Institute of Economic Development and Research
SCHOOL OF ECONOMICS
University of the Philippines

Discussion Paper No. 68-25 August 7, 1968

AN INTER-INDUSTRY STUDY OF THE 1961 PHILIPPINE ECONOMY*

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I. The System of Input-Output Analysis

A. The Accounting Framework

The technique of input-output analysis is based on an input-output table, which is a simple transactions account showing for a given period the destinations of industry outputs (i.e., the elements in the rows of the table) and the sources of costs associated with these outputs (i.e., the elements in the columns of the table). If the production (i.e., operating) or current accounts of each industry are set up in such a way that entries follow a certain uniform scheme, the input-out table can be evoked out of these accounts.

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*This is a partial report on the UP-BCS Interindustry Relations Project which is supported partly from the fund provided by the Ford Foundation through the Wisconsin-U.P. Program in Development Economics. The authors are grateful to Dean Amado A. Castro, Professors José Encarnación, Jr. Agustin Kintanar, Jr., Gerardo P. Sicat and Federico Sioson for helpful comments during the course of this study and on an earlier draft of this paper. Responsibility for any defects is entirely the authors' own.

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For each industry, outputs in terms of use are either intermediate (i.e., inter-industry flows) or final (i.e., consumption, gross capital formation, exports). Inputs are either "produced" (e.g., textile yarns) or "primary" (e.g., man-hours).

For each commodity or industry if this term connotes homogeneous outputs, this basic accounting (ex post) identity holds for every row in the table: supply equals demand, i.e., total output plus imports equals intermediate output plus private and public consumption plus gross capital formation plus exports. Total output is here defined as the sum of final output and intermediate output.

For every column, the following identity also holds: total output equals produced inputs purchases plus primary inputs purchases. Thus for each industry, total output equals total input, i.e. its row total balances with its column total. However, this is not true of the row of any single primary input and the column of any individual final output. It is only in the aggregate that primary inputs equal final outputs. It follows that rows total equals columns total. Finally, by convention, value-added in the individual industry equals its total output minus its purchases of produced inputs. For the whole economy, however, value-added eliminates all inter-

industry transactions (i.e., produced inputs purchases) and is then equal to final outputs minus imports.

B. The Analytical Framework

The transition from an input-output accounting table to input-output analysis requires that certain behavioral assumptions be made about the input-output relation (i.e., the economic production function) in each industry. In terms of the simple open static model of the Leontief type which has been adopted for the present work, the behavioral equations reflect three basic assumptions about the productive system: 1) homogeneity, 2) proportionality, and 3) additivity. The homogeneity requirement implies that production in each industry occurs at fixed proportions and rules out the possibility of substitution between outputs in consumption or between inputs, produced or primary, in production.

The assumption of proportionality requires that the demand of each industry for current inputs from other industries is a function of its own level of output. This relationship, as a first approximation and for statistical or computational convenience, is therefore linear (i.e., homogeneous of degree one or implying constant returns to scale) in the neighborhood of certain outputs. Thus on the average, the input-output (technical, or 'marginal' input) coefficient, which is obtained

directly from the input-output table by dividing each element in a column by the output total in a corresponding row), is a constant proportion of an industry's total output. This relationship of strict proportionality, i.e., $y = ax$, clearly differs from the general linear type of $y = ax + b$. In practice, it cannot be otherwise because one usually begins with a single table, from which the input-output coefficients are derived. As a matter of fact, from the recent works of input-output economists abroad, e.g., those of Burgess Cameron on the Australian and British economies, the evidence shows that these coefficients tend to remain unchanged over a number of years, particularly for three years.

The additivity assumption describes the production function as characterized by constant costs, and thereby discounts, in effect, such windfalls of economic interdependence as external economies.

C. The Empirical Scheme for the Philippines

Data availability and 'normalcy' of economic relationships are conventionally the criteria used in the choice of a given year for an input-output analysis. In the present case, however, the year 1961 has been chosen largely out of data considerations. It also falls, though, in the period when exchange controls in the Philippines were gradually being relaxed.

