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**AN AGGREGATED INPUT-OUTPUT MODEL FOR KOREA
EMPHASIZING AGRICULTURE**

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Korean Agricultural Sector Study

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March 26, 1974
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AN AGGREGATED INPUT-OUTPUT MODEL FOR KOREA
EMPHASIZING AGRICULTURE

This paper describes an aggregated input-output model of the Korean national economy for the year 1970. This model has been aggregated from the 1970 Bank of Korea 56 sector input-output model. Thus the paper will briefly describe the Bank of Korea model before presenting its results.

The primary purpose of this model is to provide a means of analyzing the linkages between the Korean agricultural sector and the rest of the economy. Because of this both the discussion and the coverage of the aggregated input-output model will be heavily weighted in favor of the agricultural sector of the economy.

The activities in the aggregate model can be divided into groups as agriculture (or primary production), agricultural processing, agricultural input, iron and steel (an import using industry), electrical and other machinery (an export producing industry) and a residual.

Description of the Bank of Korea Model

The Bank of Korea (BOK) in May 1973 published a working paper [4] which described the structure of the Korean economy in 1970 using 56 aggregated sectors. The survey data was

collected based on 340 basic sectors. The basic sectors were grouped into 153 fundamental sectors from which the 56 aggregated sectors were formed.

The coverage of agriculture in the BOK 56 sector model consists of 6 aggregated sectors which were formed from 15 fundamental sectors which were based on 25 basic sectors.

The content of the Bank of Korea model is most easily described in tabular form showing the industries which make up each of the sectors. Table 1 presents the breakdown of the 56 aggregate sectors into the 153 fundamental sectors. Where they provide insight into the linkages with agriculture the basic sectors are also presented in this table.

The Bank of Korea model gives a fairly detailed accounting of final demands and value added. There are eight categories of final demand and four categories of value added. Final demand is divided into consumption (both private and government), fixed capital formation (by both the private and government sectors), changes in inventory stocks, exports, imports, and tariff and customs charges. Value added is separated into compensation of employees, depreciation, indirect taxes less subsidies, and other value added (presumably entrepreneurial returns, or profits).

Table 1

Bank of Korea Interindustry Classification Table, 1970

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
1. Rice Barley & Wheat	1. Rice 2. Barley & Wheat	Rice Barley & Wheat
2. Fruits, Vegetables and the other Cereals	3. Other Cereals 4. Potatoes 5. Vegetables 6. Fruits	Pulses Other Grains Potatoes Vegetables Fruits
3. Industrial Crops	7. Fibre & Oil Crops 8. Tobacco, etc. 9. Other Industrial Crops	Fibre Crops Oil Crops Tobacco, etc. { Tobacco Peppermint Others Medicine Plants Garden Plants Others
4. Livestock & Sericulture	10. Livestock 11. Sericulture	Milk Cow Korean Cattle Poultry Swine Other Livestock Sericulture
5. Forestry	12. Seedlings 13. Forest Products	
6. Fishery	14. Marine Fishery 15. Aquiculture	
7. Coal Mining	16. Coal	
8. Metal Ore	17. Iron 18. Tungsten 19. Lead & Zinc 20. Non-ferrous Metal Ore	
9. Non-metallic Mining	21. Stone Quarrying & Sand Products 22. Salt 23. Raw Materials for Ceramics 24. Graphite 25. Other Non-metallic	

Bank of Korea Interindustry Classification Table, 1970
Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
10. Slaughtering; Meat & Dairy Products; Fruit & Vegetables Canning & Preserving	26. Slaughtering; Meats & Dairy Products 27. Fruit & Vegetable Canning & Preserving	
11. Canning & Preserving of Marine Prod.	28. Canning & Preserving of Marine Products	
12. Grain Milling	29. Rice & Barley Milling 30. Wheat Milling	
13. Other Processed Food	31. Bakery Products and Confectioneries 32. Sugar Mills 33. Condiments 34. Fat & Oil 35. Mixed Feeds 36. Other Food Manufacturing	
14. Beverage	37. Liquor 38. Soft Drink	
15. Tobacco Processing	39. Tobacco Processing	
16. Textile Spinning	40. Cotton Yarn 41. Silk Yarn 42. Wool and Worsted Yarn 43. Hemp and Flax Yarn 44. Synthetic Fibre Yarn 45. Other Fibre Yarn	
17. Textile Fabrics	46. Cotton 47. Silk 48. Woolen 49. Hemp 50. Chemical Fabrics 51. Dyeing and Finishing	

Bank of Korea Interindustry Classification Table, 1970
Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
18. Finished Textile Products	52. Knitting Mill Products	
	53. Rope & Fish-net	
	54. Outerwear & Garments	
	55. Other textile Products	
19. Leather & Leather Products	56. Leather	
	57. Leather Products	
20. Lumber Products & Plywood	58. Lumber	
	59. Plywood	
21. Wood Products & Wooden Furniture	60. Wood Products	
	61. Wood Furniture	
22. Paper & Paper Products	62. Pulp	
	63. Paper	
	64. Paper Products	
23. Printing & Publishing	65. Printing & Publishing	
24. Inorganic Chemicals	66. Sulphuric acid & Hydrochloric acid	
	67. Carbide	
	68. Soda Chemicals	
	69. Industrial Gas	
	70. Other Inorganic Chemicals	
25. Organic Chemicals	71. Petroleum Chemical Primary by-Products	
	72. Non-Cyclic Intermediate Materials	
	73. Cyclic Intermediate Materials	
	74. Other Organic Chemical Products	

