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THE STRUCTURE OF OPEN DUALISM*

by

Douglas S. Paauw and John C. H. Fei

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CHAPTER 7

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1. INTRODUCTION: ANALYSIS OF OPEN DUALISM

In focussing upon the transition process in the open, dualistic economy, our study has both a time perspective and a typological emphasis. The time perspective derives from our attention to the transition process, which we have seen emerges from the historical antecedents of the colonial epoch and moves the economy toward the epoch of modern economic growth. In its typological emphasis, our study concentrates upon economies exhibiting the special characteristics of open dualism--as in the cases of the Philippines, Thailand, and Taiwan. In the previous chapter we discussed the historical significance of the transition process, as well as the essential growth phenomena which occur during the transition. In that discussion, we concentrated upon the time aspect while referring only casually to the typological aspect, assuming the notion of open dualism to be self-evident. In the present chapter, this procedure is reversed, and we shall formally examine the meaning of open dualism while neglecting the question of change through time.

Investigation of the nature of open dualism, as a particular type of economy, involves two dominant types of characteristics, one having to do with the economy's form (a morphological concept) and the other with its mode of operation (a physiological concept). In

viewing the economy as a whole, both concepts can be portrayed in terms of intersectoral relationships (or flows) between aggregate sectors (e.g., agriculture, industry, foreign, government, and finance). Hence, the proper language to describe the structural characteristics of the open, dualistic economy involves the use of a national income accounting system emphasizing intersectoral flows. To develop such a system we begin by recapitulating some basic notions of national income accounting presented in Chapter 4. We then proceed in two steps. In the first step, we deduce, from our work in Chapter 4, a detailed national income accounting structure for the open, dualistic economy. To minimize references back to that chapter, we review the relevant linear graph concepts presented there. In the second step, we deduce a more macroscopic accounting framework emphasizing intersectoral relationships.

In the preceding chapter we showed that the operational significance of an economy's form lies in the mode of operation implied in that form. We made this connection in terms of an economy's functional units. In applying this premise to the task of this chapter, we identify the functional units from the national income accounting system we construct for the open, dualistic economy. This procedure is first discussed abstractly in Section 4 of this chapter. To emphasize these general principles, we will then proceed to identify the functional units

within the accounting structure--or we shall describe it, the "skeleton"--of the open, dualistic economy.

The agenda we have just listed for discussion in this chapter inevitably involves rather technical material which may appear tedious, if not difficult, to some readers. Nevertheless, this technical chapter is essential for providing a basis for a satisfactory study of the transition, particularly in its empirical aspects. Though tedious, this material paves the way for a statistical input in our work, the basis for adapting our study to reality. Once having introduced in this chapter a system of accounting magnitudes for the open, dualistic economy, we shall consistently use this system throughout this study. Thus, we hope to cultivate a sense of technical competence to deal with both the conceptual and statistical aspects of our work. Specifically, this chapter provides the background for our statistical "decomposition analysis" in Chapter 13, required for providing a firm basis of empirical evidence for our study.

This chapter has the further purpose of providing a basis for linking the technical aspects of the open, dualistic economy's structure and our evolutionary view of transitional growth (expounded in the previous chapter). By developing a technical understanding of the functional units comprising the open, dualistic economy, we will be in a position to proceed

(in the following chapter) to the implications of these functional units for our evolutionary view of transitional growth.

Finally, it is hoped that this chapter will lead toward a method of empirical analysis generally applicable to less-developed countries; i.e., not necessarily limited to our present focus of open dualism. For this reason, the method begun in this chapter will be extended in Chapter 13 with methodological formalism similar to our presentation of the national income accounting system in Chapter 3. This remark will serve to remind the reader that our work in this chapter is an integral part of the method of empirical analysis more fully developed in Chapter 13.

2. THE NATIONAL INCOME ACCOUNTING SYSTEM

The national income accounting system to be introduced here and used throughout the remainder of this study is a simplification of the system introduced in Chapter 4, Table I. In that table, four macroscopic economic sectors are first distinguished: industry, agriculture, government, and foreign. For each of the three domestic sectors (industry, agriculture, and government), the production aspect is differentiated from the income disposition aspect to emphasize these intrasectoral relationships. Finally, a finance sector is postulated to balance the capital accounting relationships among the four other macroscopic sectors. Thus, there are

eight accounting sectors in the system, shown as the eight sectoral headings in the 8 by 8 square table in Table I of the present chapter:

(a) industry (production aspect)

(b) agriculture (production aspect)

(c) government (production aspect)

(d) industry (income disposition aspect)

(e) agriculture (income disposition aspect)

(f) government (income disposition aspect)

(g) foreign

(h) finance

In Table I, 24 basic accounting concepts are recorded, each in one particular cell. All accounting concepts used in this table and throughout the remainder of this chapter are flows of monetary payments in contrast to the real flows of goods and services shown in Diagram 1 of Chapter 6. For example, the flow M* now represents payments for industrial imports rather than the flow of imported goods. Including the accounting totals indicated at the right-hand margin (Y, X, G, H, L, T, M, S), there are altogether 32 basic national income accounting concepts which will be used consistently in the empirical part of our work. Moreover,

TABLE I

ACCOUNTING SYSTEM FOR THE OPEN, DUALISTIC ECONOMY

		PRODUCTION			INCOME DISPOSITION			FOREIGN	FINANCE	
		Ind. (a)	Agric. (b)	Govt. (c)	Ind. (d)	Agric. (e)	Govt. (f)	(g)	(h)	
Industry	(a)		N	Y_g	Y_h	Y_I		E_y	I [2/]	Y
Agriculture	(b)	R		X_{1_g}	X_h	X_L		E_x		X
Government	(c)						G_T			G
Industry	(d)	V_y		G_h						H
Agriculture	(e)		V_x	G_L						L
Government	(f)				T_h	T_L				T
Foreign	(g)	M^* [1/]	M_x							M
Finance	(h)				S_h	S_L	S_g	A		S

[1/] $M^* = M_i + M_R + M_y$

[2/] $I = I_d + M_i$
$= I_x + I_y$

analysis of the open, dualistic economy's structure, as well as its mode of operation, will be conducted mainly within this framework. A numerical example, constructed from the system shown in Table I and using Philippine data for the year 1965 (millions of pesos in 1955 constant prices), is presented in Table II. Note that Table II is a balanced table, signifying that for every accounting sector [from (a) to (h)] the total row sum equals the total column sum. This may be seen from the actual numbers entered in the right and bottom margins of the table.