The Bureau of the Census and Statistics (BCS) undertook an extensive economic census in 1961 covering such activities as forestry and logging, fishing, mining and quarrying, manufacturing, construction, commerce (wholesale and retail), utilities (gas, water and electricity), transportation and communication, and services (business, personal and recreation). The BCS Census of Agriculture in 1960 had to be adjusted forward to reflect farm output in 1961. The BCS Foreign Trade Division makes an annual tabulation of external transactions of the Philippines directly from customs' manifests remitted periodically by the Bureau of Customs. Such a tabulation, however, follows the Standard International Trade Classification (SITC) and therefore entries had to be retabulated in terms of the International Standard Industrial Classification (ISIC) which is the scheme followed by the BCS in its 1961 Economic Census, and adopted in the present study.

The BCS Philippine Statistical Survey of Households (PSSH) Division supplied the basic data on the 1961 family income and expenditures.

The 1961 Census used the establishment as its basic statistical unit. In such areas as the banking and other financial institutions, insurance, real estate, sanitary, government and community (e.g. education) services, which

were not covered in the 1961 Census, independent statistical investigations were undertaken in the course of constructing the input-output table in question. As a matter of fact, data coverage was extended to include a large amount of other relevant basic information, published and unpublished, turned out by the Bureau of the Census and Statistics, and by other government and private entities. A listing of the latter and their specific contributions to the statistical work appears somewhere in this paper.

In the process of partitioning the whole economy into the different industrial sectors of the input-output table, it was necessary to use the principal product turned out by the establishment as the norm for identifying a particular industry. Other products were subsequently considered secondary, and transferred to an industry where they were principally produced. A corresponding proportion of the inputs of the original industry had to be transferred to the other industry, their distribution assumed to be the same as those of the industry to which they are transferred.

Domestic outputs are valued at producer's prices (i.e., ex-farm and ex-factory, or f.o.b.) while imports are calculated in c.i.f. values. Since inputs shown in establishment reports are valued at purchaser's price, producer's value is derived

Industry Classification and Sources of Data

No.	Industry	ISIC Classification	Sources of Data
1	AGRICULTURE, FISHING AND FORESTRY: palay, corn (both unmilled), export crops (e.g. unprocessed sugar cane, coconut, tobacco, abaca), fruits and vegetables, livestock and poultry others (e.g. ramie, cotton); forestry logging; fishing.	013-019 021-022 0111-0114 0121-0123 044,043	BCS 1960 Census of Agriculture BAE PHILCOA Bureau of Forestry Phil. Fisheries Commission BCS 1961 Census on Forestry, Logging and Fishing
2	MINING AND QUARRYING: non-metallic products (e.g. coal, crude petroleum and natural gas), metallic products (e.g. gold, iron, silver and others); quarrying covers stone, marble, limestone, sand gravel, clay and rock salt.		BCS 1961 Econ. Census for Mining & Quarrying Bureau of Mines BCS Industry Division
3	FOOD MANUFACTURES: cigars, cigarettes and related products, leaf tobacco (cured or redried)	201-209	BCS 1961 Economic Census for Manufacturing BCS Industry Div.
4	BEVERAGES: liquors, wines, brewery and malt products, soft drinks	211-312 214	-do-
5	TOBACCO PRODUCTS: cigars, cigarettes and related products, leaf tobacco (cured or redried)	221-222	-do-
6	TEXTILES PRODUCTS: knitting mill products, textiles mill products, cordage, twine and net, other textile products.	231-233 239	-do-
7	FOOTWEAR: footwear, wearing apparel, other made-up textile products.	241 243-244	-do-

No.	Industry	ISIC Classification	Sources of Data
8	WOOD PRODUCTS: sawmill and planning products, wooden containers, cane wares, cork and other products.	251-253 259	BCS 1961 Economic Census for Manufacturing BCS Industry Div.
9	FURNITURE AND FIXTURES	261	-do-
10	PAPER PRODUCTS: paper, paper products	271-272	-do-
11	PRINTED MATERIALS: newspapers, periodicals and books commercial printing products, bookbinding and services industries.	281-283	-do-
12	LEATHER PRODUCTS: leather and leather substitute products	291,293	-do-
13	RUBBER PRODUCTS: rubber footwear, tires and related products, other rubber products	301-302 309	-do-
14	CHEMICALS: basic industrial chemicals, vegetables and animal fats and oils	311-313 319	-do-
15	PETROLEUM PRODUCTS: petroleum refinery, miscellaneous products of petroleum and coal.	321 329	-do-
16	NON-METALLIC PRODUCTS: glass and glass products, structural clay products, cement pottery, china and earthenware.	331-334 339	-do-
17	FERROUS METAL PRODUCTS: iron and steel, ferrous metal products.	341-342	-do-
18	NON-FERROUS METAL PRODUCTS: tin-aluminum wares, structural metal products, cutlery, hand tools and general hardware, stamped coated and engraved metal, fabricated wire products, heating, cooking and plumbing equipment (except electrical)	351-357 359	-do-

