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A Study of Planning Methodology
with special reference to
Pakistan's Second Five-Year Plan

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There are a large number of underdeveloped countries in our contemporary world. Most of these have somehow organized themselves during the post-war era in a conscious effort at development, usually by setting up planning bodies of one kind or another and constructing 5 or 7 or 10 year plans to guide such efforts. But in spite of the large number of such plans to have appeared in recent years, the common experience of all planning commissions has never, to our knowledge, been systematically analyzed and synthesized so as to produce a fund of ideas useful for planning and transferable from one situation to another. In other words, the *methodology of plan-making* is, as yet, a largely underdeveloped field of study in the economics of underdeveloped areas.

Let us take the Second Five-Year Plan of Pakistan as an illustration. In spite of the excellent accomplishment recorded by the Planning Commission in producing such a Plan (now near completion), we can find scant explicit evidence in the hitherto published papers (e.g., the "Outline") to suggest that the Planning Commission has accepted a clearly defined planning procedure—including the specification of the strategic variables used, the structural and behavioristic assumptions made, and the method of ensuring consistency adopted. In the absence of an explicitly defined planning procedure, based on some commonly accepted methodology, plan-making cannot become a science in the sense that a store of knowledge is accumulated and the search for improvements routinized. What is unsatisfactory about such a state of affairs is, of course, not that such a plan itself is necessarily inferior but that the experience accumulated cannot be transferred to ensure progress in plan-making efficiency.

It is the purpose of this paper to present a systematic view of planning methodology. It is our hope that the framework of reference produced may prove helpful in subjecting all economic plans to systematic analysis. We shall, however, concentrate here on the Second Five-Year Plan of Pakistan as a point of departure.

There are two ideas which are central to what we are going to have to say about planning methodology: *a model of a particular national income accounting system* and a so-called *theory space*. This can be abstractly denoted by a pair (N, T) where N is the model of the national income accounting system and T stands for the theory space. We shall say a few words on each aspect.

The acceptance of a national income accounting system is, to us, a basic prerequisite for systematized planning since such a system (at whatever level of aggregation) focuses our attention on a set of strategic variables appearing in every planning context, and on the structural relationships between them. The importance of a national income accounting system for purposes of economic planning is generally so well recognized that we need not dwell on it here.

The acceptance of a given (N) is, however, only the beginning of economic planning. There are, in addition to the accounting relationships involved, other relationships and conditions which must be satisfied by a respectable plan. For example, C (consumption) must bear a satisfactory relationship to national income, Y, in order to satisfy a reasonable consumption function relation; investment, I, must be correctly related to national income, Y, through the capital coefficient; and the necessary foreign exchange component must be made available. The totality of these conditions (other than the accounting relations) which might conceivably affect the acceptance or rejection of a numerically consistent plan is called the *theory space*, T.

The national income accounting system and the theory space, together, delimit the boundaries within which a planning commission must operate. Once these limits have been firmly marked out there generally exist a considerable number of alternative planning procedures which can be systematically identified. It is then up to the planner to select that particular planning procedure most suitable to his country's economic conditions and its political and social milieu.

The Pakistan Planning Commission has, of course, implicitly accepted a national income accounting system in the process of preparing the Second Five-Year Plan. In Section I we have processed certain Commission materials available to us in order to present this system explicitly. In Section II we present certain elementary techniques required to help us identify all possible planning procedures within a given theory space. In Section III we develop the theory space with reference to Pakistan's chosen national income accounting system. In Section IV we show how once both N and T have been determined, a large number of planning procedures can be evolved and their suitability in particular planning contexts established.

I

The pattern of resource utilization, at the aggregate level, for the Second Five-Year Plan period can be described by a system of magnitudes indicating the availability of total resources of domestic and foreign origin as well as the utilization of these resources for developmental and non-developmental purposes. This system of magnitudes can be

DIAGRAM I

NATIONAL INCOME ACCOUNTING SYSTEM FOR PAKISTAN'S SECOND FIVE-YEAR PLAN
(Figures in millions of Rupees)

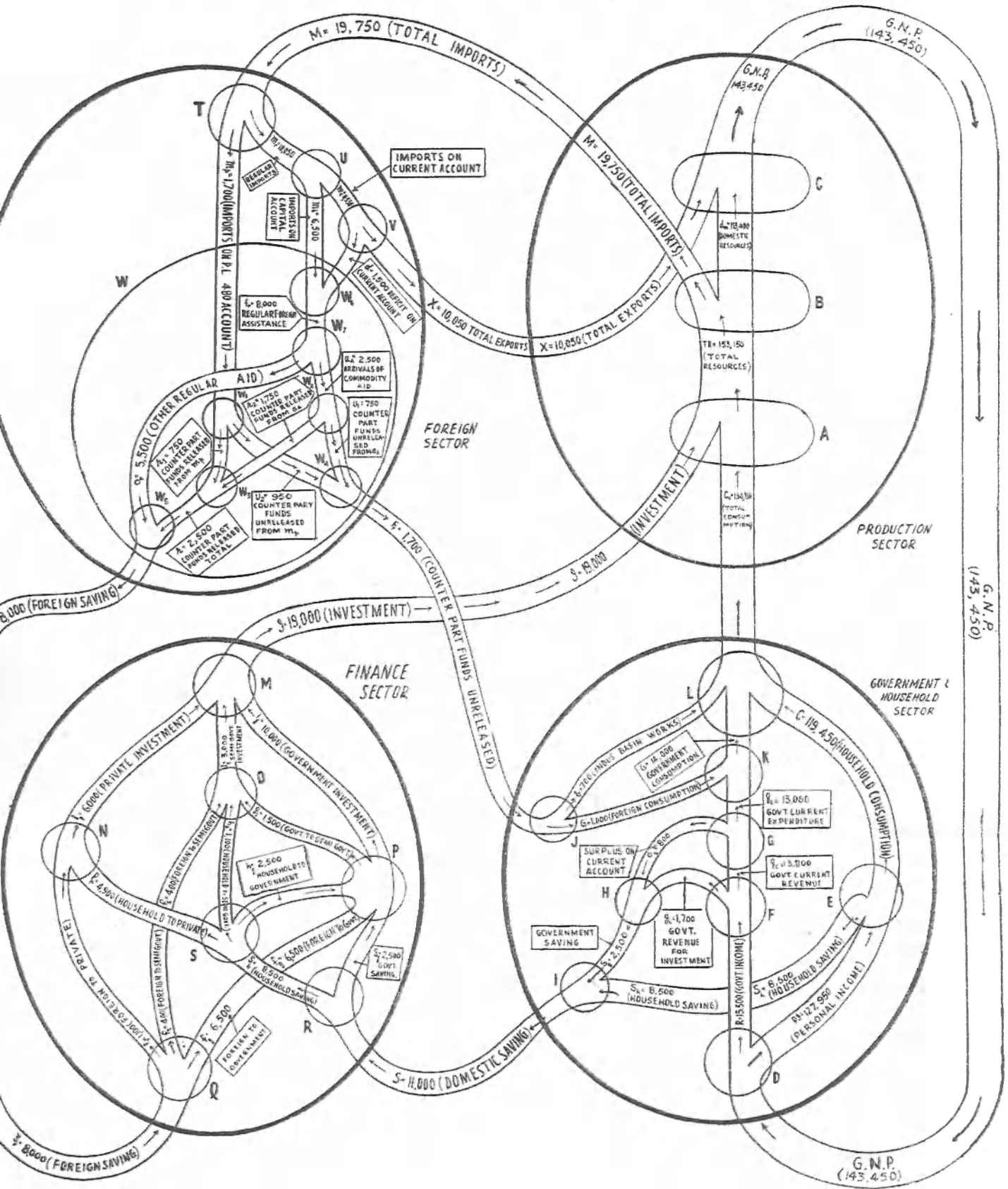
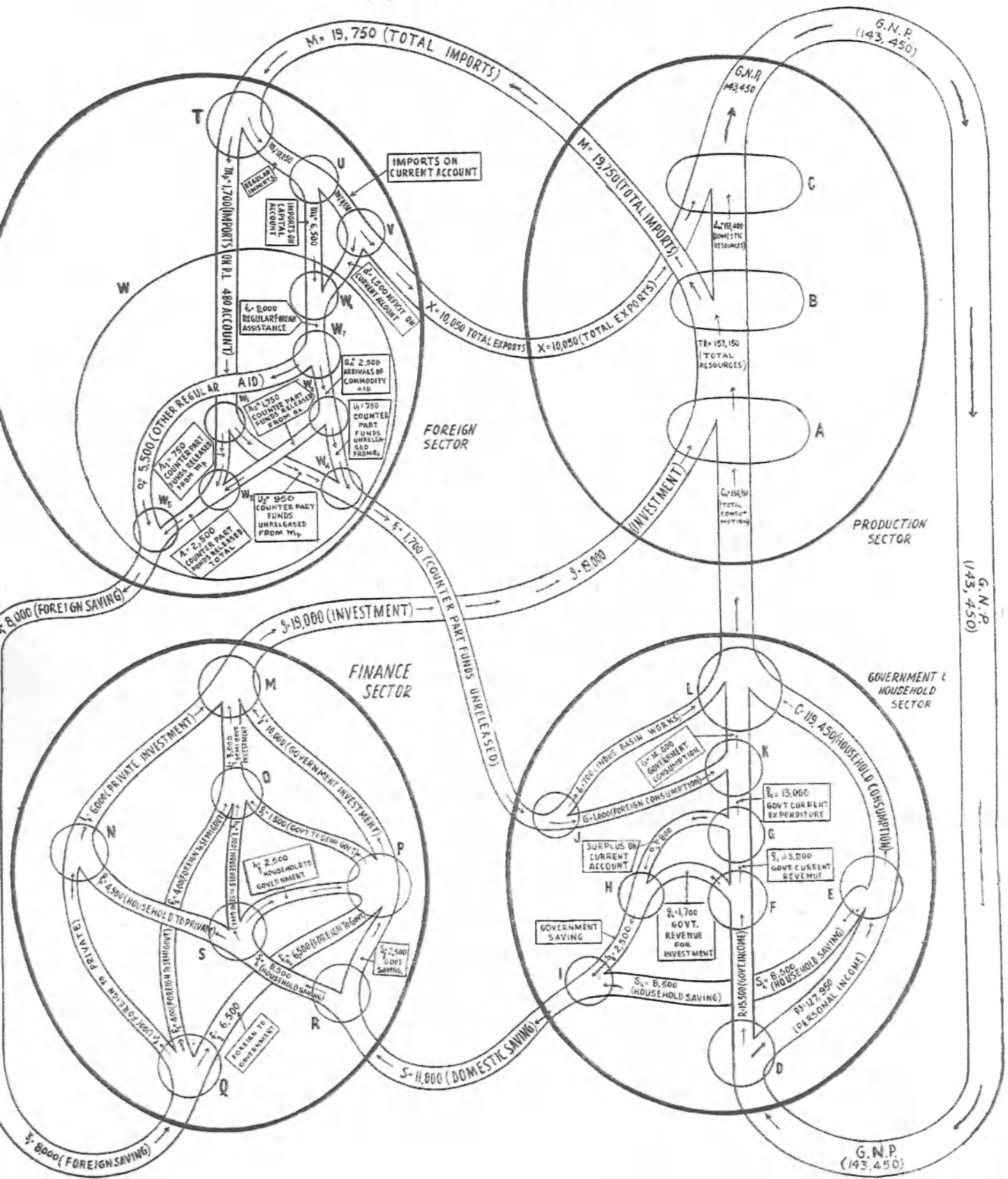