Formally, the balanced table is defined by any seven of the following eight accounting equations:[1]

1a) $N + Y_g + Y_h + Y_L + E_y + I = Y = R + V_y + M^*$ [balance of Sector (a)]

b) $R + X_g + X_h + X_L + E_x = X = N + V_x + M_x$ [balance of Sector (b)]

c) $G_T = G = Y_g + X_g + G_h + G_L$ [balance of Sector (c)][2]

d) $V_y + G_h = H = Y_h + X_h + T_h + S_h$ [balance of Sector (d)]

---

[1]See Theorem 1, Section 2.2 of Chapter 4.

[2]Notice that $G_T = G$. The two variables G and G_T are separated only to facilitate our country data procedures.

TABLE II

OPEN, DUALISTIC ECONOMY ACCOUNTING SYSTEM APPLIED TO PHILIPPINES, 1965
(Million pesos, 1955 constant prices)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
(a)		488(N)	59(Y_g)	4491(Y_h)	2405(Y_L)		976(E_y)	2234(I)[2/]	11,653 (Y)
(b)	559(R)		0(X_g)	2313(X_h)	1371(X_L)		1748(E_x)		5,991 (X)
(c)						1150(G_T)			1,150 (G_T)
(d)	8613(V_y)		562(G_h)						9,175 (H)
(e)		4116(V_x)	529(G_L)						4,645 (L)
(f)				1009 (T_h)	549(T_L)				1,558 (T)
(g)	2481(M*)[1/]	387(M_x)							2,868 (M)
(h)				1362(S_h)	320(S_L)	408(S_g)	144(A)		2,234 (S)
	11,653	5,991	1,150	9,175	4,645	1,558	2,868	2,234	

[1/] $M^* = M_y + M_i + M_R$

$2481 = 565 + 623 + 1293$

[2/] $I = I_d + M_i = 1611 + 623$

$= I_x + I_y = 357 + 1877$

e) $V_x + G_L = L = Y_L + X_L + T_L + S_L$ [balance of Sector (e)]

f) $T_h + T_L = T = G + S_g$ [balance of Sector (f)]

g) $M^* + M_x = M = E_y + E_x + A$ [balance of Sector (g)]

h) $S_h + S_L + S_g + A = S = I$ [balance of Sector (h)]

Table III is a glossary giving the names of the accounting entries, arranged in the order of monetary payments into the eight accounting sectors. With the aid of this glossary, it is easy to see the economic interpretations for the above-mentioned accounting equations. For example, Equation (1a), the balancing equation for the industrial production sector, states the equality between total demand for industrial output (Y) and total outpayments made by this sector.

TABLE III

GLOSSARY OF ACCOUNTING CONCEPTS:
OPEN, DUALISTIC ECONOMY
(Arranged in the order of sector inflows)

(a) Demand for Industrial Output:

1) N (as intermediate inputs purchased by the agricultural sector).
2) Y_g (as intermediate inputs purchased by the government sector).
3) Y_h (as consumer goods purchased by industrial households).
4) Y_L (as consumer goods purchased by agricultural households).
5) E_y (as exports).
6) I (as investment goods)
$I = I_d + M_i$ where M_i is imported capital goods and I_d is domestically produced capital goods.
$= I_x + I_y$ where I_x is investment in agriculture and I_y is investment in industry.
7) $Y = N + Y_g + Y_h + Y_L + E_y + I$ (total industrial output).

(b) Demand for Agricultural Output:

8) R (as intermediate inputs purchased by the industrial sector).
9) X_g (as intermediate inputs purchased by the government sector).
10) X_h (as consumer goods purchased by industrial households).
11) X_L (as consumer goods purchased by agricultural households).
12) E_x (as exports).
13) $X = R + X_g + X_h + X_L + E$ (total agricultural output).

TABLE III
(Continued)

(c) Government Output (valued by expenditure):

14) G_T (Total government expenditure).
15) $G = G_T$

(d) Disposable Income of Industrial Sector:

16) V_y (value added of industrial sector).
17) G_h (income received from government sector).
18) $H = V_y + G_h$ (total disposable income, industrial sector).

(e) Disposable Income of Agricultural Sector:

19) V_x (value added of agricultural sector).
20) G_L (income received from government sector).
21) $L = V_x + G_L$ (total disposable income, agricultural sector).

(f) Government Revenue:

22) T_h (tax payments by industrial sector).
23) T_L (tax payments by agricultural sector).
24) $T = T_h + T_L$ (total government revenue).

(g) Total Imports (Income of Foreign Sector):

25) M^* (imports by the industrial sector)
$= M_i + M_R + M_y$ where M_i = imported capital goods
M_R = imported intermediate goods
M_y = imported finished goods
26) M_x (imports of finished agricultural goods).
27) $M = M^* + M_x$ (total imports).

TABLE III
(Continued)

(h) Savings (Inflows into Finance Sector):

28) S_h (savings by industrial households).

29) S_L (savings by agricultural households).

30) S_g (savings by government sector).

31) A (savings from foreign sector).

32) $S = S_h + S_L + S_g + A$ (total savings).

3. STRUCTURAL ASYMMETRY

The accounting structure just described is derived from the "symmetrical" accounting structure presented in Chapter 4 (Table I).[3] As a model to depict the structure of open dualism, we must recognize that the accounting system of the previous section postulates certain asymmetrical characteristics for the agricultural and industrial sectors. These and other unique structural aspects of the system may be seen by considering the system of relationships from four viewpoints: (i) demand for output; (ii) income disposition; (iii) foreign trade; and (iv) government and (v) financial sectors.

DEMAND FOR OUTPUT

From the demand for output viewpoint, output from both the agricultural and industrial sectors is demanded as (i) intermediate factors of production (N and Y_g for industry; R and X_g for agriculture);

---

[3]Rigorously Table I of this chapter is obtained from Table I of Chapter 4 in two steps. In the first step, the entries circled in Table I, Chapter 4, are deleted, leaving 24 entries which constitute the 24 accounting concepts in Table I of this chapter. In the second step, the "investment sector" and the "finance sector" of Table I, Chapter 4, are aggregated. In Chapter 4 we have discussed an example of the first step, explaining the significance of deleting entries related to the government sector. See the discussion at the end of Section 2 in Chapter 4.

