the Power-Khan case which leads to lower total saving--consumption liberalization--because too little capital equipment is available from all sources.

3. If $m(S_t - I_{dt}) > aY_{st}$

while there is adequate domestic capital supply and adequate aggregate capital then we have the usual two-gap model in which foreign capital availability is the constraint.

4. If $n(S_t - I_{dt}) > Y_{kt}$

while there is adequate foreign capital supply and adequate aggregate capital, then we have a national or domestic capital goods industry model in which domestic capital availability is the constraint.

B. A National Capital Constraint

Certainly a most significant insight for development policy that comes from the McKinnon two-gap model is the fact that the influence of marginal additions of foreign aid on a country's rate of growth will be greater when the foreign capital constraint binds than when the saving constraint binds. Aid-as-foreign equipment is more productive of growth than aid-as-supplement-to-domestic-saving when foreign equipment limits growth.

But McKinnon's model is entirely symmetric and simply by reversing the assumed constraint the potential importance of a national capital goods industry can be illustrated. When output of national capital is specified as a function of domestic income, all of McKinnon's results follow including, importantly, the fact that additions to the constrained input--now national capital capacity--are more productive than additions to capital-in-general.

It is tempting to dismiss this reversal of the two-gap model as little more than a gimmick. Experience from Marshall Plan to the present strongly supports that there is something special about foreign capital, but not about domestically produced capital. So a bottleneck model that rests implicitly on the import and importance of technically sophisticated foreigners' equipment is more appealing than one that depends on the less demanding domestic contribution to investment. The construction industry comes immediately to mind as a national capital goods industry and hardly suggests the likelihood of a domestic capital bottleneck.

But this overlooks the existence of domestic 'capital producing' industries in the more general sense--education, on the job training and locally relevant agricultural (and industrial) research and development capability /16/. These are both of domestic production and likely to be of inordinate importance in growth.

The major message of the usual two-gap model is that foreign aid can be disproportionately effective in generating economic growth. The major message of this reversal of the model is that aid can be disproportionately effective if it is appropriately allocated to domestic capital goods producing sectors. This is, of course, a 'Mahalanobis'

criterion for aid allocation since it stresses--like the two-gap model--the specivity of the product of existing capital equipment but it assumes--unlike the two-gap model--that there is limited domestic capital capacity. And, like both of these, its relevance depends on whether a country is, in fact, facing shortages of domestic capital producing capacity. That this seems a reasonable description of the important domestic capital industries of education and domestic research lends it importance.

V.

But the question that remains unanswered is whether there is evidence that the capital goods of supply constraint has affected the growth of the Pakistan economy. To that much more difficult issue this section is addressed. Despite its considerable importance, this is a question that has been answered in the past on the basis of some surprisingly casual tests. In supporting their view of an import substitution -induced capital goods constraint.

Power and Khan / / relied mainly on the fact that the domestic absorbtion of six particular consumption goods had grown faster than the income elasticity of their demand would have warranted. The shortcomings of this inference about a general growth phenomenon from so very limited a pie ce of evidence have been commented on above and the selection of a questionably representative base period from which to construct the "correct" time path of consumption has been criticised by Lewis and Soligo /14/. They on the other hand, held that there had not, in fact, been a deficiency of capital goods in the Pakistan economy because it could be shown that capital goods output had grown at a much faster rate than had consumption goods between 1954-5 and 1963/4. But this begs the critical question of the size of the base from which each

sector's growth rate is measured--it neglects the fact that the issue is one of adequate allocation of investment between the sectors, not of their growth. Capital goods might be growing at a very fast rate, indeed, yet still not be adequate in relation to requirements.

A. The Symptoms of a Capital Goods Constraint

Since we have stressed that a capital constraint is not apparent as such, ex post, it is understandable that the presence or absence of this constraint has been judged on such incomplete evidence. But the more detailed model we have developed provides for a less haphazard examination of the evidence since it suggests that a number of related phenomena should emerge in an economy that is running into a capital goods constraint.

The list of clues that indicate a binding capital goods (Mahalonobis) constraint is, in part, a recapitulation of the conclusions of Part II. Despite the sophistication of Parts III and IV, the empirical tests must rest largely on the simplest model ignoring these modifications. If a capital constraint limits an economy's growth:

1. The rate of growth of income will be relatively low
2. Its marginal domestic savings will be relatively low
3. The structure of production will show relatively little production of capital goods compared with consumption goods--though, because of the gestation period current production relationships describe previous investment relationships
4. Excess capacity will be greater in consumption goods than in capital goods

5. Inventories will be higher in consumption goods than in capital goods.

6. The relative price of consumption goods will be low or falling

7. Income tax and indirect tax collections on consumption goods will be relatively low.

In case of the Soviet pattern of too much capital goods investment--or during the correction of a period of too much previous consumption investment each of these would be reversed.