DIAGRAM I

NATIONAL INCOME ACCOUNTING SYSTEM FOR PAKISTAN'S SECOND FIVE-YEAR PLAN
(Figures in millions of Rupees)



presented in the form of an internally consistent national income accounting system.¹

This accounting system can be described by a pipe diagram—see Diagram 1—in which each planning concept is represented by a pipe. There is an arrow in each pipe indicating the direction of monetary payments in the magnitude indicated inside each pipe. Before we proceed to discuss the economic significance of these magnitudes, however, let us point out the general principles underlying the construction of a pipe diagram. There are both qualitative and quantitative aspects involved in the understanding of such a diagram. Let us examine them in that order.

The systems of magnitudes incorporated in any economic plan are not independent and isolated events. Instead, they are related to each other in certain definite ways. A primary function of the economist is to bring out these relations and, to the extent that these relations are satisfied, to ensure the consistency of the entire plan. Translated into the “geometry” of the pipe diagram, the most obvious type of relations is represented by the “connectivity” (i.e., the pattern of connection) of the pipes. When two or more planning concepts or variables are connected, there exists a direct accounting relationship between them.

The connectivity of the pipes is most conveniently seen from the *branchpoints* of the diagram. A branchpoint is a “juncture” where two or more pipes meet. (In Diagram 1, the branchpoints are marked off by small circles.) The existence of a branchpoint indicates the existence of certain accounting relations between the planning concepts (i.e., the pipes) meeting at a particular branchpoint. Thus, the pipes and the branchpoints together describe the connectivity of the entire system.

The accounting relations referred to in the last paragraph mean that there also exist certain fundamental quantitative relations between the various concepts. In terms of our pipe diagram, these fundamental relations can be simply stated as follows: *At each branchpoint, the value of all inflows must exactly equal the value of all outflows.* This principle will be used in all our diagrams. For example, at the branchpoint marked Production Sector in Diagram 2a we see that the value of total inflows ($C + I + X$), i.e. $132,450 + 19,000 + 10,050 = 161,500$,

¹Our sources are the published Second Five-Year Plan Outline and unpublished interim materials made available to us by the Planning Commission. We realize that since completion of our monograph the Planning Commission has carried out and is continuing to carry out minor revisions of some of the Plan magnitudes to be reflected in the soon-to-be-published final version of the Second Five-Year Plan. These changes do not, however, affect in any way the argument of this paper. In a second and related monograph on the general subject of planning now under preparation the precise final Plan magnitudes will be incorporated.

equals the value of total outflows ($Y + M$), i.e. $143,450 + 18,050 = 161,500$.

Similar accounting relations exist at each branchpoint. Hence there are altogether the same number of accounting equations as the total number of branchpoints in the pipe diagram. However, it can easily be shown that one of these accounting relations can always be derived once the rest have been determined.¹ Hence, the total number of independent accounting equations is one less than the total number of branchpoints.

In summary, then, if there are E pipes and V branchpoint in a pipe diagram then there exist E planning variables or concepts and $V-1$ independent accounting equations in the entire system. The understanding of this elementary truth is the first step in systematic planning.

Returning to the planning concepts of Diagram 1, these have been classified into four groups (some contain subgroups) as described by the four large circles enclosing certain branchpoints and pipes. The names of these groups are:

- 1) Production Sector
- 2) Household and Government Sector
- 3) Finance Sector
- 4) Foreign Sector

Since a planning concept is represented by a pipe which connects exactly two branchpoints, when a "grouping" is given we can classify all planning concepts into two types: intergroup concepts, i.e., branchpoints lying between *two different* groups, and intra-group concepts, i.e., branchpoints lying within the *same* group. The intergroup concepts, (i.e., type one) give us a bird's-eye view of the entire system and will be discussed first. The intra-group concepts represent certain "refinements" and "details" of the plan which will be discussed in Appendix A because they are not directly concerned with the analytical portion of our paper.

To facilitate the exposition of intergroup concepts on which we expect to concentrate our energy, Diagram 1 has been converted and condensed into Diagram 2a in which we have listed only the intergroup concepts between the four macro-economic sectors. The only exception is the case of the foreign sector in which certain intra-group concepts are also listed.² Recall that the direction of the arrow in each pipe represents the direction of monetary payments; we shall discuss these

¹We shall omit all mathematical detail from this paper. The authors expect to present a more complete treatment of planning problems at a later date.

²This is done to facilitate the later analytical work of this paper. In the Appendix we shall indicate the derivation of Diagram 2a from Diagram 1.

DIAGRAM 2a: Aggregate Model of Planning Commission

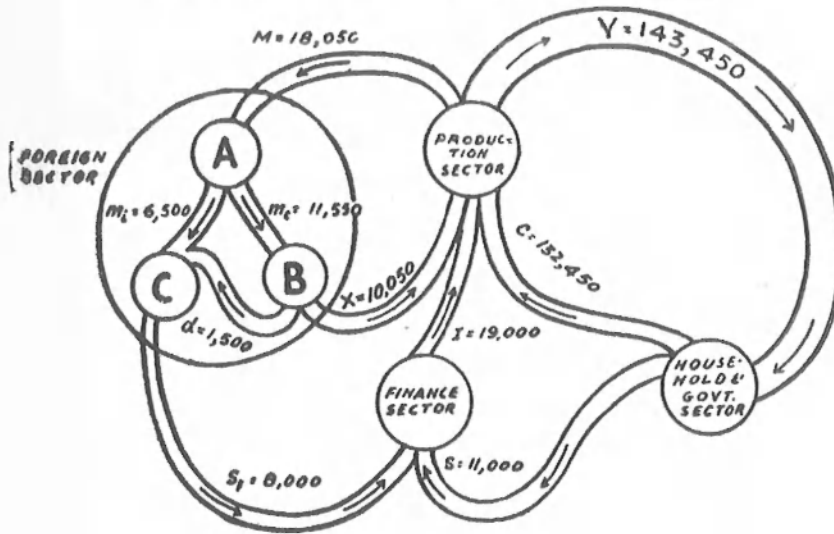


DIAGRAM 2b: Linear Graph of Diagram 2a

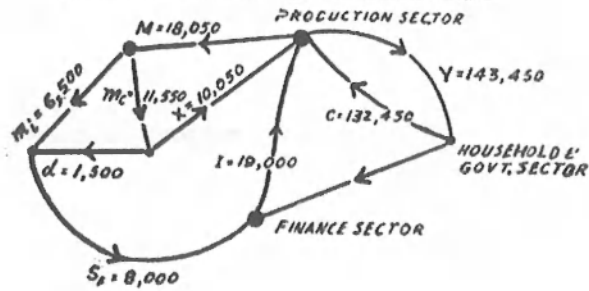
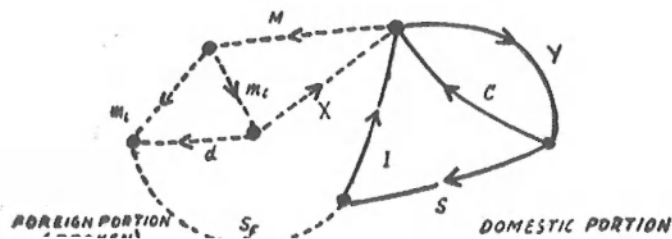


DIAGRAM 2c: Diagram 2b Broken Down into Domestic and Foreign Sectors



intergroup planning concepts in the order in which they appear as monetary *inflows* into the four economic sectors.

