Consumer Goods or Capital Goods—Supply Consistency in Development Planning

by

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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, and second, to suggest the value of a more general version of the "two-gap" model [11]. An empirical application of this analysis, to be published separately, will look at these supply relationships and their influence on Pakistan's development. The argument of the paper is simple and not unfamiliar. To the extent that installed capital 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 national income. As this constraint of insufficient physical capital is softened by trade, a foreign exchange constraint may enter. Part I sets the context by broadly contrasting the Harrod-Domar and Mahalanobis 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 specificity of capital sources in a 'four-gap model'.

I

It is inaccurate, unfair, and quite useful at the outset to present caricatures of the two models. The Harrod-Domar view of economic growth assumes that the dominant fact is Keynesian *saving-consumption* *'preferences'* (in quotes since they may be the result of taxation, income redistribution, or inflation [7; 19]). 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— both generate income and increased saving.

The question that Harrod-Domar ignore is the source or availability of investment goods which productive investment spending requires. The concentration of attention 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 dominant 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 [1; 4].

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 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* such inequalities must have been reduced to accounting identities—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 alternative 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 an economy's growth rate has been limited by such a constraint—a debatable (and debated) question in the recent past of Pakistan for one [8; 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 judgement 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 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 [7] than are problems due to supply specificity. Income allocation problems do not need the emphasis that supply problems do at the present stage of development planning[2].

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[1] It is possible of course that both requirements could be met in simultaneous 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.

[2] This is not inconsistent with the purer 'optimum' growth paths of some mathematical analysts since their optimal results require a suppression 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 [5; 6].

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 to voluntary saving [7; 13; 19].

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. 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 close economy, not only for initial simplicity, but because much of the relevant discussion of these supply constraints in Pakistan's development has dealt only with foreign capital goods, suggesting that domestic capital capacity is relatively unimportant. It is well, for instance, to show that the supply problems attributed to Pakistan's import substitution policy [8 ; 14] can exist quite apart from import substitution even if they may well be compounded by such a policy. All variables are dated, and the $\triangle$'s are discrete changes between dates.

A. Harrod-Domar Constraints — Income Allocation

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

(2.1) $Y_t = C_t + I_t$

(2.2) $S_t = sY_t$

(2.3) $I_t = \triangle K_t$

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

(2.4) $Y_t = 6K_t$

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) $\dfrac{\triangle Y}{Y} = 6s.$

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 specificity of products. So total product in period t, Y_t, is composed, quite specifically and unchangeably, 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 separately in the incomes those sectors generate) so,

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

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

(2.7) $\quad Y_{ct} = 6_c K_{ct}$ and

(2.8) $\quad Y_{kt} = 6_k K_{kt}$

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 Bronfenbrenner's simple statement of Mahalanobis model [1, 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) 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 goods*. Therefore,

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

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

Consumption spending must equal the production of consumption goods less (plus) any accumulated (used up) inventories of finished consumption goods,

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[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 [4].

I_{dt}. Investment spending equals output of capital goods plus (less) any accumulated (used up) consumption goods.

The asymmetry that requires us to include investment in 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 can be seen as an indicator of plan inconsistency—a way to move in the analysis from *ex ante* inequalities to *ex post* identities. 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.

C. 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) $S_t = s \triangle Y_t = S_{t-1} + s \triangle Y$.

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 (2.8) 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

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

If there were no change in consumer goods inventories in t—1 so $I_{d (t-1)} = 0$ then

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[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.

$$S_{t-1} = Y_{k\,(t-1)} = 6_k K_{k\,(t-1)}$$

from (2.11). Since 2.10) and (2.11a) are equal (both equal S_t),
$(S_{t-1}\,(= 6_k K_{k\,(t-1)})$ can be cancelled from both sides leaving, *ex post*

$$(2.12) \quad \triangle S = s \triangle Y = 6_k I_{k\,(t-1)} + I_{dt}.$$

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 behaviour (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,

$$(2.13) \quad s \triangle Y \lessgtr 6_k I_{k\,(t-1)}$$

Note that investment in consumer goods production does not appear in any of these last three expressions—only investment in the capital goods sector is there. Previous consumption goods investment will have generated income and saving—thus influencing Y 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