These symptoms are of three sorts--and should be accorded different degrees of seriousness in establishing the existance of a capital constraint. Clearly the first three--growth rate, savings and industrial structure-- are critical to any hypotheses about capital constrained growth and therefore it is reasonable to insist that all three support any empirical assertions that capital shortage has in fact limited growth. The next three--relative prices, excess capacity and inventories--obviously constitute a set of alternatives, since a supply shift, given demand, could be absorbed by any or all of them and to the extent that one has appeared-- say a change in relative prices--the others need not. So for these, we should expect mixed evidence even if we were certain (somehow) of the working of a capital constraint. Finally, tax changes are a plausible policy response to capital constraint .--one that has been previously suggested for Pakistan /10, 13/ but there is no a priori reason that this response must appear with capital limited growth.

In addition to this much more systematic set of symptoms of a capital constraint, the importance of time in the earlier formal analysis stresses the need for treating different periods in Pakistan's development differently. If we insisted on treating its history as one single period since 1950, the fact is that , despite the expanded set of clues, there really

is no clear evidence one way or the other of a capital constraint that has affected the Pakistan economy. But treating three separate stages, it appears that there was a capital availability constraint to growth in the period of the first plan but that constraint did not limit growth either in the pre-plan period between 1950 and 1954 or during the second Plan of 1960-65. This "three stage" hypothesis--that the capital constraint did, in fact, limit growth but only during the later half of the 1950's--is strongly supported by the data. This means, interestingly, that the Power- Khan assertion is correct that capital availability constraint was present--in the first plan period that they described--while the Lewis-Soligo allegation of adequate capital goods availability is also correct--for the second plan period with which they were primarily concerned. Finally, treatment of separate periods gives significance to the otherwise vague relative descriptions of capital constraint evidence listed above--a "relatively low" income tax, for instance, is judged against the other periods, not against some arbitrary standard of correctness.

B. The Basic Evidence

The "three-stage" hypothesis is strongly supported by the basic tests--the patterns of Pakistan's rate of growth of income, gross saving and industrial structure all indicate that growth during the First Plan period was slowed down by the availability of too little capital goods and too much consumption goods capacity.

1. The rate of growth of gross national income. Estimates of income growth are available for all three periods and are shown in Table 1. Despite problems of the accuracy of such estimates, it is hard to doubt the widence of the pattern of growth--that the rate of growth was significantly lower in the First Plan period than in either Pre-plan or Second Plan period. Taken alone of course, this fact is amenable to many explanations. But we

are not taking it alone and what is critical here is that this pattern of growth is entirely compatible with the three-stage hypothesis.

2. Gross Domestic Savings

The pattern of saving in the three periods gives, perhaps, an even stronger indication of an operative capital constraint during the first plan period. As shown in Table 2, the marginal rate of Gross Domestic Saving reported in the Third Plan /17, Table 7, p. 7/ starts at very high levels in the pre-plan period; falls to a negative value during the first plan period and then roughly regains its former level during the Second Plan. These are quite consistent with a capital availability constraint in the second period that is manifested as a reduction in the saving rate. But it is difficult either to say much more or to say enough about the importance of this evidence.

Average saving as a percent of GNP fell from 6.8% to 5.9% by the end of the first plan period and recovered to 9.5% in 1964-65.

3. The Structure of Industrial Output

Probably the most significant basic evidence in support of the hypothesis comes from the pattern of growth of industrial output. Lewis and Soligo, as mentioned above, found in these data basis for dismissing the capital constraint because the capital goods sector had grown at a faster rate than the consumption goods sector over the 1954-5 to 1963-4 period and over both the first and second plan periods considered separately. Lewis and Soligo's conclusions were based on the apparent assumption that all sectors "should have" grown at something like the same rate since they saw higher absolute growth rates for capital and intermediate goods as indicating that their growth was not inadequate or even that these

sectors were "performing quite remarkably" /14, p. 103/. But this criterion fails to use a good deal of what we know about the way industry structure changes with growth.