(ii) consumer goods (Y_h, Y_L, X_h, and X_L); and (iii) exports (E_y and E_x). These are the basic symmetrical relationships obtaining for output demand between the economy's dualistic production sectors, agriculture and industry. In addition to these, we emphasize a basic asymmetrical relationship in regard to investment demand. Industrial goods may be demanded as investment goods (I), while there is no investment component in demand for agricultural output. This asymmetrical relationship reflects the fact that the industrial sector has a higher degree of technological complexity than the agricultural sector.

INCOME DISPOSITION

From the viewpoint of income disposition, the accounting structure differs from conventional systems in disaggregating the private household sector between industry (d) and agriculture (e). A basic structural characteristic portrayed here is asymmetry caused by compartmentalization of income disbursement. The income disposition pattern shows the industrial production sector disbursing primary factor income, V_y, exclusively to the industrial income sector and agriculture paying primary factor income, V_x, only to the agricultural income sector. The absence of cross-sectoral income payments is based upon the premise that, in a dualistic economy, income disposition habits are likely to differ

according to the source of income from the economy's dualistic sectors, agriculture and industry.

FOREIGN TRADE

From the viewpoint of foreign trade, we postulate that both agriculture and industry may engage in export (E_x and E_y) and that changing composition of exports is an essential transition phenomenon in an open, dualistic economy. With respect to imports, the nominally symmetrical relation at the aggregate level (i.e., both sectors can import--M* in the case of the industrial sector and M_x in the case of the agricultural sector) obscures an important asymmetry. Viewing imports as disaggregated, we find a significant difference in the import content of the two sectors. While the agricultural sector merely imports to supplement its supply of finished agricultural goods, M_x, industrial sector imports, M*, are heterogeneous in content. Industrial sector imports comprise three types of goods: imported capital goods, M_i; imported raw materials, M_R; and imported finished industrial goods, M_y. (See Item 25 in Table III.) This distinction is important for understanding the import substitution phenomenon during the transition process.

Capital goods imports, M_i, deserve special emphasis as a key magnitude associated with changes in the domestic production structure during the transition. For this reason, total investment goods available to the economy, I (Item 6 in Table III), are disaggregated into their domestically produced component, I_d, and their imported component, M_i. For further reference, this disaggregation of imports and investment goods may be stated, respectively, as:

2a) $M^* = M_i + M_R + M_y$

b) $I = I_d + M_i$

GOVERNMENT

According to conventional accounting practice, the valuation of output from total government as a "producer of public consumption goods and services" is measured by total government expenditures, G_T. These expenditures are used to purchase intermediate goods $(Y_g + X_g)$ and for primary factor payments $(G_h + G_L)$. (See Equation 6.1c.) Government income, or total taxes collected from the two private sectors $(T = T_h + T_L)$ is used for these expenditures, G, and government savings, S_g (Equation 1f).

FINANCE

The finance sector shows the sources of the economy's finance of total investment. In addition to government savings, the two private household sectors may also generate savings. For example, for the industrial household sector, the total household income ($H = V_y + G_y$; i.e., sum of value added and transfer income) is used either as consumption (Y_h, X_h), tax payments (T_h), or savings (S_h). (See Equation 2.1d.) A similar interpretation is given to Equation 1e, which pertains to agricultural households. Thus, we postulate that all three domestic "household" sectors (i.e., industry, agriculture, and government) can save (i.e., S_h, S_L, and S_g). In addition, there is a foreign source of savings, A. These four sources provide the economy's total savings, S, used to finance investment, I (see Equation 1h).

In the discussion to this point, we have not yet specified an additional structural asymmetry of considerable significance for the open, dualistic economy. This last asymmetrical feature involves the transfer of savings from one private sector (agricultural or industry) to finance investment in the other. For this purpose we must disaggregate total investment into that formed in the two private production sectors. Thus, investment goods, I, produced by the industrial sector may have two destinations; namely, investment goods destined for the industrial

sector, I_y, and investment goods for the agricultural sector, I_x (see Item 6, Table III). Thus:

$$3)\quad I = I_y + I_x$$

Where, for example, savings of the agricultural sector have, on a net basis, been used to finance capital accumulation in the industrial sector, we have $S_L > I_x$. Thus, the significance of investment goods, I, must be investigated from the viewpoint of sectoral destination as well as their production.

4. THE MACROSCOPIC STRUCTURE OF OPEN DUALISM

We have just introduced the national income accounting concepts which will be used to describe the intersectoral relations between the macroscopic sectors of the open, dualistic economies. As conceptual tools to describe the structural form of the economy, neither the individual concepts nor even the accounting equations (Equation 1) is as important as the pattern of connectivity of the whole economy which they describe. This pattern of connectivity, which is a morphological concept, may be brought out in clear focus by the use of a directed linear graph, as shown in Diagram 1. In Chapter 4, we explained that the linear graph

corresponds to a square table.[4] Applying this principle to Table I, we may readily construct the linear graph of Diagram 1 in two steps:

Step One: The six sectors (a, b, c, d, e, f, g) are represented by the six vertices. (Notice that (a), (b), (c) are production vertices and (d), (e), (f) are household vertices).

Step Two: An entry in a cell lying in the x-row and y-column is represented by a directed edge which initiates from the x-vertex and terminates at the y-vertex.