The way these two constraints interact can best be seen by tracing the effects of a disequilibrium through time. 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 period t—1, while the *level* of

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

(i) $\triangle S = s6 I_{(t-1)}$

and the product side

(ii) $\triangle S = 6_k I_{k(t-1)}$

so that for both to be satisfied,

(iii) $s6 I_{(t-1)} = 6_k I_{k(t-1)}$

or, rearranged,

$$\frac{I_k}{I} = \frac{s6}{6_k}$$

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 suggested that a higher saving rate for East Pakistan was due to its production of relatively fewer consumption goods than West Pakistan [8 ; 14][6].

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 fulfil planned growth—is greater than that which the capital goods sector can support, so

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

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

a) through investment in consumer goods inventories, I_d, which allow it to remain an inequality (and reduce the rate of growth), or

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

    i) a reduction of the saving rate, (s)

    ii) a reduction in income growth ($\triangle Y$), so that even a constant rate of saving generates less incremental savings,

    iii) an increase in capital productivity, (δ_k), and

    iv) 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 this sort of inconsistency.

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

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6 And an appreciation of the support for forced saving that can come from control over the composition of output is evident too in the Third Plan [13].

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 alternative is more interesting.

The first of these—a reduction in saving—is most insidious 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 relative to required savings will be a reduction in taxes, especially those on income and excise taxes that repress consumption [8 ; 14]. Less officially, consumption goods manufacturers will likely increase advertising 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* identity 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 behaviour 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 a 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 judgement 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 formal 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; 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 may 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 increments of growth makes this a particularly difficult subject for clear empirical testing.

F. Price Incentives and Fixed Coefficients

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

responds to present rather than future prices and conditions [17], but also because of the inevitable lag before the consequences of investment misallocation appear.

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 noted as a consequence. Indeed, the price rise coupled with either money illusion or a particular lag structure in changing prices and wages that redistribute 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-biased investment allocation more difficult—as with the Soviet's own problems and apparently some of the 'bootleg' industrial development in Pakistan [3]. What we have is another instance, like suppressing luxury consumption by prohibiting 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 is 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 [15].

This leads to the other part 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 its real relative profitability. 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 specificity of investment in Part II need not come up. That economy could invest entirely in consumer goods capacity and still avoid problems of inconsistency if those consumer goods were exported in exchange for capital goods. Mahalanobis has been widely criticised for depending so heavily on a closed model [1]. But restrictions on unfettered trade 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 identity becomes

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

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

$$(3.2) \quad Y_t = Y_{ct} + Y_{kt} + Y_{xt}$$

where Y_{xt} is production for export with a production function like those for consumption and capital goods,

$$(3.3) \quad Y_{xt} = 6_x K_{xt}.$$

And, assume that there is external trade balance so that

$$(3.4) \quad X_t = M_t.$$

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) $C_t = Y_{ct} + (1-\alpha) Y_{xt} - I_{dt}$ and

$S_t = I_t = Y_{kt} + \alpha Y_{xt} + I_{dt}$

where α 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 derived from the Harrod-Domar side is s and s6 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) $I_t = Y_{kt} + \alpha Y_{xt} + I_{dt}$

$= 6_k K_{k(t-1)} + 6_k I_{k(t-1)} + \alpha 6_x K_{x(t-1)}$

$+ \alpha 6_x I_{x(t-1)} + I_{dt}.$

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

(3.7) $\Delta S = s \Delta Y = 6_k I_{k(t-1)} + \alpha 6_x I_{x(t-1)} + I_{dt}$

as the increment to saving required to adhere to the planned rate of growth of income. Again, the required saving function (Harrod-Domar) constraint is on the left hand side. But now the constraint on the right hand side (Mahalanobis) 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) $\Delta S = s\Delta Y > 6_k I_{k(t-1)} + \alpha 6_x I_{x(t-1)}.$

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

v) a reduction of the proportion of imports in consumer goods—an increase in α,

vi) 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 $6_k/6_x > \alpha$ 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 α, both sectors are growth-productive in Mahalanobis sense, it *does* matter how investment is allocated between them.