TABLE - 1

Rates of Growth of Gross National Product

Annual Rates Compounded*

1949 - 50 to 1954 - 55	1954 - 55 to 1959 - 60	1959 - 60 to 1964 - 65
1.67%	0.19%	2.34%

Source: CSO Monthly Statistical Bulletin, Vol. 14, No. 8, August, 1966, pp. 1344-5

* Gross National Product at Constant Factor Cost 1959-60.

TABLE - 2

Gross Domestic Saving

	1949-50	1954-55	1959-60	1964-65
Average Saving as % GNP	4.6	6.8	5.9	9.5
Marginal Saving	22.7	-1.4	21.8	

Sources: Govt. of Pakistan, The Third Five Year Plan, Table 7, p. 7.

It appears from studies like Chenery's "Patterns....." /3/ that increases in population and per capita income, like those that occured in Pakistan over the period, would quite naturally bring a shift in the composition of industrial output in favor of capital and intermediate goods at the (relative) expense of consumption goods. In other words, the general growth rates Lewis and Soligo found are necessary for the change in pattern that is to be expected and, in themselves shed no light on whether capital goods production grew "too fast" or "not fast enough". This question, as it has been posed here, must be judged not in simple terms of rates of growth compared with each other, but against those different rates of growth that change the structure as is expected with development.

Recognizing the danger of making too much of such a standard, we can compare the growth of consumption, intermediate and capital goods sectors in Pakistan against those relative rates of growth that would appear in a country typical of Chenery's international study. Chenery reports the elasticity of output with respect to per capita income (a "growth elasticity") for consumption, investment and intermediate sectors as well as an elasticity of production with respect to population (a "size elasticity")[f]. These are constant elasticities so they can be used with the actual growth of per capita income and population in Pakistan to give an estimate of the rate of which each sector would have grown if Pakistan industry were entirely typical of Chenery's sample. The results are given in Table 4 for the dates of the Lewis and Soligo data.

---

f. Chenery's Table 5 reports size elasticities by industry but not by use category /3/. We used simple averages of these for each category.

It appears, not surprisingly, that all sectors of Pakistan's industry have grown at rates far in excess of these "typical " rates. The important measure however, is again not the absolute growth rate of any sector, but its growth rate relative to other sectors. Therefore standard growth rates computed with Chenery's elasticities and Pakistan's income and population growth can be reduced to standard relative rates of growth. We find that for a country with Pakistan's income + population, the capital goods sector "should" have grown 1.7 to 1.8 times as fast as the consumption goods sector while intermediate goods should have grown 1.4 to 1.5 times as fast as consumption goods. These "standard" relative growth rates are given for each period in column--on their bases it is possible to judge whether capital goods have actually grown "too slowly" relative to consumption goods.

It emerges clearly that over the whole period the actual rate of growth of the capital goods sector in Pakistan has been quite high. Against the standard by which capital goods should grow, 1.7 to 1.8 times as fast as consumption goods, Pakistan's capital goods sector has grown more than twice rate as fast as consumption goods . But in the two separate sub-periods for which we have data a very different picture emerges. In the First Plan period the rate of growth of capital goods was much below standard--only 1.5 times the rate of growth of consumption goods. Put the other way around, consumption goods grew at distinctly too fast a rate in the 1954-59 period. The rates of growth on which Lewis and Soligo based their judgement do show that capital goods grew at a faster rate than consumption goods in this period; but, to put it awkwardly, that rate is not as much faster as it should have been.

In sharp contrast, during the second plan period from 1959-60 to 1963-64 there

is a very high relative rate of growth of the capital goods sector in Pakistan. Against a standard of 1.77 times the consumption sector growth rate, the capital goods sector grew 2.1 times as fast.

As for intermediate goods in Pakistan, they have consistently grown at a slower rate relative to consumption goods than would be expected from the standard, though only in the second plan period does this deficiency appear to be significant. This difference, however, reinforces our conclusion that there was too much incremental consumption goods output in the first plan period.

TABLE - 3

Income and Population Growth

	1954-5		1959-60		1963-4
Per Capita Income (Current)	240		318		379
% Change		33%		19%	
Population (lakhs)	882.6		988.6		1095.6
% Change		12%		11%	

Source: CSO Monthly Statistical Bulletin, August, 1966, Vol. 14, No. 8. pp. 1344-5.