1) **Payments into the Production Sector**

The payments into the Production Sector include:

- a) Consumption expenditure ($C = 132,450$), i.e., the sum of government and household consumption.
- b) Investment expenditure ($I = 19,000$) including private, public and semi-public investment expenditure.
- c) Exports ($X = 10,050$).

2) **Payments into the Household (including Government) Sector**

Payments into this sector include only:

- a) GNP = ($Y = 143,450$).

3) **Payments into the Finance Sector**

Payments into this sector include:

- a) Domestic savings ($S = 11,000$)
- b) Foreign savings ($S_F = 8,000$)

which are the two major components of the "financing" of the total investment program ($I = 19,000$) shown as "outflow" from the Finance Sector.

4) **Foreign Sector**

As shown in Diagram 2a, there are several sub-sectors in the Foreign Sector denoted by the branchpoints, A, B, C. In the order of inflows into these subsectors, we have:

- a) Inflow into A: Total imports ($M = 18,050$).
- b) Inflow into B: Imports on current account ($m_c = 11,550$).
- c) Inflows into C: Imports on capital account ($m_i = 6,500$).
and deficit on current account ($d = 1,500$).

The accounting relations between these concepts should be very clear from the diagrammatic representation. For example, total imports (M) is the sum of imports on current account (m_c) and imports on capital

account (m_i); deficit on current account (d) is the difference between imports on current account (m_c) and exports (X). The sum of $m_i + d$ corresponds to the total inflow into branchpoint C and equals foreign savings (S_F). This national income accounting system (i.e. Diagram 2a) will be referred to below as the *aggregate model of the planning Commission*. In this aggregate model there are ten planning concepts ($Y, C, S, I, X, S, M, m_c, m_i, d$) bounded by five *independent* accounting equations. The economic interpretation of these accounting equations may be stated as follows:

$$\begin{array}{ll}
 \text{Production Sector:} & C + I + X = M + Y \\
 \text{Household and Government Sector:} & Y = C + S \\
 \text{Finance Sector:} & S + S_F = I \\
 \text{Foreign Sector:} & \text{at A: } M = m_c + m_i \\
 & \text{at B: } m_c = X + d \\
 & \text{at C: } m_i + d = S_F
 \end{array}$$

For the Production Sector, $C + I + X$ describes the total use of resources and $M + Y$ describes the sources (i.e. domestic and foreign sources) of these resources. For the Household (plus Government) Sector, $C + S$ describes the disposition of total income (Y) to either current consumption (C) or domestic savings (S). For the Finance Sector, $S + S_F$ describes the two components of "financing", domestic and foreign, of the total investment program (I).

II

We have just shown that the monetary valuations of the planning concepts can be systematically presented in a national income accounting system. Such a system helps us to see the economic relationships between these planning concepts or variables and, at the same time, provides a framework for checking accounting consistency. The advantage of the national income accounting system "approach" to economic planning is not, however, limited to these more or less descriptive uses. When systematically exploited, it can help us to investigate the economic assumptions on which a given plan is based. In the remainder of this paper, we shall turn our attention to the *analytical* use of the national income accounting system for the purpose of plan construction.

The acceptance of a given national income accounting model implies:

- 1) the identification of a collection of planning concepts, and
- 2) the acceptance of certain accounting relations between these concepts.

In diagrammatic terms, the number of planning concepts is indicated by the number of "pipes" in the diagram and the number of accounting relations is indicated by the number of "branchpoints". Let E be the number of pipes and V the number of branchpoints. Since, as we have pointed out in Section I, the number of independent equations is $V-1$, the number of variables in excess of the number of equations is $U = E - (V-1)$. This number (U) is called the *cyclomatic number* of the accounting system. For Diagram 2a, we see that $E = 10$, $V = 6$ and hence $U = 5$.

The significance of the cyclomatic number is that it *indicates the "additional" number of independent conditions which must be stipulated* in order to determine the values of every variable in the system. "Additional" means in addition to the $V-1$ accounting relationships postulated by the national income accounting system. In other words, $V-1 + U = E$ is just another way of saying that, in order to determine the system, the sum of independent accounting equations ($V-1$) and additional independent conditions (U) must be the same as the total number of variables.

Let us take a simple Keynesian model as an illustration—see Diagram 3a—which contains the variable Y (national income), C (consumption), I (investment) and S (savings), related by means of the following accounting equations (one for each branchpoint at "z" "h" and "f"):

- 1) the Production Sector at z: $C + I = Y$
- 2) the Household Sector at h: $Y = S + C$
- 3) the Finance Sector at f: $S = I$

For this model $E = 4$, and $V = 3$. The number of independent equations is $V-1 = 2$ and, as is well-known, (3) can be easily derived from (1) and (2). Hence the cyclomatic number is $U = 4-2 = 2$, and in order to determine every value of this model, we have to stipulate two independent conditions. For example:

- a) Given $C = 10$, $I = 2$, we can determine $Y = 12$ from (1)
 $S = 2$ from (2)
- b) Given $Y = 12$ and $I = 2$, we can determine
 $S = 2$ from (3)
and $C = 10$ from (1)

Let us take the national income accounting model of Diagram 2a—i.e. the aggregate Planning Commission model—as another example. For that model, as we have already observed, $E = 10$, $V = 6$ and

hence $U = 5$. The Planning Commission must estimate 5 and exactly 5 variables independently to determine the entire system.

In summary, with the acceptance of a national income accounting system, the cyclomatic number U indicates the additional independent conditions which must be furnished. Any number of independent estimations less than U will not be sufficient to determine the system. (For example, in the simple Keynesian system, *one* number cannot determine the system.) Any number of independent estimations greater than U will lead to inconsistency—unless they happen to be consistent by unlikely accident. (In the simple Keynesian model, if one estimates *three* variables independently, such accident is highly improbable.)

The simple Keynesian model (with cyclomatic number $U = 2$) requires, as we know, two independent estimations. However, as examples (a) and (b) above have shown, there are several alternative ways of choosing two concepts from Y, C, I, S , in the course of making independent estimations. The two concepts which are chosen for this purpose are said to *belong to the basic set*. Again referring to examples (a) and (b) we have:

- a) Concepts in the basic set (C,I) and concepts not in the basic set (Y,S).
- b) Concepts in the basic set (Y,I) and concepts not in the basic set (S,I).

Those planning concepts included in the basic set (the number of which equals the cyclomatic number) are to be estimated independently. The planning concepts that do not belong to the basic set are to be computed from the accounting equation, i.e., they are the *endogenous variables* of the system.

Once a national income accounting system (with cyclomatic number U) is accepted, it is a simple matter to determine all possible combinations of U concepts. For example, in the simple Keynesian system, there are 6 ways to choose two concepts from the four concepts Y, C, I , and S :

(YC) (YS) (YI) (CS) (CI) (SI)

Some of these combinations, however, may not be acceptable as basic sets because they cannot be used to determine the entire system. The last set above (S,I) for example, cannot serve as a basic set. If one estimates independently $S = I = 2$, then $C = 8, Y = 10; C = 10, Y = 12; C = 100, Y = 10^2$, etc., are all possible estimations of Y and C , consistent with $S = I = 2$. In other words, the system is indeterminate. The reader may check and satisfy himself that every one of the other

DIAGRAM 3a: Simple Keynesian Model

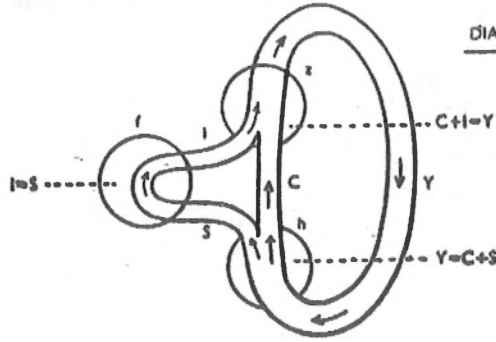


DIAGRAM 3b: Linear Graph of Diagram 3a

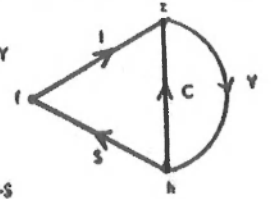


DIAGRAM 4: All Basic Sets and Trees of the Simple Keynesian Model

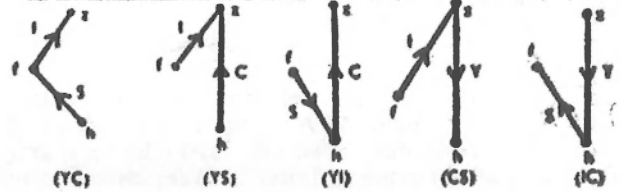
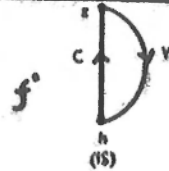


DIAGRAM 5: Counter Example



five sets, however, *is* a basic set, i.e., if any arbitrary values are postulated for the concepts in a given basic set above, the values of the variables not in the basic set are completely and uniquely determined.