The other alternatives *i*) through *iv*) from Part II remain except that we now consider increasing either 6_k or 6_x under alternative *iii*) and a retroactive increase in the combined level of investment ($I_{k\ (t-1)} + I_{x\ (t-1)}$) would imply a decrease of $I_{c\ (t-1)}$ in alternative *iv*).

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 [8; 14] 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 absorption) and a deficiency, therefore, in domestic absorption of capital goods. In other words, the excessive domestic investment in consumption goods capacity (both as I_c and indirectly as $(1 - \alpha)\ I_x$) through import substitution explains the inequality—the deficient capital goods availability—of (3.8). The resulting 'consumption liberalization' reduces growth.

But the fact that the aggregate inequality (3.8) emphasises 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 *both* 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* $(1 - \alpha)$, 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 absorption of consumption and capital goods and not simply the behaviour of a part of the total[7].

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 absorption 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 absorption, 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 absorption 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 absorption. 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*) [7], then any shift of supply from an easily controlled sector to a more intractible sector will lessen the government's overall control over consumption, hence decrease saving.

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[7] The corollary to this that we shall not pursue further is that studies of the domestic production (or absorption) 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—the inequality of (3.8)—had, in fact, forced abandonment of 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 absorption 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 absorption of isolated consumption goods the sacrifice of aggregate investment can be estimated (on these, *see* [2]).

C. Control of Domestic Absorption 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 absorption through trade. The question, of course, is not simply whether the composition of domestic absorption can be influenced by trade policies *per se*, but rather, what asymmetries make it *easier* for a government to control domestic absorption through trade than through domestic channels. And, crucially, we are dealing with 'control of domestic absorption' meaning suppression of domestic absorption 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. All of these institutional facts tend to concentrate trade information much more than information on domestic transactions.

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 yet strongly resist and resent a requirement that he inform the state of transactions with his fellow citizens. So information disclosure is likely to be more complete in foreign transactions. 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 may enter more importantly in the imposition and discipline 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. True, of course, 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 lose 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 increased by an over-valued domestic currency. When there is excess demand for imports in general their composition can be arbitrarily changed by government policy in violation of preferences—if imports of consumption goods are to be suppressed within a given quantity of total imports, it helps to have 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 over-valuation 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 absorption hence saving (in violation of preferences) an increase in export earnings should weaken this control over absorption 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 while saving declined [18].

A final reason that domestic absorption 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—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. Lipstick is simply an item of consumption, but raw materials to make domestic lipstick support domestic income and employment in the cosmetics industry. In short, on grounds of employment and capacity utilization, imports can be reduced harshly while domestic production of the same goods cannot [20].

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 specificity of output. In fact, of course, export goods will be usable 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 absorption of exportable output for 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 absorption 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 behaviour that is to be expected if consumption goods capacity has been overexpanded in a closed economy has been described in Part II. This behaviour 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 dynamic changes in 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 through either tariffs or 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 were able to 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 in an open economy 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 relative 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 [9].

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 [9, Ch. 1] 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 rate and excess capacity to determine which is the most important explanation of the relative price change.

Despite these problems of empirical inference from relative prices, one element of 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 deficient 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 [9, 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 justified asymmetry in control of domestic absorption 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 [11]. 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 [16]. And in its most general form, we have a 'four-gap' model in which 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.   A General Four-Gap Model

The simplest and the 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.