Bank of Korea Interindustry Classification Table, 1970
Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
26. Chemical Fertilizer	75. Chemical Fertilizers	
27. Drugs & Cosmetics	76. Drugs 77. Cosmetics	
28. Other Chemical Products	78. Agricultural Chemicals 79. Plastic 80. Plastic Products 81. Chemical Fibre 82. Powder 83. Paints 84. Soap 85. Others	
29. Petroleum Products	86. Petroleum Oils	
30. Coal Products	87. Coal Products	
31. Rubber Products	88. Rubber Products	
32. Non-metallic Mineral Products	89. China Goods 90. Glass Goods 91. Clay Goods 92. Cement 93. Cement Goods 94. Others	
33. Iron and Steel	95. Pig Iron 96. Blister-steel 97. Alloy-steel	
34. Iron & Steel Primary Products	98. Rolled steel Products 99. Steel Pipe and Galvanized and Plated steel 100. Cast and Forged steel	
35. Non-Ferrous Metals and Primary Products	101. Non-Ferrous Metals & Gold Bullion 102. Non-Ferrous Metal Primary Products	

Bank of Korea Interindustry Classification Table, 1970
Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (240 industries)
36. Metallic Products	103. Metallic Furniture 104. Metallic Products for Construction 105. Other Metallic Product	
37. Non-Electrical Machinery	106. Prime Movers & Boilers 107. Working and Processing Machinery 108. Machines for Special Industries 109. Office Machines and Service 110. Machines & Apparatus for General Industries 111. Home Appliances 112. General Machine Parts	Agricultural Machinery
38. Electrical Machinery	113. Electrical Machinery and Apparatus 114. Electronic and Communication Apparatus 115. Electrical Home Appliances 116. Other Electrical Apparatus and Equipment	
39. Transport Equipments	117. Ship-building & Repairing 118. Railroad Transport Equipment 119. Vehicles and Vehicle-parts 120. Vehicle Repairing 121. Other Transport Equipment	
40. Measuring, Medical Optical Instruments	122. Measuring, Medical & Optical Instruments	

Bank of Korea Interindustry Classification Table, 1970
 Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
41. Other Manufacturing	123. Other Manufacturing	
42. Residential Bldg & Non-Residential Bldg. Bldg Maintenance	124. Residential Bldg. 125. Non-Residential Bldg. 126. Bldg. Maintenance	
43. Public Construction Work	127. Public Construction 128. Other Construction	
44. Electricity	129. Electricity	
45. Water Service	130. Water Service	
46. Banking & Insurance	131. Banking 132. Insurance	
47. Real Estate	133. Real Estate	
48. Communications	134. Communications	
49. Transportation and Storage	135. Railway 136. Highway 137. Marine Transportation 138. Aircraft 139. Loading & Unloading 140. Storing	
50. Trade	141. Trade	Wholesale Retail Trade (International)
51. Government Service	142. Government Service	
52. Social Services	143. Education 144. Medical Service 145. Other Services	

Bank of Korea Interindustry Classification Table, 1970
Cont.

<u>Aggregated Sector (56 industries)</u>	<u>Fundamental Sector (153 industries)</u>	<u>Basic Sector for Arrangement (340 industries)</u>
53. Other Services	146. Services for Firm	Law and other Technical Services Enterprise Services Ag. Services { land improvement veterinary services guidance services
	147. Sanitary Services	Water Sanitation
	148. Recreation & Cultural Services	Broadcasting Film & Theater Cultural Services Other Entertainment
	149. Food & Hotel Services	Restaurant Hotel
	150. Services to Person	Personal Repairs Barbers Beauticians Other Personal Services
54. Office Supplies	151. Office Supply	
55. Business Consumption	152. Business Consumption	
56. Unclassifiable	153. Unclassifiable	

Components of Final Demand

57. Private Consumption	155. Private Consumption
58. Government Consumption	156. Government Consumption
59. Private Fixed Capital Formation	157. Private Fixed Capital Formation
60. Government Fixed Capital Formation	158. Government Fixed Capital Formation
61. Increases in Stock	159. Increases in Stock
62. Exports	160. Exports

Bank of Korea Interindustry Classification Table, 1970
 Cont.

Aggregated Sector (56 industries)	Fundamental Sector (153 industries)	Basic Sector for Arrangement (340 industries)
--------------------------------------	--	--

63. Imports (-)	161. Imports
64. Tariff & Customs (-)	162. Tariff & Customs

Components of Value Added

65. Compensation of Employee	164. Compensation of Employee
66. Other Value Added	165. Other Value Added
67. Capital Consumption Allowances	166. Capital Consumption Allowances
68. Indirect Taxes Minus Subsidies	167. Indirect Taxes Minus Subsidies

Import disposition is given a very fine accounting. In addition to the total imports by industry of origin, the imported components of each final demand category and every production activity are detailed by industry. This is done for both total imports and the imports which the Bank of Korea designates as noncompetitive.