After the acceptance of a given national income accounting system—represented by a pipe diagram—there are simple rules which help us to determine all the basic sets. To do this efficiently we can present the pipe diagram in the form of a *linear graph* in which both branchpoints and pipes are clearly indicated. For example, Diagram 3b is the linear graph corresponding to the simple Keynesian model of Diagram 3a. After this is done, we can determine a basic set on the following principle: A number of pipes form a basic set if their deletion from the linear graph will leave the remainder (i.e., the non-basic planning concepts) in a state in which the linear graph is

- 1) *connected*, i.e., any two branchpoints are connected by a path of pipes and
- 2) *circuit-free*, i.e., no closed loop of pipe remains.¹

Applying these two rules to the simple Keynesian model, we see (from Diagram 4) that (YC), (YS), (YI), (CS), (CI) are basic sets since the linear graphs remaining after the deletion of these pairs of concepts are both *connected* (between any two branchpoints) and *circuit-free* (i.e., contain no loops). As a counter example, the concepts (I,S) do not form a basic set because this deletion would result in Diagram 5, a state in which both above conditions are violated. (The branchpoint “f” is now isolated—i.e., not connected with other branchpoints—and there *is* a loop in the linear graph.) A linear graph which is *connected* and *circuit-free* is called a tree. We have established the fact that the dependent planning concepts (i.e., variables *not* in the basic set) have the structure of a tree. Given any linear graph and a subset of pipes the reader should always be able to determine whether it does or does not constitute a basic set. This technique of identifying all the basic sets in a linear graph will be used later (Section IV) and should be fully understood.

The reason we are so much concerned with the notions of basic set and tree is that they have considerable practical significance from the point of view of drawing up an economic plan. This is due to the fact that the *basic set focuses our attention on a set of strategic variables*

¹It is beyond the scope of this paper to discuss the mathematical theory behind these rules. However, condition (1) requires that, *at most*, a certain number of pipes or independent conditions can be deleted; and condition (2) requires that *at least* a certain number of pipes must be deleted. Since the deleted pipes form the basic set, these two conditions assure that the number of pipes in the basic set equals the cyclomatic number.

relative to which the entire plan can be fashioned. For example (referring again to the simple Keynesian model), if the Planning Commission began with a fixed target income, Y , and an independently estimated level of tolerable consumption, than (YC) becomes the basic set. Alternatively, the Planning Commission may know Y and have some assurance that certain domestic savings can be mobilized; in this case (YS) is the basic set.

Thus the planning procedure we have in mind involves, first, the acceptance of a national income accounting system at a given level of aggregation and, secondly, the acceptance of a strategic set of concepts within the system, i.e., the basic set. As we know, a determination of the values attached to the variables in the basic set determines the entire system and represents a solution to a particular planning problem. What remains to be done is an investigation of the manner in which a basic set is selected and the way in which its numerical values are determined. With this in mind we shall systematically examine the aggregate Planning Commission model.

III

We can now afford to be a bit more precise about the nature of the independent conditions we are permitted to select in determining the values in our basic set. Such conditions must be the end-product either of some observed and empirically testable behavioristic relationship between economic variables or of an estimation based on information from outside the system. In other words, we have a choice between behavioristic equations and exogenous variables.

As we have seen in the simple Keynesian system, the basic set must contain two independent conditions. These turn out to be the consumption function, $C = \Phi(Y)$, a behavioristic equation, and investment, I , an exogenously determined magnitude. In this fashion economic theory has been combined with a knowledge of national income accounting structure in order to render the system completely determined.

It is now time to apply this procedure to the aggregate Pakistan Planning Commission model, at least as presented in the Second Five-Year Plan Outline. We shall attempt to interpret the method employed by the Commission in arriving at the Plan magnitudes pictured in our Diagram 2a above.

From our discussion in Section II we know that cyclomatic number for this model is $10 - (6 - 1) = 5$ and that we must, therefore, select five independent conditions which, together with the accounting relationships, will determine the entire system. The Commission's documents are not explicit as to the national income accounting model selected, the independent conditions and the method of determination

of the basic set. While we, of course, do not wish to be categorical here and shall have more to say on this subject later on, the Second Five-Year Plan Outline indicates that the following logic may have been implicit in the Commission's presentation.

The five independent estimation chosen by the Commission and the method used for their determination appear to be as follows:

- 1) Income, Y , as the minimum politically acceptable Plan goal—an exogenous variable. This can be written as $Y = Y_0$.¹
- 2) Investment, I , the size of the required development program derived from Y via the capital coefficient—a behavioristic relation. This can be written as $I = k(Y)$.
- 3) Consumption, C , derived from Y via the consumption function—a behavioristic relation. This can be written as $C = \Phi(Y)$.
- 4) Exports, X , derived from projections of what the economy can reasonably market abroad—an exogenous variable. This can be written as $X = X_0$.
- 5) Imports on current account m_c , derived as a function of national income—a behavioristic relation. This can be written as $m_c = f(Y)$.

We know that these conditions determine Y , I , S , X and m_c (which will be shown to be a basic set) and are hence sufficient to determine fully the entire Second Five-Year Plan system. The actual values of the five variables in the basic set are indicated in Diagram 2b. The dependent planning concepts not in the basic set (i.e. the endogenous variables) can be determined in the following order:

- 1) $S = Y - C$ or $11,000 = 143,450 - 132,450$
- 2) $M = C + I + X - Y$ or $18,050 = 132,450 + 19,000 + 10,050 - 143,450$
- 3) $m_i = M - m_c$ or $6,500 = 18,050 - 11,550$
- 4) $d = m_c - X$ or $1,500 = 11,550 - 10,050$

¹Exogenous income, Y , reflecting a planned percentage increase (20%) in income is really based on considerations of population growth superimposed on political desirability and the enforceability of Plan discipline reflected in per-capita income growth (10%).

$$5) S_F + m_l + d \quad \text{or } 8,000 = 6,500 + 1,500$$

At this level of aggregation, then, with 10 magnitudes to be simultaneously determined the Planning Commission apparently chose two exogenous variables (Y and X) and three behavioristically determined variables (C, I and m_c) for its independent estimations. Such a selection may be called a particular *planning choice* (or planning procedure). It depends, in the first instance, on the acceptance of a particular level of aggregation for the planning model. In this paper we shall accept and restrict ourselves to a discussion of planning choices at the Pakistan Planning Commission's level of aggregation, pictured in Diagrams 2a and 2b. We believe that this model is both reasonable and realistic and one which, with appropriate modifications, can provide interesting applications for specific planning problems in other contexts.

As a second step we need to be aware that the Commission in choosing the five independent conditions already described really exercised a choice among a larger array of possible exogenous variables and a larger array of possible behavioristic equations. Any planning body utilizing the Commission's aggregative model must exercise a similar choice. The nature of this array is determined by the extent to which economic theory can be called upon to assist in planning at a given level of aggregation. We may call this total array the theory space. The theory space, in other words, includes all possible independent economic conditions which the planner might want to take into consideration. Once the theory space has been agreed upon, planning choices will be restricted to a selection from among the conditions contained in the space. The theory space appropriate to the Planning Commission's aggregative model contains at least the following exogenous variables:

- 1) $Y = Y_0$ Income as a Plan target, politically determined.
- 2) $S_F = S_{F0}$ Foreign assistance as determined independently in the outside world.
- 3) $X = X_0$ Exports as determined by market conditions abroad.
- 4) $C = C_0$ Consumption as a minimum required goal for political or caloric reasons.
- 5) $I = I_0$ Investment as an independently arrived at target.

It also contains at least the following possible behavioristic equations:

- 6) $C = \Phi(Y)$ Consumption determined by application of the consumption function, a behavioristic equation of the Keynesian variety.¹
- 7) $I = k(Y)$ Investment determined through application of the capital coefficient, a behavioristic equation of the engineering variety.
- 8) $m_i = g(I)$ Imports on capital account determined by estimation of the import component of investment, a behavioristic equation of the engineering variety.
- 9) $m_c = f(Y)$ Imports on current account determined by estimation of the import component of current production and consumption, a behavioristic equation of the engineering variety.

In a systematic approach to planning two notions must, therefore, be accepted by any planning body:

- 1) Adherence to a specific model structure (i.e. national income accounting system) and
- 2) Adherence to a specific theory space.

The aggregative model of the Planning Commission has been accepted under (1) and the theory space containing 9 elements cited above may be accepted under (2).

Working within the confines of this model and this theory space the Planning Commission, according to our interpretation, seems to have chosen numbers 1 and 3 of the exogenous variables and numbers 6, 7 and 9 of the independent variables from the accepted theory space. In other words, the Planning Commission has selected this particular planning choice, i.e. it has focussed on this particular set of independent conditions to yield a determination of the entire system.