A brief digression on this sort of classification of capital by source is necessary since it appears to say something very fixed and technically determined when in fact it depends on assumed relative prices as much as on technology. By capital goods that "must be supplied from foreign sources", we mean that *at existing prices*, supplying those goods domestically within a reasonable time would be prohibitively expensive. It is hard to conceive of goods that simply *could not* be locally manufactured—given an incentive of exorbitant prices. So the imperative "must be imported" is modified by "given existing relative prices"—as on the other side is the imperative "must be produced domestically".

This point is made, not because radical changes in relative domestic and foreign capital goods prices are to be expected and have to be accommodated in the analysis, but because some capital goods are not source-specific in this sense—those that, at existing relative prices, can reasonably be had from either domestic or foreign sources. So some capital goods must be obtained from foreign sources to avoid paying a very high price; some goods must come from domestic sources or carry a very high price; while some can come from either source with no serious difference in price.

To use these classifications in the usual manner, we need only take the additional step of assuming a fixed (or minimum) proportion of total productive investment that "must come" from foreign (m) and from domestic (n) sources. If these do not exhaust total investment, then some proportion can come from

either source. Specifically, say that there is a minimum proportion, m, of productive (note) investment that "must" come from foreign sources. Actual imports of capital goods will then have to be equal to or greater than that minimum proportion so

(4.1) $\quad m \leqslant \dfrac{\alpha Y_{xt}}{Y_{kt} + \alpha Y_{xt}} \quad$ or

(4.2) $\quad m(S_t - I_{dt}) \leqslant \alpha Y_{xt}$

since $S_t = I_t = Y_{kt} + \alpha Y_{xt} + I_{dt}$. Unproductive investment is supplied outside the two capital goods producing sectors. In the same way, say that there is a minimum necessary proportion, n, of investment that must come from 'national capital' —that which has to be domestically produced. By the same arguments,

(4.3) $\quad n(S_t - I_{dt}) \leqslant Y_{kt}$

In both of 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 McKinnon's two-gap model, imported capital is the assumed constraint on growth, then, 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) $\quad mS_t > \alpha Y_{xt}$

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 α

e) increased export earnings, Y_{xt}.

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 the two sources—each piece of equipment must come from one and only one source — $m + n = 1$ and the fact that $m(S_t - I_{dt}) > \alpha Y_{xt}$ of necessity implies that domestic capital is adequate; that $n(S_t - I_{dt}) < Y_{kt}$. And if $m + n = 1$, then the only way that domestic saving could be the constraint is if m and n are, in fact,

simultaneously satisfied—if capital is available in sufficient quantities and exactly the appropriate proportions. So assuming fixed proportional domestic capital requirements along with fixed proportional foreign capital requirements and giving the model no substitutability in either direction yields a *reductio ad absurdum* of a two-gap model in which either foreign capital or national capital binds and the domestic saving constraint can operate only under the very peculiar circumstances of a simultaneous three-way equilibrium growth (with the correct proportions of n and m and enough capital equipment in total). This artificiality 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 [11].

This relationship can be made a good deal clearer with Figure 1. On the axes are the quantities of capital goods coming from the national capital industry (N) and from foreign sources (M). If the proportions of capital goods required from each of these sources were absolutely fixed, a ray n/m from the origin would describe increasing investment levels at these fixed proportions of foreign and national capital. It is convenient to visualize a set of "incremental isoquants" with right angles lying on that ray n/m. This is not an ordinary isoquant map, of course, since the axes measure *investment* levels rather than factor inputs (*i.e.*, investment, not capital stock) and the incremental isoquants describe the *increase* in output from that investment. Then one of these isoquants, and therefore one point on the ray n/m, will describe that quantity of physical investment appropriate to the planned *growth* in a particular time, t. Arbitrarily we indicate the "right" level of growth by the isoquant δ. When the economy is in equilibrium and

$$M_t = mS_t = \alpha Y_{xt}$$
$$N_t = nS_t = Y_{kt}$$
$$\text{and } S_t = Y_{kt} + \alpha Y_{xt}$$

so that $I_d = 0$, the planned growth rate is met on all grounds—savings, capital availability and specific capital types.