Since the aggregation process which was followed in order to reduce the size of the BOK model retained the same structure of presentation, the description in the next section should provide further insight into the form of the larger model described briefly in this section.

The KASS Aggregated Model

The Korean Agricultural Sector Study (KASS) [12] in its diagrams represents the linkages between the agricultural and nonagricultural sectors of the Korean economy by a box which is labeled "National Input-Output Model." The actual realization of this linkage is rather crude, so that a more sophisticated linkage may be desired.

In an effort to possibly provide for this improved linkage an input-output table was aggregated from the BOK publications which maintained the essential linkages between agricultural production and the agricultural processing and input industries, but which is of more manageable size.

The principles underlying the aggregation process were to isolate the agricultural (or primary) production industries in

the original transactions table. Then the agricultural processing activities were determined to be the activities corresponding to those columns of the transactions table that had significantly large entries in the rows for the agricultural production activities. The agricultural input industries were those corresponding to the rows which had significantly large entries in the columns corresponding to the agricultural production activities. The remaining activities were examined to determine if they required high levels of imports per unit of output or if they were significant export industries.

Then these industry groupings were examined to determine their relative importance vis à vis the agricultural sector and the rest of the economy. The important industry groups retained the same identity that they had in the BOK model. Those of lesser importance were combined with other industry groups which were either substitutes or complements for each other, or formed an integrated whole where the output of one is a major input into the other. Finally, the remaining activities went into a residual category. Table 2 presents the correspondences between the KASS interindustry classifications and the BOK industrial designations.

The coverage of the agricultural sector is the same as in the BOK 56 sector model with two reservations: leather and leather products are aggregated with the livestock and sericulture activity. The forestry industry is aggregated with

Table 2

KASS Interindustry Classification Table, 1970

Aggregated Sector (19 industries)	Bank of Korea Components (56 industries)	Other Remarks
1. Rice, Barley, Wheat	1. Rice, Barley, Wheat	
2. Fruits, Vegetables, Other Cereals	2. Fruits, Vegetables, Other Cereals	Fruits Vegetables Potatoes Pulses Other Grains
3. Industrial Crops	3. Industrial Crops	Oil Crops Fibre Crops Tobacco Medicine Plants Garden Plants
4. Livestock Aggregate	4. Livestock and Sericulture 19. Leather and Leather Products	
5. Forestry Aggregate	5. Forestry 20. Lumber Products and Plywood 21. Wood Products and Wooden Furniture 22. Paper and Paper Products	
6. Fisheries	6. Fisheries	
7. Slaughtering, Meat and Fruit and Vegetable Canning and Preserving	10. Slaughtering, Meat and Dairy Products, Fruit and Vegetable Canning and Preserving	
8. Grain Milling	12. Grain Milling	
9. Tobacco Manufacture	15. Tobacco Manufacture	
10. Textile Aggregate	16. Textile Spinning 17. Textile Fabrics 18. Finished Textile Products	

KASS Interindustry Classification Table, 1970
Cont.

Aggregated Sector (19 industries)	Bank of Korea Components (56 industries)	Other Remarks
11. Other Processing Aggregate	11. Canning and Preserving Marine Products 13. Other Food Processing 14. Beverage	
12. Chemical Fertilizer	26. Chemical Fertilizer	
13. Other Chemical Products	28. Other Chemical Products	Ag. Chemicals Plastic Plastic Products Chemical Fibre Powder Paints Soap Others
14. Non-Electrical Machinery	37. Non-Electrical Machinery	Includes Agricultural Machinery
15. Marketing - Service	49. Transportation and Storage 50. Trade 53. Other Services	Wholesale, Retail, International Trade Includes Ag. Services (land improvement, guidance, veterinary) and Food and Hotel Services, Among Others.
16. Other Input Aggregate	24. Inorganic Chemicals 25. Organic Chemicals 29. Petroleum Products 31. Rubber Products	
17. Iron and Steel	33. Iron and Steel 34. Iron and Steel Primary Products	
18. Electrical and Other Machinery	38. Electrical Machinery 41. Other Manufacturing	
19. Residual	All Other Industries	23 Industries in All

the lumber and plywood, wood products and wooden furniture, and paper and paper products industries.

Among the processing industries, a textile processing aggregate was formed by combining the spinning and weaving industries with the textile products industry. A residual processing industry was obtained by aggregating the beverage industry and the canning and preserving of marine products with other food processing.

Since they all are used in similar types of production activities, the inorganic chemical, organic chemical, petroleum, and rubber product industries were grouped together. Transportation and storage, trade, and nongovernmental service activities were grouped to form a marketing-service aggregate.

Iron and steel products form the major import-using industry not represented in the above aggregation. Electrical appliances and other machinery were aggregated as the major export industries not represented elsewhere.

