TABLE 3.34

Distribution of Major Sectors in Terms of Relative Import Requirements, 1961

Sector	Imports as Per Cent of Total Requirements	Value of Imports (₱1000)	Value of Total Requirements (₱1000)
Gross Fixed Capital Formation	14.83%	₱ 271,484	₱1,830,624
Net Inventory Change	7.04	124,069	1,762,962
Manufactures	5.46	478,988	8,769,310
Government	4.91	75,080	1,529,317
Households	3.70	446,342	12,047,623
Agriculture, Forestry, Fishing and Mining	3.43	142,991	4,167,126
Exports	1.50	19,996	1,332,260
Services	1.00	97,891	9,814,823

vidual industries from 30.81% for ferrous metal products to 0.12% for the banking, insurance and real estate sector. In general, manufactures tend to require more imported inputs per unit of output (5.46%), than either agriculture, forestry, fishing and mining (3.43%), or the service industries (1.00%).

However, it is only in the manufacture of ferrous metal products, non-ferrous metal products, electrical machinery, transport equipment, and printed materials that imported inputs account for at least 10% of production requirements. This fact belies the conventional comment so commonly cast about the genre of recent Philippine industrialization, i.e., that it is an import-dependent and, hence, unstable structure.

What is true, as Table 3.34 shows, is this: that 21.87% of the capital formation requirements in the Philippines, at least up to 1961, had to be imported. This, of course, is a notable degree of import dependence.

In conclusion, the evidence from the input-output table under consideration defines rather unambiguously that the type of economic protection spawned throughout the 1950's has fructified not only in the emergence of the manufacturing sector and, hence, in the growth of indigenous entrepreneurs but also in pushing the stage of fabrication down the production line, and thereby localizing the production of material inputs, all in all, making for an interlocking and reinforcing system of economic production.

IV. Some Input-Output Techniques of Aggregative Analysis

A. Input-Output and National Income Accounts

1. Equality of Gross National Product (GNP) and Gross National Expenditures (GNE)

As systems of social accounting, both the GNP and the input-output accounts record real transactions rather than financial flows. The latter is the subject of a money-flows (flow-of-funds) account. The GNP account of a country, however, differs from its input-output account to the extent that the former account includes only final sales (output) while the latter account registers both intermediate and final sales. Some double-counting, then, is a deliberate feature of an input-output account while it is totally absent from an internally consistent GNP account.

For all the differences between the GNP and the input-output accounts, however, both accounting systems should yield comparable measures of a country's economic activity during a given period of time. That is, it should be possible to extract out of a country's input-output account its gross national product, whether the extraction is by way of the income (i.e., value-added or factor earnings) or the expenditure (i.e., final sales) approach. But one could still expect some discrepancies between the national income figures and a GNP obtained from an input-output account. This would be true even if one supposes that knowledgeability and good judgment have been roundly used to insure the statistical integrity of the various data-gathering

processes going into the construction of both accounts. Such differences in results reflect differences in the technical conventions adopted by each acoount. They should, however, be rather small in magnitude. On the other hand, if there are significant gaps about the data-gathering for a GNP account, a well-behaved input-output account should tell on these gaps and weaknesses, thereby indicating possible areas of improving the constnuction of a GNP acoount.

The relationship between the GNP and the input-output accounts can be clarified in more formal terms. As mentioned earlier, except for intermediate sales which an input-output account includes but a GNP account excludes, both accounts should reveal comparable national income figures. Once these intermediate purchases are eliminated, both accounts are the same in virtually every respect.

The basic formulation used in the construction of the 1961 input-output table is the balanced budget of each of the 29 producing industries. That is, total input equals total output in each industry.

Let x_{ij} = peso sales of industry i to industry j, net of import content, - (i, j = 1, ... n).

m_{ij} = import content (in pesos) in this $(i,j)^{th}$ transaction.

y_i = total final expenditures on the output of the i^{th} industry

v_j = (gross) value-added of the j^{th} industry

Then,

$$\text{total input} = \sum_i x_{ik} + \sum_i m_{ik} + v_k$$

for some industry k, while its

$$\text{total output} = \sum_j x_{kj} + y_k.$$

(intermediate, final)

in the same $k^{\underline{th}}$ industry.