TABLE - 4

Industrial Structure
"Standard" (and Actual) Growth of Industrial Output for Pakistan

	Sectoral Growth (percent)			Relative Rates of Growth[c]	
	Consumption	Intermediate	Capital	Capital/ Consumption	Intermediate/ Consumption
A. 1954-5 to 1959-60					
Growth Contribution from: Income[a]	44%	57%	74%		
Population[b]	1%	6%	3%		
Total	45% (130%)	63% (176%)	77% (199%)	1.71 (1.53)	1.40 (1.35)
B. 1959-60 to 1963-4					
Growth Contribution from: Income	25%	33%	43%		
Population	1%	6%	3%		
Total	26% (62%)	39% (80%)	46% (131%)	1.77 (2.11)	1.50 (1.29)
C. 1954-5 to 1963-4					
Growth Contribution from: Income	77%	100%	130%		
Population	2%	13%	7%		
Total	79% (274%)	113% (398%)	137% (591%)	1.73 (2.16)	1.43 (1.45)

(source on next page)

Sources (Table - 4 , page 45): (a) Chenery's per capita income elasticities are 1.32, 1.72 and 2.24 for consumption, intermediate and capital goods respectively / Table 6, p. 642/. These were multiplied by the growth figures of Table 3 to derive those entries.

(b) Size elasticities are simple averages of the industry size elasticities in Chenery's Table 5 / p. 638/.

(c) Actual rates of growth computed as in Winston/MacEwan / /. Current prices.

The important fact that appears in this comparison of growth rates and industrial structure is that the rate of growth of the capital goods sector is clearly deficient by reasonable standards during the first plan period and, equally clearly, it is quite high during the second plan period. So the pattern of industrial output lends strong and essential support to the hypothesis that Pakistan ran against a capital constraint to growth in the first plan period that was subsequently removed by substantially increased domestic production of capital goods in the second plan period.

C. Alternative Responses to a Capital Goods Constraint

The three possible manifestations of excess supply in the consumption goods sector--a relative capital goods shortage--are those listed above as symptoms numbered four through six. Relative to capital goods, there is more excess capacity in consumption goods; consumption goods inventories rise and their relative prices fall. In the second plan period, a recovery from excessive consumption goods investment should have reversed each of these. These three symptoms should be considered together since they are substitutes.

4. Excess Capacity

Pending publication of a recent study of excess industrial capacity by the Central Statistical Office (which is the subject of a future Institute study), a rough but useful

indication of its structure can be had from a private industrial survey in which some data, relating to the industrial distribution of capacity utilization were collected. From sixty-two firms, estimates of the percent utilization of existing one shift capacity were collected for four periods between June-December 1963 and June-December 1965. The data are presented in Appendix A.

The primary fact that these data convey is that there was a sharp increase in capacity utilization in general during this period. But what is most interesting for the question of an operative capital goods constraint during the First Plan is that within this significant trend of increasing utilization of industrial capacity (most persuasively attributed to import liberalization /24/,) there is a systematic pattern in the distribution of excess capacity--capital goods capacity is at no time as fully utilized as is consumption goods capacity. Since the data pertain only to the third of our three stages--to the Second Plan period (and only to part of that)--in which we have hypothesised a relatively free availability of capital goods and the absence of capital goods constraint, this distribution of excess capacity is compatible with the hypothesis, having overcome the capital capacity shortage of the First Plan period, the capital goods industry suffers relatively the greatest excess capacity in the Second Plan Period.

But it would be easy to make too much of this evidence for two reasons: (a) we know nothing as yet about how this structure of excess capacity compared to either of the earlier periods and (b) relevant to this, during the period for which we have data, the utilization of capital sector capacity increased faster than that of consumption sector--which is not what our hypothesis would suggest. These results are summarized in Table 5.

TABLE- 5

Industrial Capacity Utilization by Sector

% one shift capacity

	1963 July-Dec.	1965 July-Dec.	% change 1963-1965
Consumption Goods	68.3	92.7	35.7
Intermediate Goods	58.2	89.0	52.9
Capital Goods	50.8	76.4	50.0
Relative Utilization Rates: Consumption/Capital	134.4	121.0	

5. Inventory Accumulation

If our three stage hypothesis is correct, inventories of consumer goods should have been high relative to capital goods inventories in the First Plan period and declined, relatively, in the second or, less precisely, since consumer goods looms large in total production, total inventories should rise from first stage to second and then decline in the third. Data on which to test assertions about inventory movements are of course notoriously bad. However, from both of the sources for which we have inventory data in some meaningful form, the pattern of the three stage hypothesis is reasonably supported.

The study of corporate saving in Pakistan /1/ based on analysis of the balance sheets of publicly listed corporations was only peripherally concerned with inventories, however it gives some indication of the behavior of inventories within this important group of industries and, with a crude grouping of the reported industries by their product using sector, a

suggestion of the pattern of change in relative inventories between consumption, intermediate and capital goods. Unfortunately, these data cover only the five year period 1959 through 1963 so they cannot indicate whether there was an increase in relative consumption goods inventories between Pre-plan and First Plan, but only whether there was a decrease between First and Second Plan periods.