Based upon this aggregation process, interindustry transaction tables were compiled for all purchases, all imported commodities, and for all noncompetitive imports. Table 3 presents the interindustry accounting for all purchases in 1970, with each unit being one billion won. Table 4 and 5, respectively, present the disposition of total imports in 1970 and

Table 3

Korean Interindustry Transactions Table, 1970

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Subtotal	Private	Govt	Private	Govt	Change of	Exports	Imports	Customs	Grand
																					Consumption	Formation	Capital	Inventories			Duties	Total		
1	8.68	3.02	0.44	30.54	0.10			27.70		0.02	10.83				0.83			3.07	19.81	105.04	383.94	0.54			17.93	0.01	70.15	0.73	437.19	
2		7.20	0.02	6.05			1.00	0.03			24.23				0.41				1.07	40.01	159.97	0.18			5.95	0.73	6.75	0.51	199.27	
3			1.27	4.04	0.14		0.02		9.37	19.39	5.40				0.16	0.01		0.79	4.11	44.70	5.97	0.11	0.54		1.35	7.51	21.56	0.97	37.64	
4	3.11	1.77	0.74	5.17	0.01	0.01	49.41			14.60	0.09		0.09	0.01	0.04	0.09	0.02	0.42	0.83	76.41	60.97	0.21	1.82	0.01	6.22	1.16	5.79	0.92	140.38	
5	7.13	13.56	2.84	6.99	67.69	1.65	0.42	0.03	2.32	1.98	4.33	1.71	1.76	0.38	8.68	4.27	0.16	2.98	60.59	189.47	14.64	1.18	18.82	0.33	-5.24	29.52	58.28	2.65	187.81	
6				0.15	0.99						8.82								0.50	10.64	39.78	0.02			0.30	15.84	0.31	0.22	65.74	
7			1.77				1.08				1.09								2.37	7.80	69.63	0.22			0.40	4.22	4.40	0.46	77.31	
8	20.18	0.23	0.10			0.01				0.10	16.30	0.01						0.53	0.60	37.53	19.60	0.76			0.10	0.03	1.04	0.02	57.47	
9								0.05											1.58	1.63	65.25				-0.11	0.09	0.13	0.02	66.71	
10	0.01	0.01	0.06	0.47	0.92	5.53	0.01	0.99	0.08	139.69	0.50	0.20	0.50	0.05	4.86	2.51	0.08	2.57	7.56	166.60	134.98	0.33	0.63	0.02	5.33	99.94	29.04	0.67	378.14	
11		0.02	0.17	21.12	0.33	1.13	0.65		0.14	0.26	36.34	0.31	3.45		0.83	0.20	0.01	0.03	37.81	102.80	154.26	1.36			5.94	12.51	22.45	5.29	251.11	
12	20.58	7.21	1.56		0.80						0.04	0.13	0.04		0.04				0.21	30.61		0.10			1.41	1.73	1.42		32.44	
13	2.45	4.18	0.58	0.89	2.27	0.07	0.10	0.15	0.51	39.57	3.31	0.79	18.86	0.31	5.06	5.83	0.07	13.33	18.26	116.59	18.22	0.85			2.94	2.70	49.17	7.85	84.28	
14	0.06	0.13	0.04	0.09	0.65	0.96	0.02	0.17	0.12	1.75	0.53	0.07	0.15	2.19	1.58	0.38	0.19	0.67	10.52	20.27	1.61	0.52	85.87	5.46	2.54	0.87	86.12	5.75	26.27	
15	15.67	5.57	1.88	7.95	11.18	3.89	10.05	2.84	1.78	30.89	25.29	2.24	10.55	2.34	65.91	12.69	6.72	12.65	157.03	387.12	512.88	18.42	24.75	1.75	6.41	69.55	3.91	0.17	1016.80	
16	.23	0.90	0.02	0.80	3.93	4.73	0.25	0.18	0.94	7.63	5.22	6.40	14.51	0.49	41.39	8.23	1.38	2.56	38.14	137.98	9.53	4.54			2.34	15.54	27.37	6.82	135.53	
17			0.05	0.19	0.01	0.01	0.06	0.01	0.06	0.05	0.15	0.04	0.08	6.20	0.28	0.15	58.04	3.12	66.22	154.67	-0.15	0.00	-1.40	-0.47	7.01	4.27	45.67	4.27	94.05	
18	0.65	0.39	0.31	0.10	0.63	0.56	0.02	1.26	2.25	0.77	0.45	0.06	0.12	0.61	5.33	0.32	0.19	14.00	33.79	61.80	29.56	1.01	28.13	1.51	4.34	49.65	42.96	4.52	128.53	
19	2.94	3.15	0.72	4.12	11.37	6.38	1.90	4.63	0.80	20.60	19.64	7.61	6.56	4.74	125.58	51.67	10.93	23.65	319.77	626.95	312.49	256.35	349.99	170.34	7.87	60.03	156.55	17.23	1610.15	
20	81.74	47.14	10.65	90.25	100.36	25.91	64.95	38.04	18.37	277.51	162.56	19.57	56.87	17.32	260.98	87.29	77.78	80.55	780.77	2298.62	1993.33	286.70	509.15	178.95	73.93	376.00	633.07	56.75	5026.87	
21	24.05	11.37	7.14	8.88	29.03	23.40	4.99	9.07	4.52	52.29	21.69	3.21	10.05	5.11	207.48	8.81	7.93	18.58	493.01	950.61										
22	326.19	139.26	19.19	38.27	52.76	12.72	6.22	9.74	13.20	33.06	30.00	6.32	8.78	2.21	440.65	11.07	5.85	22.44	218.55	1426.48										
23	2.99	0.88	0.42	2.71	2.97	3.47	0.26	0.31	0.51	6.07	3.92	3.80	5.00	0.75	51.52	5.38	1.90	2.15	46.47	141.48										
24	2.23	0.63	0.25	0.29	2.71	0.24	0.89	0.31	30.11	9.22	32.95	-0.46	3.58	0.89	56.17	22.99	0.58	4.82	41.27	209.67										
25	355.45	152.14	27.00	50.14	87.46	39.84	12.36	19.43	48.35	100.63	88.55	12.87	27.41	8.96	755.83	48.24	16.26	47.98	829.32	2728.24										
26	437.19	199.27	37.64	140.38	187.81	65.74	77.31	57.47	66.71	378.14	251.11	32.44	84.28	26.27	1016.80	135.52	94.05	128.53	1610.15	5026.87	1293.33	286.70	509.15	178.95	73.93	376.00	633.07	56.75	5026.87	