Thus,

$$\sum_i x_{ik} + \sum_i m_{ik} + v_k = \sum_j x_{kj} + y_k.$$

Summing up over all industries,

$$\sum_k \sum_i x_{ik} + \sum_k \sum_i m_{ik} + \sum_k v_k = \sum_k \sum_j x_{kj} + \sum_k y_k.$$

Since,

$$\sum_k \sum_i x_{ik} = \sum_k \sum_j x_{kj}$$

we have, after a little transposition,

$$\sum_k v_k = \sum_k y_k - \sum_k \sum_i m_{ik}.$$

Note that the inter-industry transactions in the second quadrant are cancelled out leaving only the summed quantities in the third and first quadrants. For most inter-industry models, the left side of the last equation represents the GNP while the right side is the GNE so that we have now the basic national accounts identity.

In the succeeding formulation, however, the model followed has included the fourth quadrant in order to be consistent with our national aggregates. The modified model then includes the final expenditures on primary inputs.

Let v' be the (gross) value-added and m be the imports directly consumed so that $v' + m = y$, the total primary inputs directly purchased by the final demand sector. Then from the last equation

$$\sum_k v_k + v' + \sum_k \sum_i m_{ik} + m = \sum_k y_k + y$$

or

$$\sum_k v_k + v' = \left(\sum_k y_k + y\right) - \left(\sum_k \sum_i m_{ik} + m\right).$$

The left-hand side of the last equation represents GNP (at market price) which is identical with the gross national expenditure (GNE) given at the right-hand side (See Table 4.1).

Thus, in 1961, looking at the income side of the accounts, 21.82% of the gross national income of ₱16,846 million represents employee compensation, 64.79% profits, interest, rents and income of self-employed, 5.63% indirect taxes after subsidies have been deducted, and 7.76% depreciation allowances. Obviously, such distribution is suggestive of the structure of the Philippine economy in the neighborhood of 1961.

TABLE 4.1

Philippine GNP Account, 1961

(A) Value-Added Approach (Income)

Item	Current Pesos (thousands)	Per Cent
(1) Compensation of employees	₱ 3,675,467	21.82
(2) Profits, rents, interest 1/	10,914,487	64.79
(3) Indirect taxes less subsidies	947,972	5.63
(4) Depreciation allowances	1,308,049	7.76
GNP 2/ (Market price)	₱16,845,975	100.00

(B) Final Sales Approach (Expenditures)

(1) Household (Personal) consumption expenditures	₱12,047,623	71.51
(2) Government current expenditures	1,529,317	9.08
(3) Expenditures on fixed assets	1,830,624	10.87
(4) Net increase in inventory	1,762,962	10.46
(5) Exports of goods and services	1,332,260	7.91
	₱18,502,786	109.83
(6) Less: Imports of goods and services	1,656,811	9.83
GNE 2/	₱16,845,975	100.00

1/ This ~~includes~~ ~~income~~ ~~of~~ self-employed.

2/ The figures measured here already include adjustments for "net factor income" from abroad.

In 1961, household expenditures amounted to ₱12.05 billion or 71.51% of the GNP expenditures, government current expenditures ₱1.53 billion or 9.08%, purchases of new fixed capital assets ₱1.83 billion or 10.87%, net increases in inventory ₱1.76 billion or 10.46% exports of goods and services ₱1.33 billion or 7.91%, and imports of goods and services ₱1.65 billion or 9.83% (a negative sort of expenditure).

Sectoral Accounts

The Private Appropriations (Current) Account (Table 4.2) shows the sources and disposal of income of the private sector.

For the period in question, total income of the private sector amounted to ₱14.6 billion, ₱10.9 billion (74.80%) of which was generated out of profits, rents, interest payments and income of self-employed and the rest (25.20%) from employee compensations. Out of this income, ₱12.3 billion (84.61%) was spent on consumption expenditures, taxes, imports, etc., leaving a saving of ₱2.2 billion or 15.38%, net of "transfer payments" from other accounts and "donations from abroad".

Table 4.3 presents the Current Account of the government. Current revenue of the government amounted to ₱1.2 billion.