This planning choice contains a certain number of variables explicitly appearing in the independent conditions selected. These variables considered by the planner-economist to be of paramount

¹It should be noted that the consumption function can also be used to determine savings directly. The Second Five-Year Plan Outline, as a matter of fact, estimates domestic savings during the Second Five-Year Plan by splicing *ex ante* consumption function considerations on *ex post* savings (derived by subtracting foreign aid from total investment). But it matters little whether we use $C = \Phi(Y)$ or $S = h(S)$ in our theory space. There is no need to use both.

importance in determining the developmental capacity of a given economic system may be called a set of *strategic variables*. In the Commission's planning choice already cited, Y, X, S, I and mc represent the strategic variables (i.e., those variables contained in independent conditions numbers 1, 3, 6, 7 and 9 of our theory space). It will be useful to remember that these strategic variables also constitute a basic set.

It should be intuitively obvious, at this point, that the Planning Commission's choice represents but one of a number of possible planning choices; furthermore, that these choices can be enumerated once the model structure and the theory space have been determined.¹ This will be done in Section IV in order to place Pakistan's Second Five-Year Plan in proper perspective and work towards the evolution of a more systematic approach to alternative planning procedures.

IV

In order to examine at least a number of possible planning choices, we can proceed by determining all possible basic sets in our model since we know that in order to render the entire system determinate a planning choice must involve the determination of all the values of at least one basic set. This is tantamount to restricting ourselves to an examination of a particular class of cases from among the totality of legitimate planning choices yielded by the theory space. By examining all possible basic sets it should be clear that we are simultaneously examining some planning choices for which, as in the case of the Planning Commission's own choice cited above, the strategic variables are identical with the variables of a basic set.

Given N and T, the determination of the possible basic sets in the given model structure (N) and based on a given theory space (T) can be accomplished by a simple process of enumeration. The particular national income accounting structure of the Pakistan Planning Commission (Diagram 2b) and the particular theory space employed (Section III) permit us to identify all basic sets which contain only variables appearing in T. The results are presented in Column IV of Table I below. While the reader should now be able to construct such a table with the aid of our Keynesian example above (Diagram 4), it may be

(9!)

¹ The combinatorial law tells us that there are a maximum of $126 = \frac{9!}{(5!4!)}$

(5!4!)

ways in which 5 independent conditions can be taken out of a theory space containing 9 such conditions. We could show, however,—and intend to do so in a lengthier monograph under preparation—that only 69 of these choices are in fact legitimate planning choices. For example, if the strategic variables contained in a particular planning choice do not contain a basic set this choice must be discarded.

TABLE I
IDENTIFICATION OF SOME POSSIBLE PLANNING CHOICES BASED ON ALL RELEVANT BASIC SETS AT THE COMMISSION'S LEVEL OF AGGREGATION

	Domestic Variables (I, C, Y) (I)	Foreign Variables (X, mi, mc) (II)	Total Number and Descriptive Title of Legitimate Cases (III)	Enumeration of Legitimate Cases (IV)	Conditions Selected from the Theory Space (V)
(SF) included in Basic Set(I)	(Y,C) (C,I) (Y,I)	(X,mi) (X,mc) (mime)	"Given Aid" Cases 9	1) YCXmiSF 2) YCXmcSF 3) YCmi mcSF 4) YIXmiSF 5) YIXmcSF 6) YImi mcSF 7) CIXmiSF 8) CIXmcSF 9) CImi mcSF	SFo, C = $\Phi(Y)$, Y_o , X_o , $m_i = g(I)$ SFo, C = $\Phi(Y)$, Y_o , X_o , $m_c = f(Y)$ SFo, C = $\Phi(Y)$, Y_o , $m_i = g(I)$, $m_c = f(Y)$ SFo, I = $k(Y)$, Y_o , X_o , $m_i = g(I)$ SFo, I = $k(Y)$, Y_o , X_o , $m_c = f(Y)$ SFo, I = $k(Y)$, Y_o , $m_i = g(I)$, $m_c = f(Y)$ SFo, C, I, X_o , $m_i = g(I)$ SFo, C, I, X_o , $m_c = f(Y)$ SFo, C, I, $m_i = g(I)$, $m_c = f(Y)$
	(Y,C) (C,I) (Y,I)	(mi,mc,X)	"Needed Aid- Foreign Oriented" Cases 3	10) YImi mcX 11) YCmi mcX 12) CImi mcX	Y_o , I = $k(Y)$, $m_c = f(Y)$, $m_i = g(I)$, X_o Y_o , C = $\Phi(Y)$, $m_c = f(Y)$, $m_i = g(I)$, X_o C, I, $m_c = f(Y)$, $m_i = g(I)$, X_o
	(Y,C) (C,I) (Y,I)	(X,mi) (X,mc) (mime)	"Needed Aid- Domestic Oriented" Cases 3	13) YICXmc 14) YICXmi 15) YICmcmi	Y_o , C = $\Phi(Y)$, I = $k(Y)$, $m_c = f(Y)$, X_o Y_o , C = $\Phi(Y)$, I = $k(Y)$, $m_i = g(I)$, X_o Y_o , C = $\Phi(Y)$, I = $k(Y)$, $m_c = f(Y)$, $m_i = g(I)$

necessary to provide some further explanation of the classificatory device here adopted.

First of all, our system of 10 variables can be conveniently divided into two portions, a "domestic" portion containing all the domestic variables (i.e. Y, C, I, S) and a "foreign" portion containing all the foreign variables (i.e. S_F , M, m , m_c , X, d). This division is indicated in Diagram 2c in which all the "foreign" variables or pipes in Diagram 2b are indicated by broken lines.

Any combination of 5 variables chosen from the totality of 10 which, when deleted, leaves behind a "tree" constitutes, it will be remembered, a possible basic set. Simple inspection of the domestic and foreign portions of Diagram 2c will convince us that we need always select 2 domestic and 3 foreign or 3 domestic and 2 foreign variables in order to meet this condition and completely determine the system.

In the effort to come up only with basic sets based on the independent conditions within our theory space we can, moreover, eliminate certain variables from consideration. On the domestic side, for example, S can be eliminated since it does not appear in our theory space, either as an exogenous variable or (at least directly) as involved in a behavioristic equation. On the foreign side, we can eliminate M and d from consideration for the same reason.

Since a basic set must either contain S_F or not contain it, we have presented, in Row I of our table, all possible combinations of domestic and foreign variables with S_F included in the basic set. If a basic set contains S_F it must contain exactly two pipes or variables of the domestic variables and two pipes or variables of the foreign variables. There are only 3 ways to take 2 domestic variables out of the total of 3, yielding (Y,C), (C,I) and (Y,I) in Column I of Row I. Similarly there are only 3 ways (presented in Column II, Row I) to select a pair of foreign variables from the total set of 3. The total number of legitimate cases, when S_F is included is, therefore, $3 \times 3 = 9$ and the actual cases are enumerated in Column IV.

Rows II and III present basic sets which do not contain S_F ; the basic set must, therefore, contain combinations of either 2 domestic *plus* 3 foreign variables other than S_F (Row II) or combinations of 3 domestic *plus* 2 other foreign variables (Row III). Using the same procedure, we can readily see that we obtain a total of 6 more cases, which we have cited in Column IV of Rows II and III.

The inclusion or exclusion of S_F has been used as a classificatory device because it seems to us that the differential treatment of foreign aid as exogenous or as determined by the system represents an important distinction with respect to the planning enterprise. The Pakistan

Planning Commission, for example, treats S_F as endogenous. This may be considered "unrealistic" from a purely economic point of view since it assumes that the foreigner will adapt himself to the needs of our Plan. On the other hand, viewed in the broader-than-economics framework of contemporary realpolitik this procedure may not score at all badly on realism.¹ But it is not necessary to take position on this issue in order to go along with our expository device; any other would have produced precisely the same results: at least 15 possibilities in even this rather restricted category of planning choices.

If these 15 cases represent real life possibilities for alternative planning procedures it should be useful to examine them somewhat carefully with a view to their policy content and implications for alternative planning contexts. In Row I we present the cases for which S_F is determined, i.e., is part of the basic set. We may, therefore, call this family of 9, "Given Aid" cases. In Rows II and III we present two families of 3 cases each for which S_F is residually determined. We may call these families "Needed Aid" cases. Row II furthermore summarizes those cases which have a relatively heavier "dosage" of other foreign variables (to the exclusion of S_F) and Row III, those cases which have a relatively heavier "dosage" of domestic variables. We may, therefore, further distinguish between "Needed Aid—Foreign Oriented" (Row II) and "Needed Aid—Domestic Oriented" cases (Row III). Planning bodies everywhere must exercise a macro-choice of this sort (and a micro-choice within these families) according to the specific economic conditions and the socio-political background at hand.