No.	Industry	ISIC Classification	Sources of Data
19	NON-ELECTRICAL MACHINERY: farm machinery, metal working machinery, special industrial machinery, general industrial machinery, household type service machines and appliances, other non-electrical machinery.	362-365 367-369	BCS 1961 Economic Census for Manufacturing BCS Industry Div.
20	ELECTRICAL MACHINERY: electrical distribution and control apparatus, electrical communication equipment, household electrical appliances, wiring machinery and equipment.	371-374 379	-do-
21	TRANSPORT EQUIPMENT: ship-building, motor vehicles, repair shop products, bicycles, tricycles and other equipment	381 383-385 389	-do-
22	MISCELLANEOUS MANUFACTURES: professional-scientific measuring and controlling instruments photographic equipment and supplies, jewelry, silverwares and plated wares, musical instruments, other miscellaneous manufactures.	394 399	-do-
23	CONSTRUCTION: residential, commercial, industrial and institutional, special trade contractors, heavy construction (e.g. highways, bridges, harbors, airports, etc.)	441 419 412	BCS 1961 Economic Census on Construction BCS Industry Div. Phil. Contractors Association Bu. of Public Highways Dept. of Public Works Civil Aeronautics Administration NAWASA Manila Railroad & Phil. Railways Company Manila Gas Company Bureau of Telecommunication PHHC

No.	Industry	ISIC Classification	Sources of Data
24	WHOLESALE AND RETAIL TRADE: Activities associated with resale of goods and services to business institutions and government.	611-619	BCS 1961 Economic Census on Commerce BCS Business Div. Bureau of Commerce
25	TRANSPORT SERVICES: travel and freight services on land, sea, and air, and services including forwarding, shipping, tourist and brokerage services. Services involv- storage and warehousing are partly included here.	711-717	BCS 1961 Eco. Census on Transportation BCS Utilities Div. Land Transportation Commission
26	COMMUNICATION: communication services including telephone and telegraph.	731-732	Bureau of Telecommunications Bureau of Posts BCS Utilities Div.
27	ELECTRICITY, GAS AND WATER: generation of electricity or the purchase by distributors for sale to consumers; manufacture and distribution of utility and liquified gas and the supply of water by revenue producing networks system (private or government).	511-512 521	MERALCO NAWASA Office of Economic Coordination BCS Utilities Div.
28	REAL ESTATE, BANKING AND INSURANCE: Real estate refers to services related to the use of building space for dwelling or offices. The output here includes rents paid on real property including rental value of owner-occupied dwellings and fixed assets. Banking includes all industrial, commercial, rural banking and loan and savings associates. Insurance covers all life and non-life.		Central Bank Insurance Commission Phil. National Bank DBP Phil. National Cooperative Bank SSS GSIS
29	OTHER SERVICES: business services (e.g. legal, accounting and auditing, engineering and technical services), recreational services (e.g. radio, television, movies and theaters), personal services (e.g. restaurants, hotels, barber shops, beauty parlos, etc.)		BCS 1961 Economic Census on Services BCS Services Div. Univ. of the Phil. Bu. of Private Schs. Bu. of Public Schs. Bu. of Vocational Schools

by deducting from reported costs portions of inputs attributed to trade, transport services, and indirect taxes. These margins are distributed to the appropriate sectors. Absorption of inputs in the inter-industry flow reflects only those amounts used in current production, rather than amounts bought in the period or those used towards capital formation as in the case of own-account capital improvements within the industry itself.