TABLE 4.2

Private Appropriations Account, 1961
(In Current Thousand Pesos)

Compensation of employees	₱ 3,675,467
Profits, rents, interest, and income of self-employed	10,914,487
Income[1/] of Private Sector	₱14,589,954
Consumption expenditures	₱11,239,210
Net indirect taxes on household purchases	252,516
Personal and corporate income taxes	298,395
Direct imports	446,342
Domestic Services	36,796
Depreciation allowances and losses	72,759
Total Current Expenditures	₱12,346,018
Private Savings (Actual Savings less net transfer payments)	2,243,936
Disposal[1/] of Income	₱14,589,954

1/ These exclude "transfer payments" to war veterans and corresponding disbursements by the U.S. government.

TABLE 4.3

Government Current Account, 1961
(In Current Thousand Pesos)

Net indirect taxes on:	
Inter-industry purchases	₱ 566,502
Capital outlays	122,207
Household purchases	252,516
Government current purchases	6,747
Personal income tax	107,816
Corporate income tax	190,579
Borrowings and transfers to current account	324,551
Current Revenue	₱ 1,570,918
Consumption of goods and services	₱ 726,984
Imports	75,080
Depreciation allowances 1/	8,070
Indirect taxes on government current consumption	6,747
Compensation of employees	712,436
Government savings	41,601
Current Outlay	₱ 1,570,918

1/ Depreciation allowances of government sector are defined by the General Auditor's Office as part of current expenditures of the Government.

It is the sum of net indirect taxes and the direct taxes paid by households and the business sectors. Total current expenditures amounted to ₱1.5 billion, distributed as follows: ₱726 million for purchases of current goods and services, ₱712 million for general government, and the rest on imports, and so forth. The deficit of ₱374,551 was covered by borrowings and transfers from other accounts.

The Combined Capital Account (Table 4.4 below) registered a capital outlay of ₱3.6 billion, 50% of which or ₱1.8 billion went into purchases of new fixed assets, and the other ₱1.8 billion into net change in stocks.

Capital expenditures were financed from private savings (₱2.2 billion), depreciation allowances (₱1.3 billion), and government saving (₱41.6 million).

Table 4.5 shows the rest of the world account. Total imports of some ₱1.7 billion were distributed between the intermediate consumption of producing sector (₱720 million) and the final consumption of households, capital goods, and government (₱936 million). Exports and re-exports amounted to only ₱1.3 million, resulting in an imbalance of ₱325 million, which was financed out of net lending to the Philippines.

TABLE 4.4

Combined Capital Account, 1961
(In Current Thousand Pesos)

Private Savings 1/	₱2,243,936
Depreciation	1,308,049
Government Savings	41,601
Total Gross Savings	₱3,593,586
New Fixed Capital Formation	₱1,830,624
Net Change in Stocks	1,762,962
Total Capital Outlay	₱3,593,586

1/ Actual savings less net transfer payments.

TABLE 4.5

Rest of the World Account, 1/ 1961
(In Current Thousand Pesos)

Exports of goods and services	₱1,312,294
Re-exports	19,966
Current Receipts	₱1,332,260
Intermediate imports	₱ 719,870
Final imports	936,941
Total imports	₱1,656,811
Net lending to the Philippines and other transfers from abroad	(324,551)
Current Payments	₱1,332,260

1/ Current exports and import figures in this account already take into consideration factor incomes.

B. Structural Analysis in terms of Input-Output

Aside from purely statistical considerations, input-output analysis has other, and perhaps more important, uses. It has been mentioned earlier that this technique of social accounting is uniquely capable of telling on the gaps about a country's system of national statistics. It is as equally versatile for structural analysis and economic forecasting. However, its capacity for the latter type of analysis is premised on assuming a certain degree of stability about the system's economic parameters.

As a matter of fact, if contemporary studies in other countries are any good, they indicate for purposes of primarily short-run analysis, a given input-output table as remarkably versatile. The short-run here is usually defined in terms of three years. For long-run structural analysis, obviously what is required at least initially, is a comparative study of a series of tables set up at intervals of three years, say, for a period of fifteen to twenty-five years.