The data summarized in Table 6 indicate clearly that consumer goods inventories decreased quite significantly between 1959 and 1963 while capital goods inventories increased and intermediate goods inventories remained relatively constant. All figures in Table 6 are averages of inventories as a percent of Gross Fixed Assets--in other words, the percentage inventory figures have been weighted by the size of the company's included in each category. /It should be noted, that whether textiles are included in consumption or intermediate goods does not change this pattern though it does, of course, make the decline in consumption goods inventories less dramatic./ The important fact in Table 6 is the direction of movement--that capital goods inventories have increased while consumption goods inventories have diminished--and not a comparison between their levels which would be most difficult given the very different nature of their manufacture and distribution.

The second and much weaker kind of inventory evidence is that aggregate stock changes show a pronounced increase from Rs. 30 million in 1945-50 to Rs. 430 million in 1959-60 which is then reversed with a fall to Rs. 250 million in 1964-5. /17, Table 4, p. 4/ Since consumption goods loom so large in the total economy, these figures appear quite consistent with the three stage hypothesis.

6. Relative Prices

The third alternative adjustment to excessive consumer goods capacity may be a fall in relative prices of consumption goods. The three stage hypothesis holds that consumer goods prices in Pakistan should have (a) fallen relative to capital goods prices between the pre-plan Period and the First Plan period and then (b) risen relative to capital goods prices between First and Second Plan periods as the overproduction of consumption goods was corrected.

Lewis' figures /11/ provide price data from which a set of sectoral relative prices can be generated for 1951-2 to 1963-4. The three year moving averages of Table 7 show the behavior of relative prices over the period for East and for West Pakistan separately. The movement are similar in both wings--though more pronounced in the East. They lend both support and doubt to the three stage hypothesis.

TABLE - 6

Sectoral Inventory Levels
(as % of Gross Fixed Assets)

	1959	1963
Consumption Goods	84.6	44.4
Intermediate Goods	28.9	28.4
Capital Goods	42.1	54.9

Source: Baqai, M. "A Study of Savings in the Corporate Sector in Pakistan, 1954-63" Tables pp. 25-35.

The movement of prices between the Pre-plan and First Plan periods is clearly in the direction implied by our hypothesis--the prices of consumption goods fell significantly between the Pre-plan period and the first plan period. But the movement between First and Second Plan periods does not support the hypothesis since there was a continued downward drift in consumption goods prices where there should have been--if the hypotheses were to be consistently supported--a rise in consumption goods prices at this time. Whether this inconsistency means that we have reason to doubt the three-stage hypothesis or whether it simply suggests that either inventory accumulation or the level of excess capacity maintained in the capital goods sector during the Second Plan period was enough to prevent the expected rise in consumer goods prices is a question we cannot answer.

D. Policy Responses through Taxation

7. Taxes

It is well to remember that, as evidence of a capital constraint, taxes differ from the other symptoms discussed above in that their behavior is not necessarily connected with a shortage of capital goods. Instead, tax changes are a possible policy response that might be induced by a capital goods constraint, but need not be.

If taxes in Pakistan have responsed to the capital goods constraint, we should under the three stage hypothesis, expect that both income taxes and indirect taxes on consumption goods would fall during the first plan period--in response to the excess capacity in consumption goods--and rise during the second plan period--as this capacity imbalance was corrected. This pattern would appear in income taxes, in indirect taxes on consumption goods, or in both. Income taxes would be judged high or low relative to other periods of time; indirect taxes on consumption goods would be judged high or low relative to such taxes on investment goods.

7a. Income taxation

A study of Pakistan income taxation since Partition by Abdur Rab /20/ provides some basis for judging the behavior of these taxes in the three periods. While collections from income taxes have grown in absolute value during the three periods, there has been an apparent decrease in income taxes relative to total income. This decrease within a progressive rate structure has been the result of changes of the rate structure itself and changes in the definition of taxable income. Combined, these were sufficient to offset the combined rise in prices and real incomes during the period. As a rough estimate of the influence of these sources of decline in relative income tax collection--and more particularly as a way to judge the pattern of exploitation of income tax potential over time--we have compared actual tax collections with "potential" collections for the years 1952-3, 1954-5, 1956-7, and 1959-60 (the last year for which the data can be had.). "Potential" income tax collection was calculated simply as that tax which would have been generated by the rates effective in 1949-50 had the total income earned in each income braket increased at the same rate as did manufacturing income.[9]

The Results are shown in Table 8.