Source: Derived from Bank of Korea

Unit: Billion Won

Table 4

Disposition of Korean Imports, 1970

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
																				Interindustry Demands	Private Consumption	Gov't	Private Fixed Capital Formation	Gov't	Change in Inventories	Total Imports	Customs Duties	Total Demands	
1								215.74												245.16	448.36	.49			8.74	701.49	1.26	702.75	
2		1.27		3.34					.03		42.46									46.97	27.61				1.05	67.53	8.10	75.63	
3				3.09			.13		1.30	184.90	12.97									203.02	.05				22.28	215.61	9.74	225.35	
4				5.45	.09		.59		5.87	47.94	2.17	.25	6.78	.32	3.18	39.39	.03	.60	3.85	56.65	3.03		2.20		5.22	57.91	9.19	67.10	
5				.02	394.09					.98	1.45							17.56	125.52	596.14	4.93	.64	3.41	.71	3.40	582.74	26.50	609.24	
6					1.57	.01	1.40				5.73		.05					1.26	0.01	4.30	.99				3.14	2.15	5.29		
7				11.85							1.62							0.14	19.17	28.81					.68	44.01	4.64	48.66	
8																			1.62	8.08	.73				10.42	.01	10.43		
9									.49										.60	.91		.73			1.32	.19	1.51		
10				.31	.69	.66		.15	.21	257.74	.05	.22	.27		3.10	3.97	.13	2.71	6.35	276.56	13.68	.01	.16	.06	6.67	290.37	6.76	297.13	
11				53.47	.66		1.76				122.96		30.27		.87	.89	.08		4.80	215.76	20.62	.12			21.03	224.59	37.93	257.53	
12				.01	.54						.15	.95							12.54						1.66	14.19		14.20	
13	9.90	.46	.53						2.10	172.19	9.02	7.41	138.84	.41	17.00	48.41	0.07	96.85	47.15	551.49	3.97	1.79			13.00	491.72	78.53	570.24	
14	1.09	1.26	.20	1.89	7.43	.15	.02	.28	.36	4.01	.71	.18	.17	11.06	8.28	.52	.32	1.78	67.27	101.27	5.73	2.99	746.11	44.73	17.89	861.24	57.43	918.72	
15	.15	.23		.07	3.65	2.22	.01					.01			14.32		.03	.10	4.53	18.99	13.20	8.57			39.05	1.72	40.77		
16	2.00	.03		1.05	3.34	.15	1.48	.37	4.55	38.30	13.63	9.74	115.17	.75	11.96	34.91	1.08	10.25	75.04	323.80	4.15	2.23		.02	11.65	273.63	68.27	341.86	
17															10.67			295.06	7.66	178.64	492.03					6.84	456.26	42.68	498.88
18				.19	.01	.20		.01	.10	3.55	.06	.01	.23	1.39	10.26	.08	0.82	100.30	103.15	220.36	39.67	1.35	180.49	5.85	27.08	429.64	45.15	474.79	
19	.22	2.57	.44	2.51	114.89	18.39	4.72	.46	.95	9.14	12.19	19.55	5.35	7.28	103.58	433.60	48.35	40.98	466.70	1291.90	54.32	31.55	297.98	51.54	10.84	1565.84	172.14	1738.11	
20	13.36	5.82	1.17	83.25	526.96	21.78	10.11	218.01	15.96	718.77	250.25	38.31	297.14	31.88	172.55	561.77	345.97	280.06	1085.21	4678.33	678.11	50.47	1230.35	102.91	158.03	6330.70	557.49	6888.19	