In the following, some of the various possible uses of input-output analysis are illustrated, although they do not exhaust the range of other possibilities. They are based on what is known in literature as the matrix multiplier. The matrix

multiplier is the inverse of the original matrix of transactions coefficients. The inversion was accomplished by the Los Baños Computing Center, University of the Philippines. However, subsequent manipulations of the inverse matrix were performed by the Bureau of the Census and Statistics on its 1401 IBM Computer. The manipulations consisted in multiplying either 1) the elements of the inverse matrix, 2) the elements of the transpose of the inverse matrix, or 3) elements of a diagonal matrix derived from the inverse matrix, by a column vector whose elements represent the different economic parameters of the input-out system.

C. Estimate of Import Content of Output

The direct and indirect import content of output can be estimated by premultiplying a column vector whose elements are ratios of direct imports to output in each industry, i.e., the import coefficients, by the transpose of the inverse matrix. The product, then, indicates not only the imported inputs directly required for production, but also those indirectly required as a result of the fact that even those domestic inputs absorbed directly by one industry from others also have imported ingredients in them.

Let, for instance, r_{ij} be the $(i,j)^{th}$ element of the inverse of the input coefficients. This element may be interpreted

to mean as the output (domestic) from industry i required directly and indirectly to satisfy 1 unit (₱) of final demand for the output of industry j. Assume further that there are n' categories of primary inputs (in our model, we have five categories: imports, indirect taxes less subsidies, depreciation, compensation of employees and profits, etc. which include entrepreneural income of self-employed).

Define

F_{hg} = amount in ₱ of primary input h(h=1,...,n') absorbed in industry g(g=1,...,n).

$f_{hg} = \frac{F_{hg}}{X_g}$ = amount of primary input h absorbed per peso output of industry g.

Then the product

$f_{hg}r_{gj}$ = amount of primary input of category h required directly and indirectly from industry g to satisfy one peso of final demand for the output of industry j.

And summing up over g,

$\Sigma_g f_{hg}r_{gj}$ = the total primary input of category h absorbed directly and indirectly to satisfy one peso of final demand for the output of industry j.

The results of this operation are shown in Table 4.6. It is clear from the magnitude of the results that the extent of dependence of Philippine industries on imported inputs does not substantially change even after all the indirect import requirements have also been taken into account. And, except for the ferrous metal products, nonferrous metal products and electrical machinery industries, Philippine industries really do not appear to be notably dependent on imported inputs. Moreover, the ranking of industries before and after the indirect import requirements have been considered has not materially changed.

One practical use of such a table is to provide a more precise estimate of the total imported input requirements of the different industries or the entire national economy for that matter. It has been the practice in some government agencies when estimating the imported input requirements of certain industries or of the economy to consider only the magnitude of the import coefficient, i.e., the direct import content of output. Clearly, under a system of industrial interdependence which is the realistic situation, such estimates of imported input requirements fall short of the total requirements by an amount representing the indirect imported input requirements.

TABLE 4.6

Estimate of Import Content of Output

Sector	Import Content		Ranking	
	Direct	Direct and Indirect	Direct	Direct and Indirect
1	3.18%	3.87%	20	22
2	7.75	9.10	9	12
3	2.24	3.05	25	24
4	2.33	3.03	24	25
5	3.83	5.77	18	17
6	3.72	5.10	19	19
7	7.05	9.58	12	11
8	2.46	4.00	23	21
9	5.39	6.58	14	14
10	9.26	11.95	6	7
11	10.16	13.10	5	5
12	5.01	6.25	15	16
13	4.87	6.58	16	15
14	9.12	12.01	8	6
15	4.80	5.68	17	18
16	7.73	9.70	10	10
17	30.81	36.34	1	1
18	18.70	22.08	2	2
19	9.25	10.29	7	8
20	15.96	19.38	3	3
21	11.62	13.46	4	4
22	7.65	10.13	11	9
23	6.47	7.92	13	13
24	0.43	0.50	28	28
25	1.49	2.18	26	26
26	3.08	3.54	22	23
27	3.15	4.14	21	20
28	0.12	0.16	29	29
29	0.71	1.05	27	27

As a matter of fact, even the estimates of the national foreign exchange gap between requirements and availabilities can be grossly understated or overstated depending on whether only direct or both direct and indirect imported input requirements are taken into account. This consideration can appreciably vitiate substantive parts of an economic development plan or forecast.