The pattern of income taxation in table 8 is compatible with the hypothesis that the government encouraged consumption expenditures during the first plan period by

---

9. This estimate of "potential" tax assumes that income and exemption allowances of tax payers in each income bracket maintained the same relationship while total income earned within the bracket increased--at its simplest, with unchanged set of exemptions and rates, the income of each bracket would expand by multiplication of identical taxpayers in that group and not by increase in the incomes of the taxpayers. This is wrong, of course, but it makes a simple computation possible--without the need to adjust for movements between tax brackets, hence between effective marginal tax rates. The results are doomed suggestive, nonetheless.

TABLE - 7

Consumption and Capital Goods Prices
Consumption Good, Price index as % Capital Goods Price
(3 year moving average base 1954-60)

	West Pakistan	East Pakistan
1951-2	.821	-
1952-3	.977	1.162
1953-4	1.196	1.482
1954-5	1.074	1.487
AVERAGE	1.017	1.377
1955-6	.964	1.027
1956-7	.925	.957
1957-8	.976	1.004
1958-9	1.002	.966
1959-60	1.000	1.000
AVERAGE	.973	.989
1960-61	1.019	.894
1961-62	.989	.858
1962-63	.907	.909
1963-64	.894	.877
AVERAGE	.952	.884

Source: Lewis Appendix C. /11/.

reducing tax collections relative to the 1949-50 base. The decline from 100% in 1949-50 to about 60% in 1954-5 and 1956-7 certainly bears this out. Further, the subsequent increase in relative taxation that shows up in the 1959-60 period, at the beginning of the Second Plan is quite compatible with a redress of the consumption goods imbalance that allowed an increased exploitation of the income tax potential. So these figures might suggest a government response through income taxes to excessive consumption investment (and its correction).

However, these figures are also inkeeping with the simpler and more likely hypothesis that a gradual and consistent errosion of income taxes was stopped by the political revolution of 1958 and that these figures simply reflect the seriousness with which the new administration pursued an objective of economic growth with its concomitant demands on all sources of taxation.[10]

TABLE - 8

Income Taxes
Actual and "Potential" Collections
(Base 1949-50)

	1949-50	1952-3	1954-5	1956-7	1959-60
Actual Collections as % of "Potential"	100%	78%	58%	61%	70%

Source: Tax rates and taxable incomes from A. Rab unpublished work sheets /20/. "Potential" tax collections were computed by applying 1949-50 tax rate to that income which would have been generated in each bracket had income expanded since at 1949-50 at just the rate of manufacturing income.

10 This has been widely noted /25/.

7b. Indirect Taxation

An even less clear picture emerges from the data on indirect taxation of industrial output by use. Starting from the Lewis and Quereshi data on excise and sales tax collections on domestic output /13/, reclassified by use[11], the levels of indirect taxation for consumption, intermediate and capital goods manufacturers were calculated for 1954-5, 1959-60 and 1962-3. To give these absolute quantities meaning, they have further been reduced to annual rates of growth and, in Table 9, compared to the corresponding annual rates of growth and, in Table 9, compared to the corresponding annual rates of growth of output for (almost) the same periods.

It is certainly borne out by these comparisons that indirect taxes over both periods grew less rapidly than did output (with one very important exception) as noted by Lewis and Quereshi /13, p. 500/. But this is not the most important fact for present purposes, since ours is a question of the pattern of taxation of consumption goods relative to capital goods. We should expect with those stage hypothesis, taxes on consumption goods to fall during the First plan period and rise during the Second Plan Period. But they didn't, while all taxes grew slower than output in the First period taxes collected on capital goods increased very much faster than did capital goods output during the second Plan period. This is the important exception to the Lewis and Quereshi generalization that output outran tax collections. If we can trust the figures, this implies that either the rate and coverage of indirect taxes on capital goods production were sharply increased during the second plan period or Less plausibly that the structure of production within the