Of course, we have not been particularly interested in such a sweeping equilibrium in the earlier parts of this paper—our concern instead has been with frustrated equilibria, especially when capital availability is inadequate to support the rate of investment justified by intended savings. This can easily be represented in Figure 1 by letting δ describe the planned investment level which is, by assumption, supported by *ex ante* savings. Then any isoquant cutting n/m between δ and the origin, say γ, shows a lower rate of investment and output growth
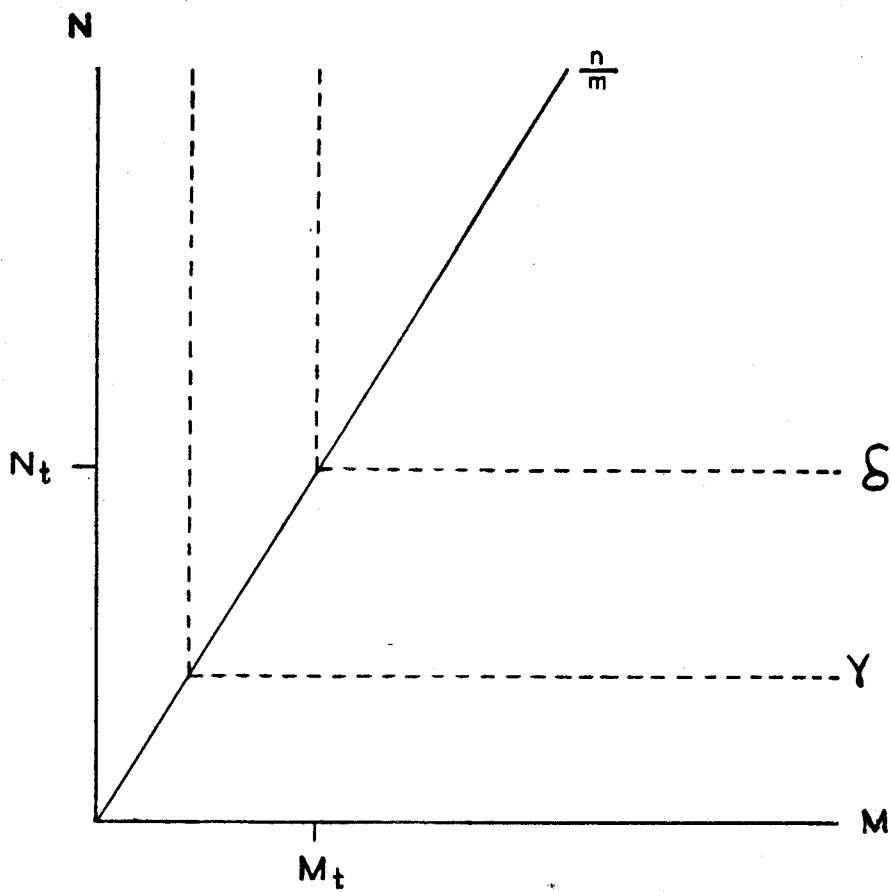
Figure 1

brought about by the shortage of capital equipment. The coordinates of the point where δ intersects n/m would be $N = nS_t$ and $M = mS_t$ while the coordinates of γ at n/m would be $N = Y_{kt}$, $M = \alpha Y_{xt}$.

On the other hand, graphically the forced draft case would look the same except that δ would represent the level of investment attainable with available capital (having coordinates $(Y_{kt}, \alpha Y_{xt})$ at n/m) and γ would represent the level of investment supported by savings (with coordinates (nS_t, mS_t) at n/m).