Source: Derived from Bank of Korea

Units: 100 Million Won

Table 5

Disposition of Korean Non Competitive Imports, 1970

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
																				Interindustry Demands	Private Consumption	Govt	Private Fixed Capital Formation	Govt	Change in Inventories	Total Imports	Customs Duties	Total Demands	
1																					.00								.00
2							.13		.03		.05										.21	3.06							.00
3									.07	183.65	9.42									1.14	194.28					22.28	208.83	7.73	216.56
4				.38	.09					45.51									.16	.94	47.08						39.71	7.37	47.08
5					361.41					.01			5.66	.01		39.34		2.18	.26	408.87		.03			3.11	400.58	11.43	412.00	
6							1.28					.05									.00						.94	.38	1.33
7																					1.33								.00
8																					.00								.00
9																					.00								.00
10										1.20										1.20		.01	.05	.06	.13	1.43	.03	1.46	
11										78.04		29.65		.03	.08				.04	107.84					20.76	106.52	22.08	128.60	
12	7.80										.95									8.75					1.59	10.34		10.34	
13				.01					.07	8.04		7.22	90.29	.03	8.21	38.04		6.38	25.73	187.39	.63	1.22			9.90	160.20	38.94	199.14	
14				.07										.08	5.17	.26		.21	24.72	30.52		1.19	76.79	7.81	1.01	111.75	5.56	117.31	
15																				.00								.00	
16	2.00			.63	5.94	1.45		3.34	17.27	9.36	9.22	100.90	.15	1.63	15.82		.08	6.53	52.89	227.22		.13		.02	10.71	194.48	43.61	238.09	
17																	88.65			15.00	104.65		.01			4.40	98.64	10.40	109.04
18													.11	4.27			.01	12.78	14.50	31.67	.21	.05	67.91	.92	1.31	96.24	5.83	102.07	
19				.02	.03					3.02	18.58		.35	43.64	424.12	4.24	1.83	196.79	692.62	2.72	.22	80.29	6.51	-.96	716.53	64.87	781.42		
20	9.80	.00	.00	2.34	369.62	.00	2.86	.00	3.51	255.68	99.89	35.97	226.55	.74	62.92	517.61	93.06	30.07	333.01	2043.63	6.62	2.86	225.04	15.32	74.24	2147.68	220.02	2367.71	

Source: Derived from Bank of Korea

and the disposition of noncompetitive imports in 1970. The units for tables 4 and 5 are equal to 100 million won - one tenth of the units of table 3.

These interindustry transaction tables were converted into the technology matrices which give the inputs, imports, or value added per unit of output (A, AM OR AV, respectively) by dividing the first 19 columns in each of the transactions tables by the respective row sums of the total transactions table (Table 3).

Because the data incorporated in these transactions tables are denominated in won value rather than physical units, inferences based upon these technology matrices must be contingent upon an assumption of constant relative prices at the 1970 levels. As the relative prices change from the 1970 relationships the corresponding rows must be multiplied by the new price indices and the corresponding columns must be divided by the new price indices. Thus the net effect of such price changes on the diagonal elements of the technology matrix is to leave them unchanged.

Likewise the final demand vectors are denominated in won value, rather than physical units. As relative prices change the corresponding rows of the final demand matrix must be multiplied by the new price index.

The effects of such price changes on the organization of production indicated by the Leontief Inverse^{1/} of the technology

^{1/} The Leontief inverse of matrix "A" is $(I-A)^{-1}$, where I is the identity matrix.

matrix are very difficult to predict a priori and should be investigated on a case-by-case basis.

Other than these few cautionary words the effects of price changes will not be discussed further in this paper. Furthermore, the technology matrices will be discussed as if they were derived from a physical, rather than a value, basis because the exposition is somewhat easier.

Table 6 presents the net direct requirements for the inputs from the world economy. The positive elements of this "Technology Matrix" show the proportion of total production available to satisfy worldwide final demands. The negative elements indicate the amount of output of the row commodity required to produce a unit of the column commodity.

Table 7 shows the total requirements for all inputs (domestic and imported) per unit of final demand. A one-unit change in the final demand for one of the commodities requires production of each commodity to increase by the amount of the row entry for that commodity in the column corresponding to the commodity with the changed demand.

Both Table 6 and Table 7 are more relevant to the world perspective than to a Korean perspective. The corresponding tables of greater interest to Korea present the amounts of

Table 6

NET DIRECT REQUIREMENTS FOR ALL INPUTS I.E. TECHNOLOGY MATRIX (I-A)