D. Estimate of Prices of Output in Terms of Primary Inputs

The value or price of industry or commodity (j) is decomposable into the value of inputs absorbed in the course of its production. These inputs are the sum of produced and non-produced, i.e. primary inputs. However, it is possible to further decompose the value of the produced inputs absorbed by the productive process j in terms of the primary or non-produced inputs.

This operation requires postmultiplying a row vector from the transpose of the inverse matrix, representing industry j, by a column vector whose elements consist of the ratio of a particular primary input to the total output in every industry. A replication of this operation for all industries and each primary input results in a schedule which shows for each industry the relative importance of every primary input in its output, i.e., its price in terms of primary inputs.

The formulation here is similar to the preceeding section (IV.C). The tabulation given in Table 4.7 has the h's in columns while the j's in rows.

Note that

$$\sum_h \sum_g f_{hg} r_{gj} = 1$$

for every j. However, because of roundings and certain operations inherent in the inversion of the matrix, the totals do not generally add up to exactly 1. Those marked "b" are preliminary pending some further investigations.

Table 4.7 is important for two reasons:

(1) it gives the direct and indirect contribution of every category of primary input to the total value (or price) absorbed by an industry in the course of domestic production;

(2) it serves to establish certain priorities according to certain criteria involving the five components of primary inputs or any combinations of them.

Such a table is useful in describing the structure of industrial costs for a given period. As a matter of fact, for analysis of inflation of the structural type, the above distribution suggests the direction and the magnitude of repercussions

TABLE 4.7

Prices or Value of Output in Terms of Primary Inputs

Sector	Imports	Net Indirect Taxes	Depreci-ation	Wages	Profits, Rents Interest	Total[a/]
1	3.87%	0.77%	3.39%	35.54%	56.47%	100.04%
2	9.10	5.42	11.85	30.08	43.72	100.17
3	3.05	1.48	1.79	8.81	84.95	100.08
4	3.03	17.72	4.23	16.42	58.65	100.05
5	5.77	31.75	2.78	16.98	43.11	100.39
6	5.10	5.16	5.28	17.66	66.96	100.16
7	9.58	3.54	6.73	24.47	55.89	100.21
8	4.01	1.82	7.51	27.03	59.83	100.20
9	6.58	2.98	2.48	12.76	79.74	104.54[b/]
10	11.95	10.62	4.89	15.83	56.82	100.11
11	13.10	3.78	6.29	29.33	47.68	100.11
12	6.25	6.27	2.95	14.45	70.22	100.14
13	6.58	4.08	4.65	17.53	67.40	100.24
14	12.01	5.98	4.35	15.33	62.81	100.48
15	5.68	21.28	4.82	6.52	61.72	100.02
16	9.70	6.32	7.34	17.70	59.17	100.23
17	36.34	12.97	3.51	11.17	36.11	100.10
18	22.08	10.04	4.57	19.81	43.88	100.38
19	10.30	13.31	3.08	17.52	55.95	100.16
20	19.38	12.31	5.04	14.97	48.69	100.39
21	13.46	21.09	6.28	18.30	41.09	100.32
22	10.13	7.04	17.16	19.86	81.13	135.32[b/]
23	7.92	0.78	38.61	16.07	41.71	105.09[b/]
24	0.50	0.09	1.80	12.94	84.68	100.01[b/]
25	2.18	1.26	34.75	11.58	61.96	111.73[b/]
26	3.54	0.49	11.90	55.11	29.03	100.07
27	4.14	2.04	7.73	15.89	70.27	100.07
28	0.16	0.02	0.31	2.64	96.53	99.66
29	1.05	0.20	3.71	36.99	58.13	100.08

---

a/ The relative values do not always add up precisely to 100% because of rounding-off errors.

b/ Preliminary figures.

in cost changes between industries in the system. It is also suggestive of the incidence on factor payments of a change in the level of final demand, both as to the distribution and extent of the impact.

E. Illustrative Analysis of the Price Effects of the Proposed Petroleum Tax

As an exercise in the area of analysis suggested by the preceding paragrah, one could consider the proposed increase in the specific taxes on petroleum products, which is part of the Marcos Tax Program for the fiscal year 1969.