---

11 Again using the Winston-Mac Ewan classification /27/.

TABLE - 9

	1954-5	1959-60	1962-3
A. Indirect Tax Collections: (a)			
Consumption Goods	219,579	437,545	571,017
Intermediate Goods	31,565	54,481	77,554
Capital Goods	6,598	15,413	60,944
TOTAL	257,742	507,439	709,515
B. Annual Rates of Growth of Taxes (and of output (b))			
Consumption Goods	14.8 (18.1)	9.4 (12.8)	
Intermediate Goods	11.6 (22.3)	12.4 (16.2)	
Capital Goods	18.5 (24.8)	158.1 (23.2)	
C. Percentage Shares of Total Taxes (and of output)			
Consumption Goods	85.2 (79.8)	86.2 (76.0)	80.5 (71.6)
Intermediate Goods	12.2 (11.4)	10.7 (13.0)	10.9 (13.4)
Capital Goods	2.6 (8.9)	3.0 (11.0)	8.9 (14.8)

Source: (a) Lewis and Guereshi /13, p. 514/ classified by /27/.
(b) /14/

---

capital goods sector swung radically toward highly taxed commodities. Either way, there is little here to support the contention that consumption goods were relatively lightly taxed during the First Plan period or that capital goods were relatively lightly taxed during the Second Plan . Neither appears to be the case. Part C of Table 9 explains, if it doesn't rationalize, this sharp increase in indirect taxation of capital goods manufacture in the Second Plan as a step to force the capital goods sector to share more equally in indirect taxes. Though their favored treatment is still evident in 1962-3--where, with 14.8% of output; they paid only 8.9% of the tax--it is far less than in the earlier periods.

Too, the question of relative taxation is answered another way in Part B. If the government had offered tax concessions to induce utilization of excessive consumption goods capacity, it should have reduced relative taxation of consumption goods capacity, it should have reduced relative taxation of consumption goods. Instead it was increased and in the Second Plan the consumption goods sector provided 76% of industrial output while paying 86% of these indirect taxes; the capital goods sector produced 11% of the output and paid 3% of these taxes.

So it appears that the government did not take the easy way, responding to excess consumption goods capacity by favorable taxation of domestic consumption goods manufacture. In fact, the opposite case could be made--that it (wisely) continued to induce capital sector investment by very favourable tax treatment in that sector and, what's more, made these concessions most attractive during the First Plan period when over-expansion of consumption goods was (by our hypothesis) a most serious problem. The government began to eliminate these tax incentives as the imbalance was corrected. This may be a too sophisticated a reading of the government's motives and understanding, but the tax pattern that appears certainly was the correct one for an appropriate investment allocation.

Summary

Table 10 brings together the results of this examination of capital constrained growth in the Pakistan economy. The items of evidence we have explained are summarised (where there were data) in the table. Those that support the three-stage hypothesis are distinguished by italics. Those that either fail to support the hypothesis or cast doubt on it are in roman type.

TABLE - 10

Summary Evidence of a Capital Constraint

	Pre-plan	First Plan	Second Plan
A. Basic Evidence			
1. Rate of growth of Income	falling	rising	
2. Savings	high	low	high
3. Structure of Output; (C/K)	rising	falling	
B. Alternative Responses			
4. Capacity Utilization (C/K)	-		high (but falling)
5. Inventories (C/K)	-	falling	
Inventories aggregate	rising	falling	
6. Prices (C/K)	falling	falling	
C. Policy Responses			
7. Taxes: Income	falling	rising	
Indirect (C/K)	rising	falling	

It is difficult from these data not to accept that the Pakistan economy encountered a capital constraint which seriously limited its growth in the first plan period. The importance three symptoms of capital constrained growth all behave in accordance with this hypothesis. The alternatives of price change, inventory accumulation and differential excess capacity are not so uniform, but seem on balance to indicate the existence of a

capital goods capacity shortage in the first plan period. Finally , the tax evidence probably says that tax liberalization as part of an overall consumption liberalization was not a policy followed by the Pakistan government even when the capital goods constraint was most binding and consumption goods in most generous supply. Certainly, income tax collections were loose during that period, but the structure of indirect taxation ran quite contrary to such a policy.

VI

The first parts of this paper have developed a series of increasingly detailed, but still quite simple, models of economic growth that combine with the orthodox Harrod-Domar model that stresses income allocation, the restrictions of a Mahalanobis model with its emphasis on the availability of capital goods. The purposes of this analysis have been twofold; to show how and under that circumstances the composition of output--the relative availability of capital and consumption goods--can influence the rate of economic growth; and to specify, as the basis for empirical study, the symptoms that would appear is capital goods availability did, in fact, limit growth.

The last part of the paper is an empirical study of the Pakistan economy which strongly suggests that the rate of economic growth was slowed down during the first plan period 1955-59, by a (relative) scarcity of capital goods--an overabundance of consumption goods. However, no such constraint appears to have operated in either the pre-plan or the second plan periods. No study can yield "conclusive" results, expecially when the basic imbalance as such appears only ex ante, but short of certainty, the evidence of three separate stages in Pakistan history seems clear.