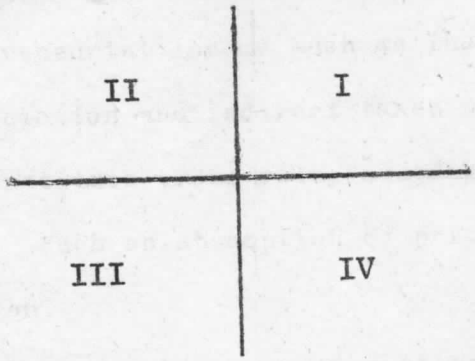
At several points in the course of the work, stray or seemingly unidentifiable outputs and inputs were distributed to the most likely consuming industries and the most likely supplying industries.

In regard to imports, these are distributed in a row outside the inter-industry flow itself. Hence, the inter-industry flows whose coefficients were subsequently inverted reflect only absorption of domestically produced inputs, to evoke a measure of stability about the inter-industry coefficients. Purely as a matter of analytical exercise, a distinction is made between competitive and noncompetitive imports, the former being interpreted as a close substitute to a domestically produced output and the latter, as having either no or quantitatively negligible domestic substitutes. In practice, of course, an arbitrary guideline is to define

an import as competitive if it accounts for more than 10% of the total supply.

D. Summary View of the 1961 Inter-industry Matrix

The accounting flows describing the 1961 input-output framework partition the inter-industry matrix into four parts:



Quadrant I accounts for that portion of output turned out by each of the productive (29) industries which goes to final demand sectors such as households (including non-profit private institutions), government, capital formation, and exports. In 1961, this flow amounted to ₱16.35 billion or 39.64% of a total volume of transactions which ran to ₱41.25 billion. (Cf. Table 1: Transactions Matrix).

Quadrant II represents the inter-industry flows among the 29 productive industries. The row registers sales to other industries and the column, purchases from other industries. The diagonal elements are outputs of an industry consumed within itself. This network of sales and purchases between

and among the industries themselves amounted in 1961 to ₱6.39 billion or 15.51% of the total volume of transactions.

Quadrant III records, columnwise, the absorption by each of the 29 productive industries of primary inputs such as imports, compensation of employees, profits, rents, interest and other entrepreneurial income such as that of the self-employed, depreciation and indirect taxes net of subsidies, all of which constitute gross value-added generated by each of the industries. Such an absorption of primary inputs amounted to ₱16.35 billion.

Quadrant IV shows the absorption of primary inputs by the final demand sectors, which added up to ₱2.15 billion or 5.21% of the total transactions for the period.

In terms of the disposition of total output, intermediate demand totalled ₱22.75 billion, 28.15% of which or ₱6.39 billion were for produced inputs while the other 71.88% or ₱16.35 billion were for primary inputs. Final demand, on the other hand, amounted to ₱18.50 billion, the absorption of produced inputs representing ₱16.35 billion or 88.38% while the absorption of primary inputs, ₱2.15 billion or 11.62%.

II. Pattern of Economic Interdependence

The unique value of an input-output table consists in its capacity to elucidate the system of industrial interdependences about economic production. These interdependences are revealed by a network of inter-industry sales and purchases.

Recall once more the basic structure of an input-output system. Briefly, total output is exhausted by the intermediate absorption of industries and the final absorption of the major institutional sectors of the economy such as households, business, the government, and the rest of the world. All production is made partly of intermediate inputs from industries and partly of primary inputs from the major institutional sectors.

For study of interdependences[6] of linkage effects about the process of economic production, it is the intermediate purchases among and the intermediate sales between industries that are of primary consideration. The linkage effect among industries may be in the nature of supplying inputs as in the case of intermediate purchases by industry j from industry i. Alternatively, it may take the form of utilizing output as in the case of intermediate sales of industry j to industry i.

Hirschman[1] labels the former type of interdependence as backward linkage and the latter as forward linkage.

The measure that is conventionally used to identify the backward linkage is the ratio of total intermediate purchases (U_j) of inputs to the total output (X_j) of an industry. In the case of the forward linkage, it is the ratio of total intermediate sales (W_i) to the total sales or output of an industry. The backward linkage is then the ratio:

$$u_j = U_j/X_j$$

and the forward linkage is the ratio

$$w_i = W_i/X_i$$

A. Structure of Backward Linkages

The measure adopted here excludes purchases of imported inputs. The value of u_j, as can be seen from Table 2.1, varies from 73.89% in the case of miscellaneous manufactures to 2.20% in the case of trade. The average value for all the 29 sectors, however, is 41.85%. Using this value as a benchmark, one notices that industries characterized by a u_j value lower than the average for all industries in the system are generally in the nature of 1) service industries, (2) consumer industries, and