Thus, the 24 national income accounting concepts of Table I are represented by the 24 directed edges in Diagram 1. In this diagram, we see that the structural form of the economy is described by a total of 24 links (i.e., edges) between eight sectors (i.e., vertices). Needless to say, this is a considerable simplification of the economic reality of an open, dualistic economy. Yet, in order to investigate the economy's changing form--which lies at the heart of our evolutionary view of the transition--we need the bare outline of the economy's basic structure. For this purpose the structure portrayed in Diagram 1--

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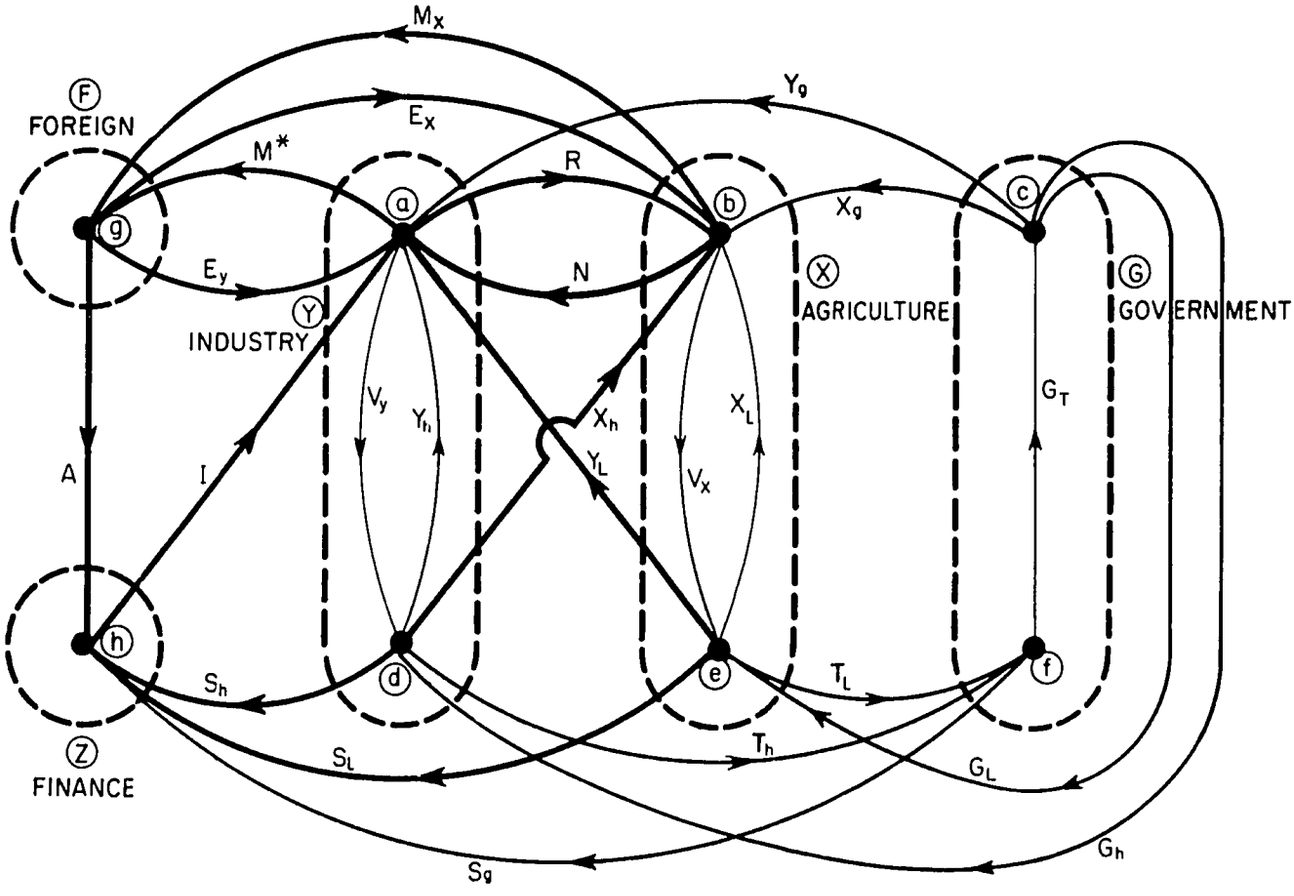
[4]See Section 2.2 of Chapter 4.

Diagram I: Disaggregated Accounting Structure:
Open, Dualistic Economy



containing as many as eight sectors and 24 entries--is, in fact, too complicated. To arrive at a simpler structure at a higher level of abstraction for investigating issues of structural change, an appropriate criterion is required. We find this criterion in the concept of intersectoral flows among the economy's five macroscopic sectors, industry (Y), agriculture (X), foreign (F), government (G), and finance (Z), neglecting, for our present purpose, all intrasectoral flows.

The aggregation procedure, introduced in Chapter 4,[5] serves as the technique to emphasize intersectoral relationships. Applying this technique to the linear graph in Diagram 1, we proceed in two steps:

Step One: The eight vertices ((a) through (h)) are grouped into five subgroups, (Y) = ((a)(d)); (X) = ((b)(e)); (G) = ((c)(f)); (F) = ((g)) and (Z) = ((h)) and these subgroups (Y), (X), (G), (F), and (Z) are treated as vertices of the aggregated linear graph.

Step Two: A directed edge from (X) to (Y) exists in the aggregated linear graph if and only if there is a directed edge ((a), (b)) in the disaggregated system such that (a) belongs to (X) and (b) belongs to (Y).