As it stands, however, Figure 1 fails adequately to reflect the earlier qualification that the source of capital equipment is not a technological absolute, but depends on relative prices. Fig. 2 modifies the "isoquants" on either side of the ray n/m to show that, up to a maximum and down to a minimum, foreign and domestic capital goods can substitute for each other with relatively slight cost in total investment level. The McKinnon model, in these terms, would show such substitutability only *below* the ray n/m—at some small increase in cost, foreign capital goods can substitute for domestic, but domestic cannot substitute for foreign goods. Our representation and analysis explicitly allow substitutability in both directions though only to a limited extent. The limit of this extent—graphically the distance between the rays n/m max and n/m min— determines how serious the capital source constraint is likely to be—the narrower is the limit, the less freedom there is to substitute between sources of capital goods and the more likely is the system to hang up on shortage of a specific type of capital.

Once again, we let δ be the level of physical investment necessary to achieve planned growth. We can then use Figure 2 to help describe a 'four-gap model' as a general phenomenon. More particularly, four familiar cases can be distinguished.

i)

If $mS_t < \alpha Y_{xt}$

and $nS_t < Y_{kt}$

while $S_t \leqslant \alpha Y_{xt} + Y_{kt}$

then either domestic saving is the constraint on growth or, under the harsh assumptions of absolute product (not capital source) specificity used in Part II, domestic saving is forced up by the Soviet forced draft method of denying consumer goods. In Figure 2, the isoquant δ describes available (as well as required) capital equipment while γ is savings. If the forced draft method works, forced saving will push total saving up to δ and the planned growth will be achieved.
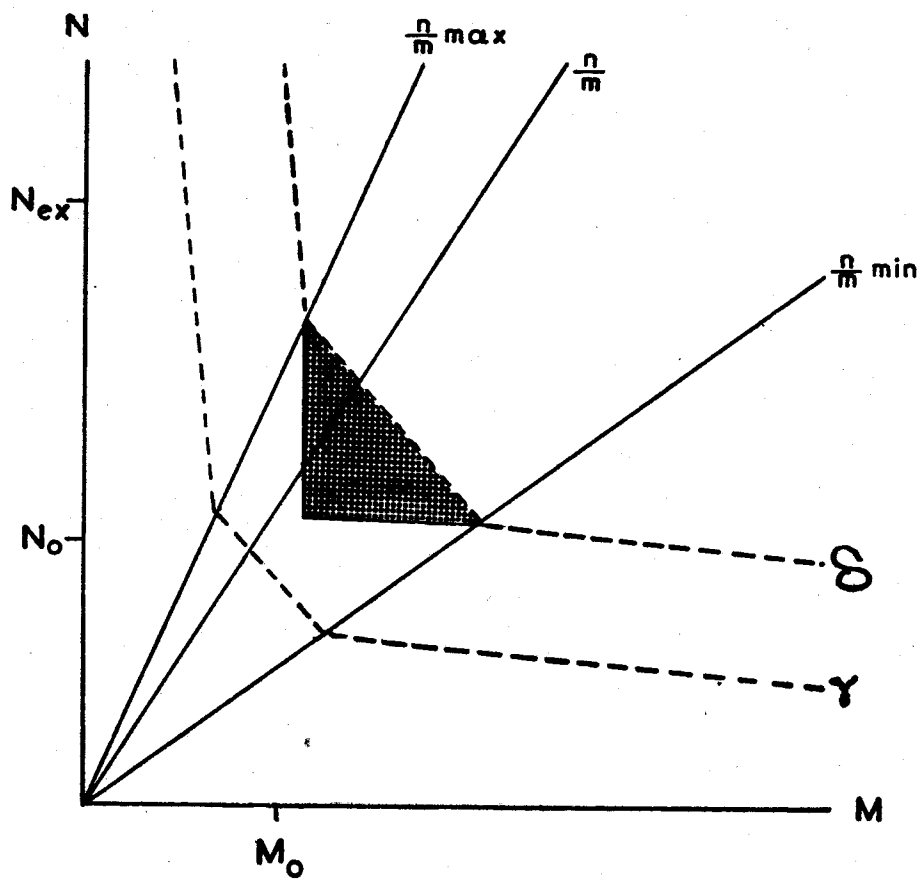
Figure 2

ii)