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[1] Albert O. Hirschman, The Strategy of Economic Development, Yale University Press, 1958

TABLE 2.1

Distribution of Industries in Terms of Magnitude of Backward Linkage Effects, 1961

Sector	Backward (u_j) Linkage (Inter-Industry Purchases as Per Cent of Total Output)	Ranking
Miscellaneous	73.89%	1
Leather Products	72.78	2
Paper products	67.04	3
Wood products	61.49	4
Non-electrical machinery	60.43	5
Chemicals	60.11	6
Footwear	58.34	7
Non-metallic products	57.57	8
Electrical machinery	52.24	9
Textile products	49.76	10
Rubber products	48.46	11
Transport equipment	47.26	12
Non-Ferrous metal products	45.81	13
Agriculture, fishing, forestry	44.90	14
Ferrous metal products	44.77	15
Printed materials	44.75	16
Mining	44.26	17
Tobacco products	41.30	18
Construction	37.81	19
Petroleum products	31.57	20
Electricity, gas, water	30.07	21
Food manufactures	29.48	22
Furniture and fixtures	25.75	23
Communication	25.41	25
Beverages	25.15	25
Transport services	14.29	26
Other services	13.83	27
Banking, insurance, real estate	3.05	28
Trade, wholesale and retail	2.20	29
Unweighted average	41.85	

(3) those to which the service industries themselves are vitally related, e.g., petroleum products.)

On the other hand, industries whose u_j values are above the average for all industries as a whole are generally manufacturing industries and such basic industries as mining, agriculture, fishing and forestry. Thus, if one were merely concerned about maximizing backward linkages about the national economic system, the direction of such efforts would be in the area of manufactures generally, and to a less extent that of agriculture and mining. As a matter of fact, to the extent that agriculture and mining supply the material inputs for manufactures, any chronic gains in productivity in agriculture and mining would simply reinforce the type of external economies accruing to the manufacturing services.

B. Structure of Forward Linkages

Table 2.2 shows the distribution of industries relative to their individual capacity for forward linkages. The configuration of industries indicates that generally industries with high forward linkage effects are somewhat low on backward linkage effects. As a matter of fact, a Spearman rank correlation applied to both distributions registered a negative relationship of 0.006.

TABLE 2.2

Distribution of Industries in Terms of the Magnitude of Forward Linkage Effects, 1961

Sector	Forward (w_i) Linkage (Inter-Industry Sales as Per Cent of Total Demand)	Ranking
Banking, insurance, real estate	60.26%	1
Paper products	59.36	2
Petroleum products	54.89	3
Communication	53.44	4
Other Services	48.35	5
Electricity, gas, water	44.72	6
Trade	42.90	7
Leather products	34.28	8
Chemicals	33.74	9
Miscellaneous manufactures	29.47	10
Wood products	28.94	11
Ferrous metal products	28.84	12
Non-metallic products	27.73	13
Mining	26.32	14
Textile products	25.43	15
Rubber products	23.87	16
Construction	23.81	17
Agriculture, fishing, forestry	16.90	18
Electrical machinery	13.83	19
Food manufactures	11.56	20
Footwear	8.37	21
Non-ferrous metal products	7.76	22
Transport services	6.96	23
Transport equipment	6.59	24
Non-electrical machinery	3.86	25
Furniture and fixtures	2.51	25
Printed materials	2.23	26
Beverages	2.22	27
Tobacco products	0.43	29
Unweighted average	25.16	

It is also evident from the table that industries with markedly low forward linkage relative to the average of 25.16% for all industries are either 1) primarily fixed capital goods industries or, 2) primarily consumer goods industries.

There are, however, a number of industries which in terms of both the forward and backward linkage distributions persistently register values above the average values for each distribution. These include paper products, leather products, miscellaneous manufactures, wood products, chemicals, non-metallic products and textile products. Chart I presents the scatter of industries in terms of their capacity for both forward and backward linkages. At least for these seven (7) industries, one could expect an expansion path over time nourished by a network of reinforcing forward and backward linkages, all in all, growing by dint of external economies about their production processes

Again, public policy in an effort to economize on investment resources, i.e., maximizing the generation of social marginal products out of a given collection of investment projects and thereby enlarging the country's gross national product, may bias the use of such resources towards industries characterized by high values of forward and backward linkages about them.