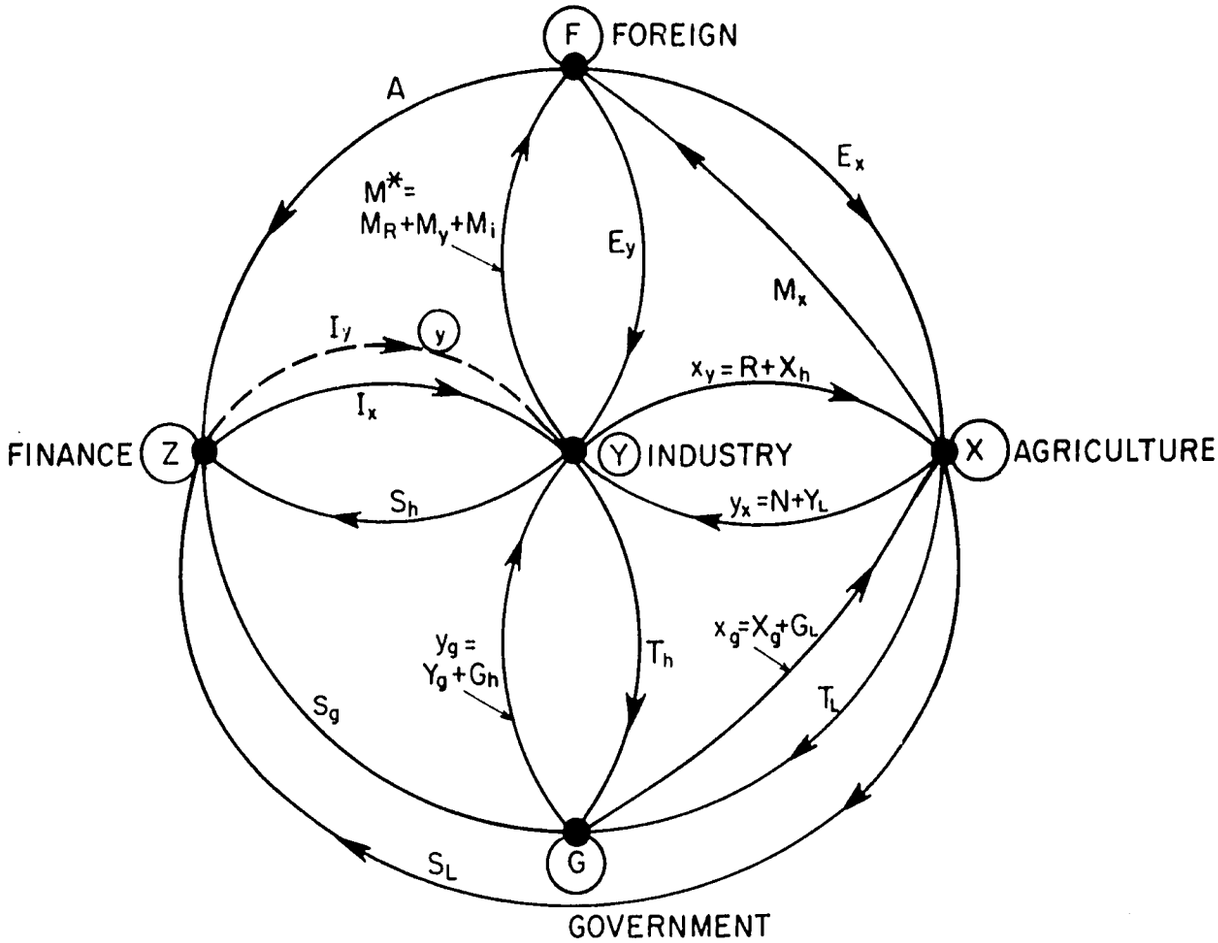
---

[5]See Chapter 4, Section 2.4.

In Diagram 1 the grouping of vertices is indicated by the dotted circles. Notice that the "foreign" and "finance" sectors are kept distinct, while for each of the remaining sectors (industry, agriculture, and government) a household sector and production sector are aggregated. The new notations for the five aggregated sectors are: Y, (industry); X (agriculture); G (government); F (foreign); and Z (finance). There are five intra-group concepts (i.e., V_y, Y_h, V_x, X_L, and G_T) lying entirely within a dotted circle that become completely suppressed by the aggregation process. The remaining nineteen inter-group concepts are consolidated into 15 concepts, in accordance with the procedure indicated in Step Two. The resulting aggregated linear graph is shown in Diagram 2. The 5 x 5 table below Diagram 2 is the balanced table corresponding to the aggregated linear graph.

In this aggregated national income accounting structure, derived to emphasize intersectoral flows, it is inevitable that concepts somewhat different from traditional economic aggregates appear. While we list in Table IV a glossary of the aggregates emerging from Diagram 2, the nature of these intersectoral flows will be explored in detail in the next chapter. One example, however, deserves emphasis here because of its uniqueness in the aggregated system. A special

Diagram 2: Aggregate Structure: Open Dualistic Economy



	Y	X	G	F	Z
Y		$y_x = N + Y_L$ 3893	$y_g = Y_g + G_h$ 621	E_y 976	$I = I_y + I_x$ 2234 $I_y = 1877$ $I_x = 357$
X	$x_y = R + X_h$ 2827		$x_g = X_g + G_L$ 529	E_x 1748	
G	T_h 1009	T_L 549			
F	$M^* = M_R + M_y + M_i$ 2481	M_x 387			
Z	S_h 1362	S_L 320	S_g 408	A 144	

TABLE IV

GLOSSARY OF INTERSECTORAL CONCEPTS
FOR THE AGGREGATE OPEN, DUALISTIC MODEL
(Listed as inflows into aggregate sectors)

I. Industrial Sector, demand for industrial goods and services:

1)	y_x $(= N + Y_L)$	by agriculture sector as consumer goods or as intermediate production inputs.
2)	y_g $(= Y_g + G_h)$	by government sector as primary factors or intermediate inputs.
3)	E_y	as exports.
4)	I_y	as investment destined for industrial sector.
5)	I_x	as investment destined for agricultural sector.

II. Agricultural Sector, demand for agricultural goods and services:

6)	x_y $(= R + X_h)$	by industrial sector as consumer goods or as intermediate production inputs.
7)	x_g $(= X_g + G_L)$	by government sector as primary factors or intermediate inputs.
8)	E_x	as exports.

III. Government, revenue derived from:

9)	T_h	tax payments by industrial sector.
10)	T_L	tax payments by agricultural sector.

TABLE IV
(Continued)

IV. Foreign Sector, payments to foreign sector for:

11)	$M^* (=M_R + M_i + M_y)$	imports of capital goods, industrial finished goods, and raw materials for the industrial sector.
12)	M_x	imports of finished agricultural goods.

V. Finance Sector, inpayments as:

13)	S_h	industrial sector savings.
14)	S_L	agricultural sector savings.
15)	S_g	government savings.
16)	A	foreign savings.

device is used to apply the distinction made in Equation 3 above between investment goods destined for the industrial sector, I_y, and those destined for the agricultural sector, I_x. This differentiation is shown in Diagram 2 by postulating two distinct edges both flowing from the finance vertex (Z) to the industry vertex (Y).[6] To distinguish between the two flows, the dotted edge is shown as flowing through an addition vertex, (y), and this flow represents investment goods destined for the industrial sector. With the addition of this vertex and the dotted edge, the aggregate model of Diagram 2 now has 16 edges and 6 vertices.