Let us begin with the "Needed Aid—Domestic Oriented" cases in Row III of our table, since case 13 can readily be recognised as the choice of the Pakistan Planning Commission and thus presents a convenient point of departure. Case 13 ($YICXm_c$) implies a knowledge of the consumption function, $C = \Phi(Y)$, of the aggregate capital coefficient, $I = k(Y)$, and of national income as an independently stipulated Plan goal, $Y = Y_0$, (on the domestic side); of independently determined exports, $X = X_0$, and a knowledge of the behavioristic equation linking income and current account imports, $m_c = f(Y)$, (on the foreign side). The domestic variables in any basic set, e.g., YIC here, may, of course, be determined in one of three possible ways: all three are exogenously determined; two are exogenously determined and the third results from a behavioristic equation; only one is exogenously determined and the other two are derived by means of behavioristic equations. On the foreign side this question does not arise since there is no allowance in our theory space for X to be determined in a behavioristic

¹It seems clear, for example, that India has consistently, and quite successfully, assured that foreign exchange gaps, in excess of to-be-anticipated levels of assistance, would somehow be filled.

fashion or for m_c or m_i to be determined exogenously.¹ Thus we see that for each basic set listed in Table I there are several planning procedures, e.g., for case 13, $I = I_o$ can be substituted for $Y = Y_o$ from our theory space while the capital coefficient and the consumption function are retained. In this paper, however, we shall content ourselves with discussing only one reasonable planning procedure appropriate to each case. The independent conditions from the theory space used in each case are indicated in column V of Table I.

The significance of case 13, already pictured in Diagram 2b, is that, under the self-imposed condition of a 20% growth of income over the Plan period, and a knowledge of the over-all capital coefficient (built up from the collection of schemes composing proposed sectoral allocation programs), the required national development program follows. If, as the Second Five-Year Plan Outline contends, domestic savings are estimated by the ex-post difference between total investment and foreign aid, as adjusted upward by ex ante consumption function considerations, consumption (and savings) are uniquely determined by income. S_F is then required to fill whatever the gap may be in order to enable the necessary investment program to go forward. On the foreign side we know that S_F is utilized specifically to finance the current account deficit, $d (= m_c - X)$, and/or imports on capital account, m_i . Given an exogenous X and the fact that m_c is strictly determined, the amount of imports required for the development program, m_i , constitutes the only residual flexibility in the economy. In other words, if S_F proves insufficient, the only point of "give" or adjustment in the system lies in the possibility of technological change reducing m_i by substituting domestic for imported components in the development program.

Case 14, $YICXm_i$, differs from case 13 in that m_i , derived from $m_i = g(I)$, now appears in the basic set in place of m_c , derived from $m_c = f(Y)$. Everything remains the same on the domestic side and X remains exogenous on the foreign side. The significance of this case is that the planner who chooses it is apparently less optimistic about the possibility of import-saving innovations on capital account and more optimistic about import-saving innovations on current account. The choice between cases 13 and 14 is based on some sort of empirical knowledge about the relative innovative capacities in different sectors

¹It should be clear that the planning choice which relies more heavily on behavioristic equations constitutes a "better" choice in the sense that it permits greater play for the contribution of economic theory: but the system can be equally fully determined in either case. Whether to use more or less exogenous variables and more or less behavioristic equations is, of course, not simply a question of preference but of necessity since some behavioristic relationships may not be obtainable, given the state of economic knowledge and statistical sophistication.

of the economy. Such considerations which are not a part of the system but help the planner to make a selection from among alternative planning choices may be called extra-model considerations.

Case 15 ($YICm_c m_i$) combines both functions $m_c = f(Y)$ and $m_i = g(I)$ in the basic set but is forced to abandon X as an exogenous variable. Such a planning choice does not seem very acceptable from the point of view of a primary-producing export country heavily dependent on foreign trade. It may, however, be quite suitable from the point of view of an economy carrying on a very limited amount of trade but facing a seller's market for its exports. It should be noted that none of the planning choices discussed thus far (13-15) preserves X as an exogenous variable *and* simultaneously retains f and g as technologically determined behavioristic equations.

One might hazard the guess, in view of the difficulties attending the discovery and successful entry into new markets in the mid-twentieth-century, on the one hand, and the relative inflexibility of import capital coefficients on the other, that, *ceteris paribus*, the planning choice placing a residual burden on import requirements on current account is the most realistic of the three from the point of view of contemporary underdeveloped areas.

The family of "Needed Aid—Foreign Oriented" cases in Row II (S_F still excluded from the basic set but with 2 domestic and 3 foreign variables now included) must now be examined. Planning choices 10, 11 and 12, of course, still treat foreign aid as an endogenous variable. The difference rests in the fact that these choices permit no freedom on the foreign side, i.e. the technological conditions governing import requirements $m_c = f(Y)$; $m_i = g(Y)$ and the exogenously stipulated amount that can be exported ($X = X_c$) are now simultaneously retained. There is a good deal of realism in treating these three as rigid conditions to which the plan must adjust itself. On the other hand, one of the three independently determined conditions on the domestic side, i.e., the consumption function determining C , the capital coefficient determining I , or the exogenously determined Y , must now be sacrificed.

Dealing first with case 10 ($YIm_i m_c X$), it may be helpful once again to present the relevant linear graph (Diagram 6) with the variables of the basic set indicated by broken lines. We know that while Y has been retained as an independently determined plan goal and the capital coefficient yielding I remains, the consumption function has now had to be abandoned.

The logic of this model is that, starting from the well-represented foreign side, exogenous X , in combination with m_c , yields d ; d and m_i then determine S_F which, in turn, given the development program, I , yields required domestic savings, S .

DIAGRAM 6: Planning Choice Y I m_f m_c X

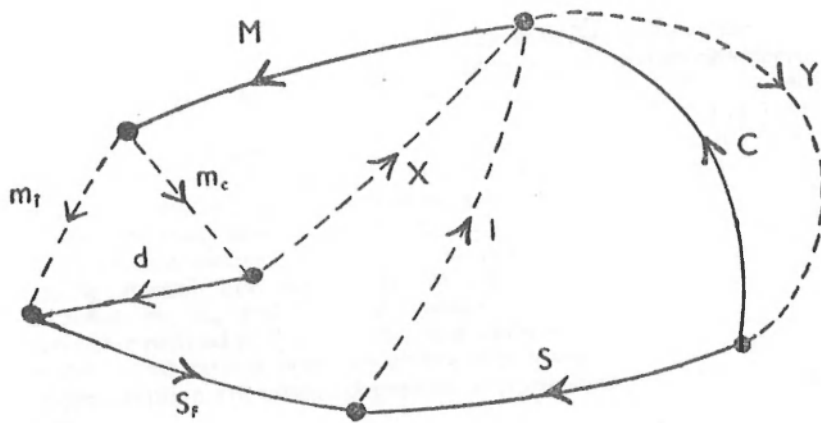
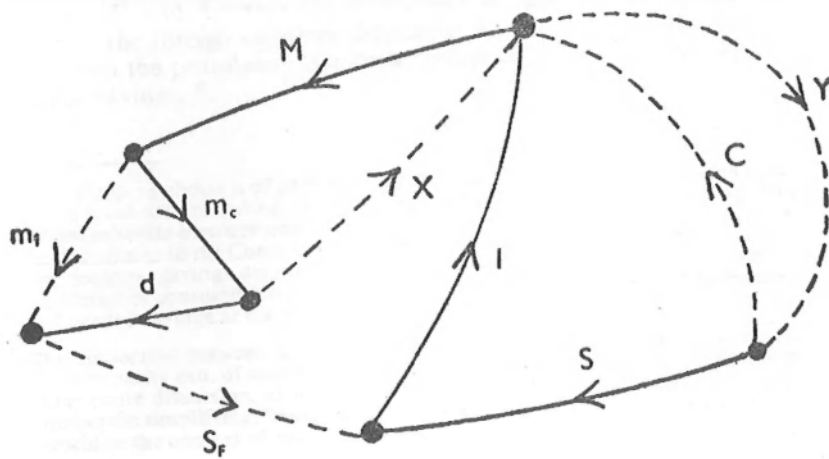


DIAGRAM 7: Planning Choice Y C X m_f S_f



Needed domestic and needed foreign savings are thus simultaneously determined in this particular planning choice. Consumption, C , turns out to be what is left of income, Y , after domestic savings, S , have been extracted. Without consumption function restrictions to provide support, consumption can thus, if necessary (for reasons of insufficient foreign aid or a higher-than-expected capital coefficient), be squeezed residually to accommodate the planned income growth and the required investment program.¹

In the case of planning choice 11 ($Y C m_i m_c X$) we have the same situation on the foreign side (i.e., the presence of the two engineering restrictions governing imports and of the exogenous X), but now retain the consumption function while sacrificing the capital coefficient. In this instance income, Y , must be viewed not as a plan goal but as the reflection of the economy's productive capacity to accommodate, in the first instance, a behavioristically determined level of consumption.² Domestic savings constitute the residual productive capacity available as a contribution to total investment. The foreign contribution S_F , is easily determined from the independently arrived at foreign variables, m_i , m_c and X . The consumption-oriented nature of this particular method is clear. Its choice is likely to result from such extra-model considerations as the possibility of political upheaval if low levels of consumption are further depressed or from some other welfare considerations.

Turning now to planning choice 12 ($C I m_i m_c X$) income, Y , whether as plan goal or as given initial capacity, has been sacrificed here along with the consumption function and the capital coefficient. We begin with independently estimated minimal political or caloric consumption requirements and an independent investment target—in addition to exogenous X and functionally determined m_i and m_c , as before. We know that the foreign variables determine S_F , once again, and that the latter, given the postulated investment program, I , determines required domestic savings, S .