III. Analysis of Aggregate Supply and Aggregate Demand

A. Structure of Supply of Primary Inputs 1961

1. Compensation of Employees

a. As Source of Income

The fact that employee compensations account for only a little over one-fifth of the GNP seems to suggest that on the whole, subsistence wages were, in effect, the going wage for the Filipino labor at the time. This does not exclude the possibility that in several isolated cases, wage levels may have been significantly above the subsistence level as possibly in many manufacturing and service industries, reflecting rather high productivity about the type of skilled or unique labor required in such industries. What is being inferred, however, is this: that in the Philippines during this period, such high productivity industries were relatively few so that in the process of averaging things out, these were virtually swamped by the more numerous low productivity-subsistence wage industries. This would certainly be the case if the greater bulk of Filipino labor force were engaged in agricultural or primary production of a generally low-productivity type.

It may also be inferred that even if there was a sufficiently large number of high productivity industries

at the time, employee compensation still remained to be a small fraction of the GNP. Labor unions were probably not aggressive enough to capture and translate substantive parts of high productivity into higher than subsistence wages. As a matter of fact, unionism for one or more reasons might have been totally absent from many of the industries at the time. Even if there were as many high productivity industries as there were low-productivity, and that unionism in these industries was aggressively organized, the national wage income would still amount to a relatively small sum and therefore would not constitute a major fraction of the GNP as long as the expectations of both wage recipients and employers add up to generally low wage levels. This would be the case where food prices in general are virtually stable in the neighborhood of the period (1961) under consideration. Food prices would be stable, even in the face of serious population pressure, as long as resources for food production such as cultivable land continue to be relatively generous or when the frontiers of cultivation themselves can be stretched within rather wide limits. This is even truer if most of what goes into the indigenous diet depends on land crops. Generally low wage levels may also be maintained for a time as long as consumer habits and horizons remain relatively

unchanged, social legislations set a low minimum wage rate or if this is significantly high, it seldom applies in the ordinary operation of business or gets applied only on the breach.

Up to this point, the discussion has proceeded on the macro level, explaining for the most part only the magnitude of the wage income itself and its proportion to the GNP in 1961. When one considers the distribution of this magnitude among the various industries in the economy, the resulting distribution is also suggestive of the structure of the Philippine economy at the time. That is, as shown in Table 3.1 , agriculture, forestry and fishing account for 31.68% or ₱1.164 million of the national wage income in 1961, government services 19.38%, other services (i.e., education, personal, business and recreational) 13.55%, trade 7.32%, transport services 4.60%, food manufactures 3.03%, banking, insurance and real estate 2.20%, mining 1.47%, textile products 1.35%, wood products 1.35%, chemicals 1.31%, electricity, gas and water 1.09%, and the households, hospitals and private non-profit institutions 1.00%. These thirteen sectors together account for 89.33% of the total wage income, the remaining 10.67% representing all the other sectors.

TABLE 3.1

Distribution of Industries in Terms of Magnitude of Relative Shares in the National Wage

(A) Sector	Value of Wage Income (₱1000)	Per Cent Share in Total Wage Income	Ranking
Agriculture, Forestry and Fishing	₱1,164,307	31.68%	1
Government	712,436	19.38	2
Other services	498,193	13.55	3
Wholesale and retail trade	268,913	7.32	4
Transport services	168,885	4.60	5
Food manufactures	111,445	3.03	6
Banking, insurance and real estate	80,883	2.20	7
Mining	54,204	1.47	8
Textiles	49,523	1.35	9
Wood products	49,495	1.35	9
Chemicals	48,075	1.31	10
Electricity, gas and water	40,123	1.09	11
Households and private non-profit institutions	36,796	1.00	12
Sub-total	₱3,283,278	89.33	
Other sectors	392,189	10.67	
All Sectors	₱3,675,467	100.00%	

(B)			
Agriculture, forestry, fishing and mining	₱1,218,511	33.15%	2
Manufactures	562,950	15.32	3
Services	1,894,006	51.53	1
All Sectors	₱3,675,467	100.00%	