As the proposed tax bill has them, these taxes come in three variants: on gasoline, lubricating oil, and crude oil, to be applied over a period of time at graduated rates for some products. The tax increases are quoted in terms of specific taxes. These, however, can be translated into their ad valorem equivalents very easily once the weighted average price of the commodities in question is given. Assuming that all these adjustments have been made, and that the effective tax increase over the period under consideration is 40% of the initial level, the incidence of such a tax increase would be to raise industrial costs across the board to the extent that petroleum is an input to the industries.

Suppose that the cost of production before the tax increase was set at 1.00, the effect of a tax increase of 40% on petroleum products would be to raise unit cost of production in each industry by a factor which is the product of 1) the petroleum dependence ratio of this industry, and 2) the given rate of increase in the tax on petroleum products. An index of one industry's dependence on the petroleum industry must reflect both direct and indirect absorption of petroleum products in the course of its production process. It represents the direct effects and "feed backs" of cost of petroleum products in terms of proportion to total industrial costs of industries. Such an index is an element in the inverse matrix at the intersection of the row for petroleum industry and the column for the other industry. If this inverse coefficient is now multiplied by 1.40, which reflects the increment in the unit price of petroleum products due to the 40% tax increase, the product would represent the new unit cost of production for that industry embodying the effect of a tax-induced higher unit price for petroleum inputs absorbed in its production process. A replication of this procedure for all the 29 industries in our I-O table would result in a schedule such as Table 4.8, which shows (column 3) the extent of effect of the increased petroleum tax on the individual industrial and the

TABLE 4.8

Distribution of the Effect on Unit Cost of Production of an Increase of 40% on Petroleum Products

Sector (1)	Petroleum Dependence ratio (2)	Increase in Sectoral Unit Cost of Production (3) = 1.40 x (2) (3)	Household-Industry Dependence Ratio (4)	Increase in Prices Paid by Households (5) = (3) x (4) ( )
1	.007777	.0109	.196038	.0021
2	.053620	.0751	*	*
3	.010422	.0146	.249334	.0036
4	.006764	.0095	.018419	.0002
5	.006632	.0093	.039750	.0004
6	.010532	.0147	.024620	.0004
7	.006782	.0095	.013493	.0001
8	.028952	.0040	.010103	.0001
9	.003701	.0052	.011066	.0001
10	.009127	.0128	.005575	.0001
11	.007799	.0109	.004711	.0001
12	.004696	.0066	.000066	*
13	.012684	.0177	.004825	.0001
14	.023657	.0331	.033168	.0011
15	1.007561	1.4106	.008457	.0119
16	.085852	.1202	.003645	.0004
17	.010161	.0142	*	*
18	.010611	.0148	.000988	*
19	.007903	.0111	.000746	*
20	.005296	.0074	.004106	.0001
21	.008313	.0116	.003479	*
22	.027485	.0385	.000852	*
23	.013498	.0189	.017398	.0004
24	.003194	.0045	.072098	.0003
25	.052941	.0741	.131022	.0097
26	.004247	.0059	.001157	*
27	.094408	.1322	.006434	.0008
28	.000297	.0004	.088509	*
29	.002663	.0037	.050099	.0002
		TOTAL	1.000000	.0322

* Either nil or negligible effect.

distribution of its incidence among the different industries.

A further question to ask, and which directly affects the Filipino consumer, is: what effect do these increases in industrial costs, triggered off by a 40% increase in petroleum taxes, have on consumer prices and, therefore, on consumer real income and material well-being? This effect clearly is the sum of the price effects on individual industries which deliver goods and services to the household sector. To estimate the impact due to each industry's delivery to the household sector, one must find the product of 1) the new increase in unit cost of production for each industry, and 2) the dependence ratio of household consumption on this industry's output. Having done this, add up all the price effects on individual industries. The sum represents the totality of effect on the prices paid by households on the same bundle of consumer goods and services as of a given period.

The results of such a procedure are presented in column (5) of table 4.8. The index used to capture household dependence on an industry's output is the proportion of the total household expenditures on goods and services from the 29 industries that goes into the purchase of this industry's output. This is obtained from original transactions table.