COMMODITIES	Rbc GRAINS	FRT Vg OTH	IND. CROPS	LIVSTK	FOREST AGG	FISH	FOOD PACKNG	GRAIN MILLNG	TOBACC MFR.	TEXTIL
	1	2	3	4	5	6	7	8	9	10
1 RBW GRAINS	.9001	-.0152	-.0117	-.2176	-.0005	.0000	.0000	-.7820	.0000	-.0001
2 FRT VEG OTH	.0000	.9639	-.0005	-.0431	.0000	.0000	-.0129	-.0005	.0000	.0000
3 IND CROPS	.0000	.0000	.9663	-.0288	.0007	.0000	-.0003	.0000	-.1405	-.0513
4 LIVESTOCK	-.0071	-.0089	-.0197	.9632	-.0001	-.0002	-.6391	.0003	.0000	-.0386
5 FOREST AGG	-.0163	-.0670	-.0755	-.0498	.6396	-.0251	-.0054	-.0005	-.0348	-.0052
6 FISHERIES	.0000	.0000	.0000	.0000	-.0008	.9849	.0000	.0000	.0000	.0000
7 FOOD PACKING	.0000	.0000	.0000	-.0126	.0000	.0000	.9860	.0000	.0000	.0000
8 GR MILLING	-.0462	-.0012	.0000	-.0007	.0000	.0000	-.0001	1.0000	.0000	-.0003
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.9993	.0000
10 TEXTILE	-.0000	-.0001	-.0016	-.0033	-.0049	-.0841	-.0001	.0172	-.0012	.6304
11 OTH PROCESS	.0000	-.0001	-.0045	-.1504	-.0018	-.0172	-.0084	.0000	-.0021	-.0007
12 FERTILIZER	-.0471	-.0362	-.0414	.0000	-.0043	.0000	.0000	.0000	.0000	.0000
13 MISC CHEM	-.0056	-.0210	-.0154	-.0063	-.0121	-.0011	-.0013	-.0026	-.0076	-.1044
14 GI MACHINES	-.0001	-.0007	-.0011	-.0006	-.0035	-.0146	-.0003	-.0030	-.0018	-.0046
15 MKTG-SERV	-.0358	-.0280	-.0499	-.0566	-.0595	-.0592	-.1300	-.0494	-.0267	-.0817
16 CHEM PET RUB	-.0006	-.0045	-.0005	-.0057	-.0269	-.0720	-.0032	-.0031	-.0141	-.0202
17 IRON STEEL	.0000	.0000	.0000	-.0004	-.0010	-.0002	-.0001	-.0010	-.0001	-.0002
18 ELEC MACH	-.0015	-.0020	-.0082	-.0007	-.0034	-.0085	-.0003	-.0219	-.0337	-.0020
19 RESIDUAL	-.0067	-.0158	-.0191	-.0293	-.0605	-.0970	-.0246	-.0806	-.0120	-.0550

COMMODITIES	OTH PROCSS	FERTI LIZER	MISC CHEM	GI MACHIN	MKTG SERV	CHEM PT RUB	IRON STEEL	ELEC MACH	RESIDOL
	11	12	13	14	15	16	17	18	19
1 RBW GRAINS	-.0431	.0000	.0000	.0000	-.0008	.0000	.0000	-.0237	-.0123
2 FRT VEG OTH	-.0765	.0000	.0000	.0000	-.0004	.0000	.0000	.0000	-.0007
3 IND CROPS	-.0215	.0000	.0000	.0000	-.0002	-.0001	.0000	-.0061	-.0026
4 LIVESTOCK	-.0004	.0000	-.0011	-.0004	-.0000	-.0007	-.0002	-.0033	-.0005
5 FOREST AGG	-.0172	-.0527	-.0233	-.0145	-.0085	-.0315	-.0017	-.0232	-.0376
6 FISHERIES	-.0351	.0000	.0000	.0000	.0000	.0000	.0000	-.0014	-.0003
7 FOOD PACKING	-.0043	.0000	.0000	.0000	.0000	-.0067	.0000	-.0041	-.0015
8 GR MILLING	-.0649	-.0003	.0000	.0000	.0000	.0000	.0000	.0000	-.0004
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	-.0010
10 TEXTILE	-.0020	-.0062	-.0059	-.0019	-.0048	-.0185	-.0009	-.0200	-.0047
11 OTH PROCESS	.8553	-.0096	-.0409	.0000	-.0008	-.0015	-.0001	-.0002	-.0235
12 FERTILIZER	.0002	.9960	-.0005	.0000	-.0000	.0000	.0000	.0000	-.0001
13 MISC CHEM	-.0132	-.0244	.7762	-.0118	-.0090	-.0430	-.0007	-.1037	-.0113
14 GI MACHINES	-.0021	-.0022	-.0018	.9166	-.0016	-.0028	-.0020	-.0052	-.0085
15 MKTG-SERV	-.1007	-.0691	-.1252	-.0891	.9352	-.0936	-.0715	-.0484	-.0775
16 CHEM PET RUB	-.0208	-.1973	-.1722	-.0137	-.0407	.9393	-.0147	-.0199	-.0237
17 IRON STEEL	-.0006	-.0012	-.0009	-.2360	-.0003	-.0011	.3629	-.0243	-.0411
18 ELEC MACH	-.0018	-.0018	-.0014	-.0232	-.0352	-.0024	-.0020	.8911	-.0210
19 RESIDUAL	-.0782	-.2346	-.0778	-.1804	-.1235	-.3813	-.1162	-.1840	.8014

Table 7

TOTAL REQUIREMENTS (DIRECT AND INDIRECT) FOR ALL INPUTS ((I-A) INVERSE)