So we have shown that the composition of output can, in theory, limit a country's growth and, in Pakistan, that it appears to have done so. But this has served to raise the further and perhaps more important question of why or how Pakistan was able to correct a serious deficiency in relative capital goods production between the first and second plan periods. It is tempting to speculate on the answer--to guess at the relative importance of "market forces" or fortuitous tax policies--but we won't indulge in such guesses here since any useful answer requires a good deal more study.

REFERENCES

1. Baqai, Moin, "A Study of Savings in the Corporate Sector in Pakistan, 1954-63," (mimeo), Karachi, 1965.

2. Bronfenbrenner, M., "A Simplified Mahalanobis Model," Economic Development and Cultural Change, October 1960.

3. Chenery, Hollis B., "Patterns of Industrial Growth," American Economic Review, September, 1960.

4. Desai, V. V., "Import Substitution, Growth of Consumer Goods Industries and Economic Development," (mimeo), Bombay, 1966.

5. Durani, Tariq, "The Pattern of Private Industrial Investment in Pakistan During the Second Five Year Plan Period (1960-65)," Research Report No. 54, Pakistan Institute of Development Economics, May, 1966.

6. Ezekial, Hannan, "A Comment on Bronfenbrenner's Simplified Mahalanobis Model," Economic Development and Cultural Change, April, 1966.

7. Frankel, Marvin, "Producer Goods, Consumer Goods and Acceleration of Growth," Economic Journal, December, 1961.

8. Goodwin, R. M., "The Optimal Growth Path for an Underdeveloped Economy," Economic Journal, March , 1961.

9. Heller, Walter W. "Fiscal Policies for Under-developed Countries," in Bird, R and Oldman, O., Readings on Taxation in Developing Countries (Johns Hopkins Press; Baltimore; 1964), pp. 3-30.

10. Khan, Azizur Rahman, "Import Substitution, Export Expansion and Consumption Liberalization: A Preliminary Report," Pakistan Development Review, Summer, 1963.

11. Lewis, Stephen R., Jr., Relative Price Changes and Industrialization in Pakistan, 1951-1964. Statistical Paper, No. 3, Pakistan Institute of Development Economics (forthcoming).

12. Lewis, Stephen R., Jr., Economic Policy and Industrial Growth in Pakistan, Monograph (forthcoming).

13. Lewis and Guereshi, Sarfraz Khan, "The Structure of Revenue from Indirect Taxes in Pakistan," Pakistan Development Review, Autumn, 1964.

14. Lewis and Soligo, Ronald, "Growth and Structural Change in Pakistan Manufacturing Industry, 1954-1964, Pakistan Development Review, Spring, 1965.

15. McKinnon, Ronald, "Foreign Exchange Constraints in Economic Development and Efficient Aid Allocation," Economic Journal, June, 1964.

16. Mellor, John, The Economics of Agricultural Development. (Ithica; The Cornell University Press; 1966).

17. Pakistan, Planning Commission, The Third Five Year Plan, 1965-70 (Karachi; Interservices Press Limited; March, 1965).

18. Power, John H., "Industrialization in Pakistan: A case of frustrated take-off?" Pakistan Development Review, Summer, 1963.

19. Power, John H., "Import Substitution as an Industrialization Strategy," (mimeo) Quezon City, September, 1966.

20. Rab, Abdur, "Income Taxation in Pakistan," (PhD dissertation in preparation)

21. Sanders, Martin, "The Semi-Input-Output Method: A Comment and an Extension," Pakistan Development Review, Summer, 1966.

22. Scitovsky, Tibor, "Tow Concepts of External Economies," Journal of Political Economy, April, 1954.

23. Sheahan, John, Imports, Investment and Growth: Colombian Experience Since 1950", (mimeo), Williams College, March, 1966.

24. Thomas, Philip, "Import Licensing and Import Liberalization in Pakistan," Research Report No. 38, Pakistan Institute of Development Economics, Karachi, February, 1966.

25. Waterston, Albert, Planning in Pakistan, (Johns Hopkins Press; Baltimore; 1963).

26. Winston, Gordon C., "A Note on Saving as a Public Good," (mimeo), Williams College, 1966.

27. Winston, Gordon C., and MacEwan, Arthur, "A Note on the Use Classification of Four Digit Industries or How to Call a Spade a Spade," Pakistan Development Review, Winter, 1966.