If $m(S_t - I_{dt}) < \alpha Y_{xt}$

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

while $S_t > \alpha Y_{xt} + Y_{kt}$

then domestic saving is adequate and the specific *proportional* capital require-
ments are satisfied, but total capital availability from all sources is inadequate
and constrains growth. As in earlier descriptions, $I_{dt} > 0$ allows this to happen
ex post. This is the Mahalanobis-Power-Khan case described above which leads
to lower total saving—to consumption liberalization—because too little capital
equipment is available from all sources. In Figure 2, δ in this second case repre-
sents intended saving (as well as required capital) while actual capital availability
is less than that, lying somewhere in the shaded triangle below δ. In this region,
the absolute quantities of foreign and domestic capital considered alone are
appropriate to minimum levels for planned investment, δ, so that neither alone
can be considered a constraint to reaching δ. Yet total capital availability is
inadequate and the economy cannot reach the investment level δ consistent
with the plan. If under-production of capital goods resulted in consumption
liberalization, saving would decline and the planned growth would be sacrificed.

iii)   If $m(S_t - I_{dt}) > \alpha Y_{xt}$

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. In Figure 2, the limited amount of foreign capital goods,
M_o, combined with its required minimum proportion prevents the economy's
reaching planned growth δ except at exorbitant cost in domestic capital goods,
N_{ex}.

iv)   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. As in the case above, Figure 2
shows this as an absolute limit, N_o on national capital goods which precludes
reaching planned investment level δ except at very high cost in foreign capital
goods.

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 is effec-
tive. 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 national capital capacity is a limit to further income generation, 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. Our experience from Marshall Plan to the present strongly supports the idea that there is something special about foreign capital, but not about domestically produced capital. So a bottleneck model for underdeveloped countries 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 [12]. These are both domestically produced and likely to be of inordinate importance in growth.

The major message of the usual two-gap model is that foreign aid can be more productive in generating economic growth than simple additions to domestic saving. The major message of this reversal of the model is that under some circumstances, foreign aid used to provide additional domestic capital capacity can be more productive in generating economic growth than simple additions either to domestic saving or to the flow of foreign capital not so directed. Put somewhat more meaningfully, under such circumstances, aid used to increase domestic capital capacity will be more productive of growth than aid used to increase domestic consumption goods capacity, even though both represent the same addition to savings and foreign capital. This is, of course, a 'Mahalanobis' criterion for aid allocation since it stresses—like the two-gap model—the specificity 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

In this paper we have developed a simple view of growth that explicitly accommodates both the savings requirements of Harrod-Domar and the capital supply requirements of Mahalanobis. We have shown, first in a closed economy, how inadequate attention to the Mahalanobis requirements could slow down a country's growth, despite adequate total *ex ante* saving, simply because capital equipment was not available to yield productive investment. Such equipment deficiencies result from previously inadequate investment in the capital goods sector. Even at this very artificial level, the model yielded some relevant insights into investment policy.

But more pertinent is the model in an open economy in which inadequacies of domestic capital goods supply can be made up, given sufficient foreign exchange earnings, by importing capital goods. While this significantly relaxed the capital supply constraint in the model, it also added as a potential source of capital deficiency, errors in trade policy—the Power-Khan import substitution phenomena.

Finally, in recognizing the need for some capital equipment to come from specific national or foreign sources, we suggested a generalized version of McKinnon's two-gap model showing that additions to either national or foreign capital resources may, depending which is the constraint, have a disproportionately high payoff in growth rates.

These are important considerations in development planning, even on the abstract and aggregated level of this discussion. And they are considerations that are too easy to overlook with the usual emphasis of planning on adequate supplies of saving. It remains, however, to use the analytical insights of this model to answer the very important question of whether capital equipment shortage has in fact constrained the growth of Pakistan's economy. To this much debated issue we shall turn in a forthcoming paper.

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