To summarize, in this section we have developed the notion of the open, dualistic economy's structural form, building on the intersectoral national income accounting framework developed in the previous section. We have noted (in Chapter 6) that this morphological aspect is one of the essential components of an evolutionary view of the transition process. Our purpose in this chapter has been to evolve a definite and concrete concept of structure. Thus, we have defined "structure" in terms of familiar national income accounting tools, capable of statistical implementation. More specifically, we have developed the notion of

---

[6] The reader can confirm from Diagram 2 that the pair of vertices (Z) and (Y) is the only pair linked by three edges, two going in the same direction.

structure at two levels of aggregation: the disaggregated system of Diagram 1 and the macroscopic structure of Diagram 2. These two structures correspond to two essential aspects of our approach. The more detailed disaggregated system (Diagram 1) will be used in our book mainly as the descriptive instrument. It is the framework according to which statistical data will be collected. The data collected and processed in this way will be used for our empirical analysis in later chapters. It is a basic purpose of our book to have a firm grounding for our analysis in the transition process in quantitative empirical evidence. In order to give a preliminary emphasis to this empirical focus, in the following section we give one numerical example--for the sole purpose of reminding the readers of this quantitative sense.

For theoretical purposes, we have argued that a higher level of aggregation is needed to analyze structural change. For this purpose, we have chosen the more aggregated, macroscopic structure (Diagram 2). As we have pointed out earlier, this macroscopic structure emphasizes intersectoral flows and, hence, our analysis of structural change in later chapters will be based mainly upon intersectoral relationships. We shall return to discussion of the macroscopic structure in Section 6 of this chapter after presentation of the quantitative example in the next section.

5. QUANTITATIVE ANALYSIS OF OPEN DUALISM

To assist the reader in understanding the quantitative and empirical significance of the (disaggregated) open dualism national income accounting system, we translate the linear graph of Diagram 1 into the more conventional pipe diagram, shown in Diagram 3. In this latter diagram, we make one modification. In addition to the eight vertices, (a) through (h), in Diagram 1, we add vertices (i) and (j). These two additional vertices enable us to introduce two concepts: total availability of industrial goods, Y_a, shown at vertex (i), and total availability of agricultural goods, X_a, shown at vertex (j). Both concepts of availability refer to goods available for final domestic use. Total availabilities of the two types of goods are, respectively:

4a) $Y_a = Y_d + M_y + M_i$ (industrial goods available for final domestic use)

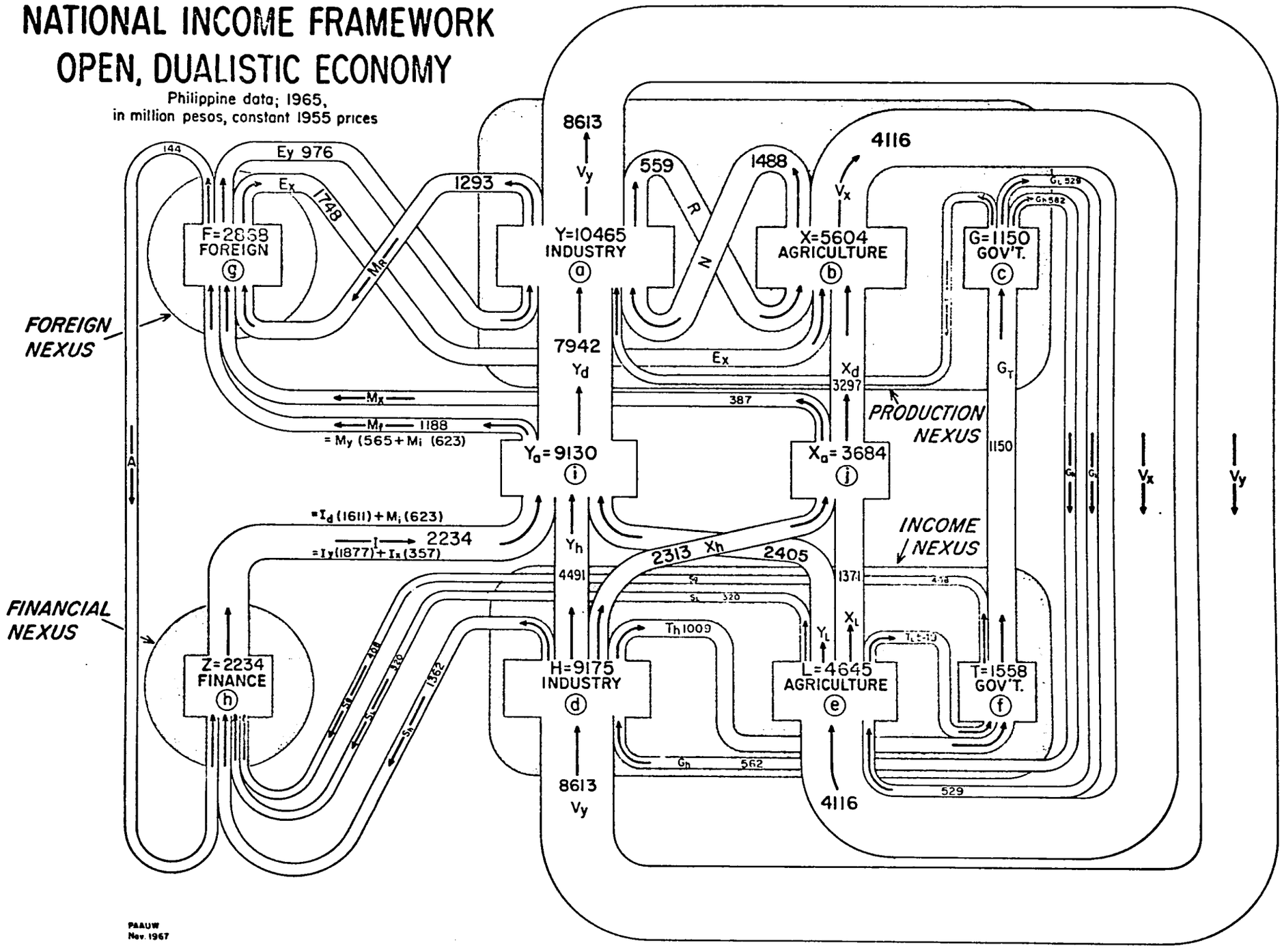
b) $X_a = X_d + M_x$ (agricultural goods available for final domestic use)