¹This planning choice is of particular interest since it is another serious contender as a candidate reflecting the Planning Commission's own methodology. We must reiterate here our unwillingness to be categorical about ascribing a particular choice to the Commission. It is just possible, however, that the derivation of domestic savings described in the Outline and already referred to gives no evidence of consumption function considerations but of an *ex post* assessment of needed savings at the margin.

²The distinction between Y as an end-of-plan target and Y as a beginning-of-plan capacity can, of course, be rigorously observed only in dynamic planning. Our entire discussion, as well as that of the Planning Commission, implicitly makes the simplifying "instantaneous" assumption. The defects of such a static world in the context of planning should be kept in mind.

Income, Y , thus appears as the needed domestic effort to render the exogenously determined level of consumption and the endogenously derived level of domestic savings possible. If the economy is forced to save more in order to satisfy the requirements of both C and I it will be forced to work harder, i.e., increase Y . Y may be viewed as a variable means to the fixed end of the investment program. We may call this choice a mild minimum national effort model. It may be appropriate to the case of a centrally planned economy like Yugoslavia in a position to depend on a generously flexible supply of foreign assistance.

We have now briefly examined all six cases in the "Needed Aid" category which have the important common feature that S_F is not included in the basic set, i.e., the foreigner can be depended upon to share the burden of development in an open-ended fashion. We have also seen that the difference between the foreign-oriented and the domestic-oriented members of the family rests on the relative importance attached to the foreign and domestic conditions which underlie a plan, i.e., the more seriously the planner takes the restrictive nature of a given behavioristic relationship or a given exogenous condition the more likely he is to include it in the basic set of his planning choice. What remains now is an examination of the family of nine "Given Aid" cases, listed in Row I of our table and including planning choices containing S_F in the basic set.

We should note at once that, on the foreign side, it is not possible in any of these cases to retain simultaneously the two behavioristic equations governing import requirements $m_c = f(Y)$; $m_i = g(I)$ as well as exogenous exports, $\bar{X} = X_0$. This means that in selecting among the planning choices included here the planner must again weigh certain extra-model considerations on the foreign side. For example, if he is relatively optimistic about the economy's innovational capacity with respect to engineering import requirements on capital account, he is likely to exclude m from the basic set. Likewise, relatively greater optimism on the substitutability of domestic for imported materials on current account will result in the exclusion of m_c ; and residual export flexibility in the exclusion of X .

Let us proceed now with the first three cases, (1, 2 and 3) of our Table I in which the domestic variables included in the basic set are Y and C . This means that the capital coefficient has been sacrificed while both exogenous Y and the consumption function have been retained. Income must again be viewed as capacity inherited at the beginning of the period. Behavioristically determined consumption exercises first option on this capacity and what is "left over", i.e., S , can contribute to I , the development program, along with S_F . These three consumption-oriented planning choices differ from each other only in the selection of the variables included from the foreign side. This determines the form in which a given amount of foreign aid is

received. For example, in the case of planning choice 1 ($YCXm_iS_F$), pictured once again, for the sake of clarity, in Diagram 7, we know that exports are exogenous and that no resort to production function flexibility with respect to imports on capital account is possible. Foreign aid, S_F , the sum of m_i and $d = (m_c - X)$, is firmly determined from the outside and the only residual "leverage" rests with softening the tyranny of import requirements on current account. Case 2 ($YCXm_cS_F$) is selected if there exists relatively greater innovational potential for reducing the import requirements of the investment program, and case 3 if there is relative optimism with respect to the residual potentialities for pushing exports.

Planning choices 4, 5 and 6 may now be examined. What distinguishes them from cases 1-3 of the family of "Given Aid" cases already discussed is the retention of domestic variables Y and I in the basic set. Now the capital coefficient is retained and the consumption function sacrificed. Income, Y , is reinstated as a plan target to be achieved by means of a given investment program working through a known aggregate capital coefficient. Needed domestic savings, S , are uniquely determined as the residual between I and exogenous S_F ; and consumption as whatever is left of income after such demands have been satisfied.

The choice among cases 4, 5 and 6, all of which are clearly production and not consumption-oriented, must, of course, again be made on the basis of further extra-model considerations on the foreign side. Case 4, for example, $YIXm_iS_F$, throws the residual burden, in terms of the need to adapt to plan exigencies, on m_c . Case 5 is chosen if there is relatively greater faith in capital account import flexibility; and case 6 if there is relative optimism about the flexibility of the export potential.

Let us dispose of the three remaining cases, planning choices 7, 8 and 9. Tracing through the solution for $CIXm_iS_F$, by once again using the basic set in conjunction with our known structural relations, we can determine current account deficit, d , as the portion of foreign aid, S_F , not used to finance imports on capital account, m_i . Since we know X and have just determined d , we know m_c and M . Similarly S_F and I jointly give us S ; S and C give us Y .

Returning to the meaning of this model, exogenous Y has been abandoned, along with the consumption function and the capital coefficient. In their place we have an exogenously determined investment program and an exogenously determined minimal level of consumption. Savings are expected to adjust themselves to the needs of the development program; and income must be viewed as the minimum effort required to make possible a minimum level of consumption (politically and/or calorically determined) and to accommodate the possibly ambitious investment program on which the plan is focussed. The selection of the two foreign variables (other than S_F) to be included

in the basic set, which constitutes the difference between cases 7, 8 and 9, is again made on the basis of the extra-model considerations already cited.

This planning choice may be called a severe national effort model. The added severity rests on the fact that, unlike in case 12 above, we have no indulgent foreigners to fall back on and the adjustment is thrown wholly on the domestic effort. Such a planning choice seems to have some applicability to a centrally planned economy without access to sources of foreign aid, e.g., the U.S.S.R. Given an ambitious investment program, possibly severe consumption restrictions and exogenously determined foreign aid, the model determines the minimum national effort required to achieve this target.

Thus, if in rather cursory fashion, we have analyzed a group of 15 possible planning choices of which the Planning Commission's selection is but one possibility. Special attention has been given to the policy content of the choices, given a particular set of economic conditions and extra-model considerations. It is our hope that a systematic presentation of this kind which includes the basic tools for future analysis, will prove helpful to planners and policy makers. It should be noted that such a systematic approach should prove especially helpful in working towards dynamic planning flexibility, i.e., protecting a plan systematically against such elements of uncertainty as an unexpected shortfall of foreign exchange, an unforeseen windfall in export prices, a change in government policy.

Our treatment remains somewhat inadequate in at least two respects. Firstly, we have not fully explored all possible planning choices derivable from our given theory space. This can easily be done but would have gone beyond the present limitations of time and space. Secondly, we have been dealing with equalities throughout and have not examined the possibilities of planning by means of certain inequalities, e.g., consumption must *at least* be equal to a given proportion of national income; foreign aid can *at most* be equal to a given amount. There is some reason to believe that the Planning Commission may, in fact, be implicitly using such a simple linear programming approach. An extension of our treatment in at least these two directions is contemplated.

APPENDIX A

In this appendix we shall first briefly describe the intra-group concepts of Diagram 1, by describing the *inflows* into each branchpoint. Secondly, we shall describe the derivation of Diagram 2a from Diagram 1.

1) Production Sector

At A: Total Consumption	C_o	= 134,150
Investment	I	= 19,000
At B: Total Resources	TR	= 153,150
At C: Domestic Resources	d_m	= 133,400
Total Exports	X	= 10,050

Thus we see (at A) that the total resources (TR) can be used for consumption (C) or investment (I) purposes. At branchpoint B we see that total resources can be derived from domestic resources (d_m) or imports (M). Branchpoint C indicates that the sum of domestic resources (d_m) and exports (X) is GNP.

2) Government and Household Sector

At D: GNP = 143,450

At E: Personal Income P.I. = 127,950

At F: Government Income R = 15,500

At G: Government Current Revenue g_c = 13,800

At H: Government Revenue for Investment g_i = 1,700
Surplus on Current Account G_s = 800

At I: Household Savings S_h = 8,500
Government Savings S_g = 2,500

At J: Counterpart Funds Unreleased F_r = 1,700

At K: Government Current Expenditure $g_e = 13,000$
 Foreign Consumption $G' = 1,000$

At L: Household Consumption $C = 119,450$
 Government Consumption $G = 14,000$
 Indus Basin Works $b = 700$

As seen from branchpoint D, the GNP is divided into personal income (P.I.) and government income (R). Personal income is divided (at branchpoint E) between household consumption (C) and households savings (S_h). Government income (R) is resolved (at branchpoint F) into government revenue for investment, g_i and government current revenue, g_e . The latter (g_e) is used partly as government current expenditures (g_e) and partly as surplus on current account (g_s) for investment purposes. (See branchpoint G.) The above government revenue for investment (g_i) is grouped with government surplus on current account (g_s) to give us S_g , namely, government savings. When this is added to household savings (S_h), the concept of domestic savings (S) is derived. (These relationships are shown at branchpoints H and I.)

The unreleased counterpart funds (F_r) are retained either for Indus Basin Works (b) or as foreign consumption (G'). The latter is treated as a part of government consumption (G) in addition to government current expenditure (g_e). Finally, total consumption (C_o) is shown as the sum of household consumption (C), government consumption (G) and Indus Basin Works (b). (These relationships are shown at branchpoints, J, K and L.)