For example, the total availability of agricultural goods for final domestic use, X_a, is seen to be the sum of imported (final) agricultural goods, M_x, and domestically produced agricultural goods available to the home market, X_d. Some readers will find this way of treating the imported agricultural final goods, M_x, more enlightening than their

Diagram 3:

NATIONAL INCOME FRAMEWORK
OPEN, DUALISTIC ECONOMY

Philippine data; 1965,
in million pesos, constant 1955 prices



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treatment in the linear graph of Diagram 1. Since these are finished consumer goods, they do not reach the domestic production sector as an input--an impression which might have been conveyed in the linear graph of Diagram 1. In Diagram 3, the pipe (i.e., the edge) representing M_x leads directly from (j) to (g)--rather than from (b) to (g) as was the case in Diagram 1. Similarly, the total output of final industrial goods available for domestic use, Y_a, is the sum of imported capital goods, M_i, imported finished industrial consumer goods, M_y, and domestically produced final industrial goods, Y_d. Thus, in Diagram 3, the only imported goods shown as purchased by the industrial production sector are genuine intermediate good inputs, M_R.[7]

In Diagram 3, we have recorded in all the pipes the numerical data from Table II, showing the magnitude of the flows for the Philippine economy in the year 1965. This pipe diagram has the additional visual advantage of recording the pertinent total inflows (= total inpayments) at each vertex. We present the pipe diagram and a numerical example to assist as a visual aid to grasping the quantitative aspect of the open,

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[7] The linear graph (Diagram 1) can be obtained from Diagram 2 as a result of aggregating (i.e., "grouping") the (a) and (i) vertices and the (b) and (j) vertices of Diagram 2. (See Section 2.4 in Chapter 4 for the rigorous definition of aggregation.)

dualistic economy. The corresponding aggregated balanced table is given below Diagram 2. Diagram 3 will be used as the data framework for our later empirical applications. For the remainder of this chapter, we find it more convenient to work with the linear graph representation of the open, dualistic economy (Diagram 2) to emphasize its abstract "structure."

6. MODE OF OPERATION OF THE ECONOMY

In Chapter 6 we emphasized that in an evolutionary view of the transition, changes in an economy's structural form and alteration of its mode of operation are two of the most essential growth phenomena. We have just analyzed the concept of structural form. In this section, we investigate the operational aspect which is closely related to the structural form of the economy. In this, we are guided by the position adopted in Chapter 6 that it is possible to analyze the economy's mode of operation in terms of its component parts. In this approach, each component part is viewed as an operating unit, and the mode of operation of the entire economy is considered to be a simultaneous operation of all its component units. We have referred to these component parts as the economy's functional units. It is our purpose in this section to investigate functional units in relation to the structural form which we have just analyzed.

As a simple, or elementary, mode of the economy's operation, a functional unit is regarded as a consistent set of events (definable in terms of intersectoral flows) which can assume an independent existence and which describes a meaningful pattern of resource utilization of the economy. Although there are many ways in which we might proceed to identify such functional units, there is a long tradition in economics of identifying particular types of functional units as circulations.[8] In economics, a specific circulation always presumes the notion of "sectors," as a "circulation" is nothing but a consistent set of events transacted between these sectors. The term "circulation" is an apt description of a functional unit since the very idea of circulation suggests that a functional unit is a living-and-moving process rather than a mere collection of static entities or relations. Although there may be other more complicated types of functional units, we may thus begin with this traditional concept of circulations. The abstract mathematical counterparts of circulations are, of course, circuits, which can be identified from a linear graph.[9]

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[8] E.g., any textbook on money and banking, where the circulation of money is not only defined but is also measured (i.e., by the velocity of circulation).

[9] See Chapter 4, Section 2.3.

By thus directing our attention to circuits, we find a direct and firm link between the structural form of the economy and its mode of operation. This link appears when the economy's structural form is defined in terms of the skeleton[10] of the linear graph--such as Diagram 2. For we may then systematically identify all the circuits from the skeleton; and when construed as the set of an economy's functional units, these circuits constitute the component parts for analysis of the entire economy's mode of operation. Hence, our immediate tasks consist of: (i) identifying all circuits from the macroscopic structure of Diagram 2; (ii) investigating their operational significance as component parts of an economy's mode of operation; and (iii) investigating the growth significance of circuits in an evolutionary thesis of the transition. We begin these tasks in the next section, but their completion is deferred until later chapters.

Before proceeding, however, we make two technical observations--the significance of which will become apparent only in a later section. First, the use of linear graph concepts clearly separate the structural

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[10] The term skeleton was introduced in Chapter 4, Section 2.3, to emphasize the structural aspect of a national income accounting system independently of its quantitative aspect.

aspect from the quantity aspect in a national income accounting system. While the "values" of a valued linear graph refer to quantity and magnitude, the linear graph itself, as a skeleton of the accounting system, depicts only structural form (i.e., the pattern of connectivity).[11] In the remainder of Part II of this book, we shall discuss only the matter of abstract structural form, deferring for the time being the quantity aspect. A full investigation of the latter (quantity or value) aspect will be undertaken in later chapters where we will be concerned directly with statistical data.

The second technical remark is a reminder from Chapter 4, where we specified that a linear graph must possess the property of being a cyclic net if it is to qualify as a skeleton of a national income accounting system.[12] This means that the linear graph must be one which is connected and in which every edge belongs to at least one circuit. We note that the skeleton represented by Diagram 2, showing the macroscopic structure of the open dualistic economy, is, indeed, a cyclic net. For this reason, it is obvious that a large number of circuits can be identified from the skeleton, suggesting that our approach is feasible in terms of identifying functional units.

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[11] See Sections 2.1 to 2.3 in Chapter 4.

[12] See Chapter 4, Section 2.3, Theorem 2.

7. CLASSIFICATION OF FUNCTIONAL UNITS

To proceed with analysis of functional units construed as circuits within a cyclic net, we return to further scrutiny of Diagram 2. We recall that this diagram shows intersectoral flows among five sectors: foreign, (F); agriculture, (X); industry, (Y); government, (G); and finance, (Z).[13] The reader can verify that systematic listing of all possible circuits in this skeleton yields a total of thirty-one circuits. The first step in understanding these circuits is classifying them by length; i.e., on the basis of the number of edges contained in each circuit. This gives us a preliminary idea of their complexity. Such classification of the 31 circuits produces seven circuits of length two, ten of length three, ten of length four, and four of length five. To assist in understanding the economic meaning of these circuits, we list in Table V all the circuits identified from the skeleton shown in Diagram 2. However, in this section, we shall only classify these circuits mechanically. Beginning from the next chapter we shall help the reader to memorize them partly through graphic device but mainly through exploring their economic significance in a systematic way.

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[13] As we noted earlier, the vertex (y) is added merely to handle the special problem of two investment goods flows from finance (Z) to industry (Y).

TABLE V

ECONOMIC CIRCULATIONS IN OPEN, DUALISTIC ECONOMY

	PRIVATE (G excluded)				PUBLIC (G included)			
	CURRENT (Z excluded)		FINANCIAL (Z included)		CURRENT		FINANCIAL	
	(1) BILATERAL	(2) TRIANGULAR	(3) INTRASECTORAL	(4) INTERSECTORAL	(5) BILATERAL	(6) MULTILATERAL	(7) INTRASECTORAL	(8) INTERSECTORAL
(1) DOMESTIC (F excluded)	$C_1 = (XY)$		$Z_1 = (Z_yY)$ $Z_7 = (XZY)$	$Z_2 = (XZ_yY)$ $Z_6 = (ZY)$	$G_1 = (YG)$ $G_2 = (XG)$	$G_3 = (XYG)$ $G_4 = (YXG)$	$P_1 = (YGZ_y)$ $P_4 = (XGZY)$ $P_6 = (XZYG)$	$P_2 = (YGZ)$ $P_3 = (XGZ_yY)$ $P_5 = (XZ_yYG)$
(2) FOREIGN (F included)	$C_2 = (FX)$ $C_3 = (FY)$	$C_4 = (FXY)$ $C_5 = (FYX)$	$Z_8 = (XZYF)$	$Z_3 = (XZ_yYF)$ $Z_4 = (FZ_yY)$ $Z_5 = (FZ_yYX)$ $Z_9 = (FZY)$ $Z_{10} = (FZYX)$		$G_5 = (YFXG)$ $C_6 = (XFYG)$	$P_8 = (XGZYF)$	$P_7 = (XGZ_yYF)$ $P_9 = (FZ_yYGX)$ $P_{10} = (FZYGX)$

We now proceed, in Table V, to classify these circuits in terms useful for economic analysis. The first broad distinction is between private and public transactions, depending on whether circuits touch the government sector, (G). A further sub-classification distinguishes between current and financial (capital) circulations, based on whether circuits involve the finance sector, (Z). The four major columns of Table V correspond to these classifications.

Let us first explore private circulations [Columns (1) - (4) in Table V], representing strictly market phenomena between private parties. These may be either current [Columns (1) and (2)] or financial [Columns (3) and (4)]. Current circulations represent resource transfers through which exchanges are completed when the activities take place--leaving neither capital accumulation effects nor the contracting of indebtedness for future settlement. All current circulations are classified either as bilateral (i.e., involving two sectors) or triangular (i.e., involving three sectors) as listed in Columns (1) and (2).

Financial circulations are distinguished by their relationship to the economy's augmentation of capital resources through saving and investment activities. Moreover, we have in the previous section distinguished the destinations of investment goods between industrial investment, I_y, and agricultural investment, I_x. Implicit in this distinction is the important

growth question of whether each sector's investment is financed from its own savings or by inward transfers of savings from other sectors. Hence, we may identify intrasectoral [Column (3)] and intersectoral [Column (4)] patterns. Intrasectoral finance represents circulations in which a sector's own savings finance investment within that sector, while intersectoral finance involves transferring one sector's savings to finance investment in another sector.

Distinguished from private circulations are public circulations, which are partially or fully executed through the exercise of political power. While private market transactions are conceived of as exchange, those involving political power are construed as transfers. Public circulations are also divided into current and financial, carrying the same sub-classification as the private circulations as shown in Columns (5) - (8).

Finally, all circulations are classified into foreign and domestic, depending on whether the foreign sector, (F), is involved. In Table V this classification is shown by the two rows, (1) and (2), extending across the table. This distinction is obviously significant for investigation of an economy's openness. Operationally, therefore, the economy's openness is defined in terms of the existence and nature of the foreign circulations identified from the open, dualistic skeleton.

A few remarks may be added on the notation used in Table V. When a circuit passes, for example, through the vertices (X), (Y), (Z), in this given order, we shall simply write it in the form (XYZ). For later reference circuits are given a numerical index, C_1, C_2, $C_3 \ldots C_5$ for current circulation; Z_1, Z_2, $Z_3 \ldots Z_{10}$ for financial circulation; and G_{T_1}, $G_{T_2} \ldots G_{T_6}$, P_1, $P_2 \ldots P_{10}$ for public circulation. We also note that whenever vertex (y) in Diagram 2 is referred to, it will be denoted by a letter in the lower case as in $Z_1 = (Z_y Y)$ in the table. Whenever this vertex symbol, y, appears, of course, it will always follow the financial vertex (Z) and signify investment in the industrial sector, I_y.

8. SUMMARY

The evolutionary view of transition growth focusses the analysis squarely upon the open, dualistic economy's structure and upon the mode of operation implied by that structure. In this section we have explored the technical meaning of the concept of structure and its relation to the economy's mode of operation. We define structure in terms of an intersectoral national income accounting system, by proceeding from a relatively disaggregated level to a more simplified, macroscopic level through aggregation. The skeleton of this latter structure, comprising only intersectoral relationships and shown in Diagram 2, constitutes the model of the open, dualistic economy.

The operational (or "physiological") aspect of the open, dualistic economy is linked to the structural aspect in a first approximation by conceiving of functional units as circuits, and these are the elementary building blocks for analyzing the economy's mode of operation. Given this assumption, we have taken two further steps by (i) systematically identifying all circuits in the national income accounting skeleton, and (ii) formally classifying them into useful economic categories. The more fundamental problem of the growth significance of circuits requires further consideration, a task undertaken in the next chapter.