3) Finance Sector

At M: Private Investment $I_p = 6,000$
 Government Investment $I_g = 10,000$
 Semi-public Investment $I_s = 3,000$

At N: Foreign Savings for Private Investment $f_p = 1,100$
 Household Savings for Private Investment $p_p = 4,900$

At O: Foreign Savings for Semi-public Investment $f_s = 400$
 House Savings for Semi-public Investment $h_s = 1,100$
 Government Savings for Semi-public Investment $g_s = 1,500$

At P: Household Savings for Government Investment $h_g = 2,500$
 Foreign Savings for Government Investment $f_g = 6,500$
 Government Savings for Government Investment $S_g = 2,500$

At Q: Foreign Savings $S_F = 8,000$

At R: Domestic Savings $S = 11,000$
At S: Household Savings $S_h = 8,500$

The accounting concepts in the finance sector describe the various types of *demand* for investment funds, the different sources of *supply* of investment funds as well as the channelization of the latter to the former.

As is indicated at branchpoint M, there are three types of *demand* for investment funds: private (I_p), public (I_g) and semi-public (I_s). There are also three sources of *supply*: foreign savings (S_f), domestic savings (S_h) and government savings (S_g). (These are represented as inflows into branchpoints Q, S and P, respectively. We may add the remark here that the outflows from branchpoint R in the finance sector give us the same information as the inflows into branchpoint I in the government and household sector.)

Branchpoints N, O and P represent the "receiving centers" for investment funds for the private, semi-public and public investment programs, respectively. The channelization of the various sources of supply into these "receiving centers" is clearly described in the Diagram and needs no further explanation.

Foreign Sector

(For the foreign sector, we shall first treat the sector "W" as one branchpoint. The planning concepts within this sector, will be described later.)

At T: Total Imports $M = 19,750$

At U: Regular Imports (i.e., non-P.L. 480 imports) $m_r = 18,050$

At V: Imports on Current Account $m_c = 11,550$

At W: Imports on Capital Account $m_i = 6,500$

Deficit on Current Account $d = 1,500$

Imports on P.L. 480 Account $m_p = 1,700$

Total imports (M) are the sum of imports on P.L. 480 (m_p) account and regular imports (m_r). The latter are divided into imports on current account (m_c) and imports on capital account (m_i). The deficit on current account (d) is shown as the difference between imports on current account (m_c) and exports (X).

The sector W within the foreign sector describes the computation relating to "counterpart funds". The planning concepts used for this computation include:

At W_1 : Imports on P.L. 480 Accounts $m_p = 1,700$

At W_2 : Arrivals of Commodity Aid $a_r = 2,500$

At W_3 : Counterpart Funds released from P.L. 480 Account $r_1 = 750$
Counterpart Funds released from Commodity Aid $r_2 = 1,750$
At W_4 : Counterpart Funds unreleased from Commodity Aid $u_1 = 750$
Counterpart Funds unreleased from P.L. 480 Account $u_2 = 950$
At W_5 : Total Counterpart Funds released $r = 2,500$
Other Regular Aid $O_r = 5,500$
At W_6 : Imports on Capital Account $m_i = 6,500$
Deficit on Current Account $d = 1,500$
At W_7 : Regular Foreign Assistance $f_r = 8,000$

This rather complicated accounting system is due to the fact that the Planning Commission chose to compute counterpart funds released and unreleased, separately for *two types* of foreign aid: outflow from branchpoint W_1 indicate the released (r_1) and unreleased (u_2) P.L. 480 counterpart funds (m_p); outflows from branchpoint W_2 indicate the released (r_2) and unreleased (u_1) counterpart funds from the arrivals of commodity aid (a_r). The total released counterpart funds (r) (from both sources) is indicated at branchpoint W_3 , and the total unreleased counterpart funds (F_r) (also from both sources) is indicated at branchpoint W_4 . Since the imports on P.L. 480 account (m_p) concept *is used* as a major inter-group planning concept, it is directly resolved into the released and unreleased portions. However, the "arrivals of commodity aid" (a_r) is not an inter-group planning concept, i.e., has never previously appeared and presumably constitutes a portion of regular foreign assistance (f_r). A more complicated treatment is involved in the counterpart fund computation for a_r . First, the imports on current account (m_c) and the import on capital account (m_i) must be grouped together to derive regular foreign assistance (f_r) at W_6 . Next, the arrival of commodity aid (a_r) must be separated from "other regular aid" (O_r) at W_7 . Finally, the other regular aid (O_r) must again be regrouped with the released counterpart funds (r) at W_5 to give us foreign savings (S_F).

We shall now describe the way in which the aggregate model of the Planning Commission—i.e., Diagram 2a—can be derived from Diagram 1. To do this, let us first show all the *inter-group* planning concepts of Diagram 1—see diagram A of the Appendix. Comparing Diagram A and Diagram 2a, we see that they differ only in that Diagram A contains two concepts—i.e., imports on P.L. 480 account ($m_p = 1,700$) and unreleased counterpart funds ($F_r = 1,700$)—missing from Diagram 2a. To derive Diagram 2a from Diagram A we must somehow "cancel" these concepts.

First, let us locate a circuit which contains both concepts (m_p and F_r). Such a circuit is shown in Diagram B. It contains, in addition to m_p and F_r , the two concepts we want to eliminate, consumption (C_o) and total imports (M). If *any fixed number* k is subtracted from (or added to) *all* the concepts (contained in a circuit) in Diagram A, this will leave the accounting system in balance. If we let $k = 1,700$, we derive Diagram 2a from Diagram A directly.

Notice that the above operation simultaneously “cancels out” the two concepts m_p and F_r . This is due to the fact that by accident $m_p = F_r (= 1,700)$. In the general case (i.e., when $m_p \neq F_r$), we can cancel out only one concept (i.e., the concept with the *lower* value) by means of such an operation. From the economic standpoint, we have no reason to believe that the proposition $m_p = F_r$ is generally valid. Thus, it is this accidental equality between m_p and F_r which ensures the equally accidental equality between S_F and $m + d$ within the framework of the Planning Commission’s model.

DIAGRAM A

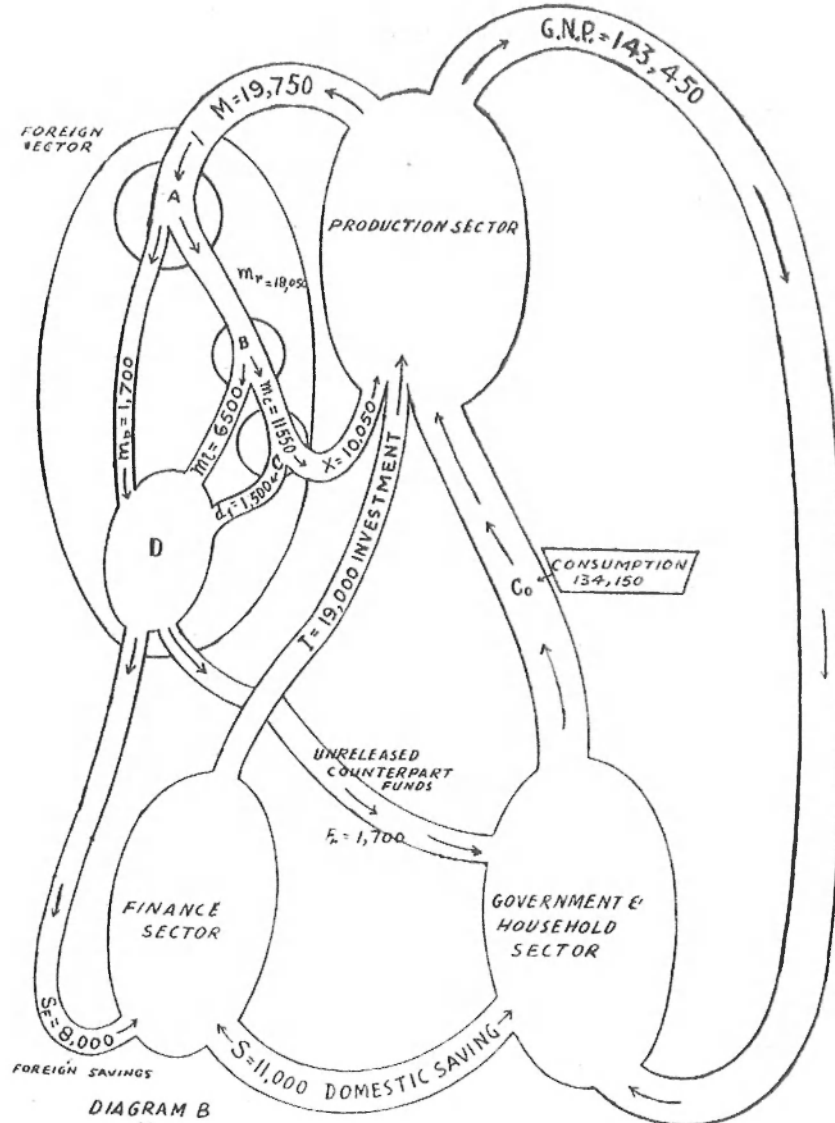
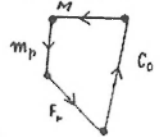


DIAGRAM B



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