COMMODITIES	ROW GRAINS	FRT VEG OTH	IND. CROPS	LIVSTK	FOREST AGG	FISH	FOOD PACKNG	GRAIN MILLNG	TOBACC MFR.	TEXTIL
	1	2	3	4	5	6	7	8	9	10
1 ROW GRAINS	1.0471	.0211	.0205	.2576	.0050	.0078	.1695	.5081	.0053	.0231
2 FRT VEG OTH	.0009	1.0387	.0031	.0665	.0013	.0036	.0581	.0017	.0011	.0066
3 IND CROPS	.0008	.0010	1.0367	.0367	.0031	.0093	.0298	.0028	.1466	.0883
4 LIVESTOCK	.0082	.0104	.0223	1.0520	.0017	.0074	.6824	.0058	.0039	.0680
5 FOREST AGG	.0375	.1218	.1383	.1188	1.5829	.0670	.0951	.0316	.0817	.0627
6 FISHERIES	.0002	.0009	.0007	.0069	.0017	1.0165	.0050	.0004	.0004	.0013
7 FOOD PACKING	.0064	.0005	.0007	.0147	.0008	.0014	1.0290	.0007	.0006	.0021
8 GR MILLING	.0487	.0024	.0019	.0252	.0010	.0025	.0174	1.0240	.0007	.0037
9 TOBACCO MFR	.0001	.0001	.0001	.0001	.0002	.0002	.0001	.0002	1.0008	.0002
10 TEXTILE	.0046	.0039	.0073	.0124	.0175	.1431	.0108	.0326	.0065	1.5964
11 OTH PROCESS	.0043	.0065	.0142	.1908	.0107	.0304	.1362	.0071	.0073	.0320
12 FERTILIZER	.0497	.0393	.0448	.0167	.0072	.0012	.0116	.0244	.0068	.0054
13 MISC CHEM	.0135	.0358	.0309	.0259	.0360	.0353	.0230	.0217	.0240	.2319
14 GI MACHINES	.0012	.0022	.0029	.0034	.0081	.0197	.0035	.0055	.0035	.0116
15 MKTG-SERV	.0608	.0611	.0705	.1338	.1387	.1317	.2418	.1098	.0627	.2288
16 CHEM PET RUB	.0191	.0277	.0261	.0324	.0557	.1028	.0353	.0245	.0286	.0977
17 IRON STEEL	.0075	.0101	.0127	.0178	.0301	.0390	.0204	.0260	.0127	.0357
18 ELEC MACH	.0056	.0052	.0131	.0073	.0118	.0176	.0078	.0311	.0418	.0130
19 RESIDUAL	.0544	.0722	.0864	.1236	.847	.2290	.1484	.1629	.0660	.2396

COMMODITIES	OTH PROCSS	FERTI LIZER	MISC CHEM	GI MACHIN	MKTG SERV	CHEM PT SUB	IRON STEEL	ELEC MACH	RESIDL
	11	12	13	14	15	16	17	18	19
1 ROW GRAINS	.0990	.0101	.0119	.0089	.0050	.0127	.0089	.0379	.0228
2 FRT VEG OTH	.1188	.0035	.0080	.0020	.0015	.0035	.0021	.0031	.0052
3 IND CROPS	.0282	.0036	.0043	.0027	.0018	.0050	.0027	.0118	.0059
4 LIVESTOCK	.0078	.0035	.0051	.0027	.0014	.0092	.0026	.0108	.0038
5 FOREST AGG	.0732	.1311	.0890	.0634	.0325	.1002	.0459	.0823	.0916
6 FISHERIES	.0122	.0013	.0028	.0008	.0004	.0012	.0008	.0026	.0020
7 FOOD PACKING	.0061	.0027	.0028	.0014	.0008	.0190	.0014	.0061	.0028
8 GR MILLING	.0814	.0028	.0355	.0016	.0009	.0024	.0016	.0033	.0042
9 TOBACCO MFR	.0002	.0005	.0003	.0004	.0002	.0006	.0005	.0004	.0013
10 TEXTILE	.0178	.0246	.0266	.0136	.0127	.0413	.0128	.0459	.0160
11 OTH PROCESS	1.1798	.0289	.0739	.0150	.0082	.0246	.0155	.0217	.0400
12 FERTILIZER	.0107	1.0054	.0021	.0010	.0006	.0015	.0009	.0029	.0021
13 MISC CHEM	.0380	.0619	1.3182	.0379	.0177	.0824	.0211	.1720	.0338
14 GI MACHINES	.0064	.0079	.0070	1.0970	.0040	.0092	.0104	.0111	.0113
15 MKTG-SERV	.1880	.1793	.2607	.2298	1.1082	.2091	.2741	.2166	.1817
16 CHEM PET RUB	.0559	.2480	.2672	.0644	.0588	1.1099	.0721	.0810	.0555
17 IRON STEEL	.0300	.0616	.0446	.7268	.0272	.0753	2.6716	.1210	.1551
18 ELEC MACH	.0123	.0162	.0131	.0426	.0121	.0196	.0198	1.1344	.0305
19 RESIDUAL	.2105	.4757	.3243	.4399	.2127	.6003	.4796	.3833	1.3524

domestically produced inputs used per unit of output in Korea (Table 8) and the amount of Korean domestic production needed to satisfy a unit change of final demand (Table 9).

Table 8 presents the net requirements for inputs produced in Korea per unit of output of the Korean industries. The positive elements in each column are the amounts of production available to satisfy final demand per unit of production of the commodity represented by that column. The negative elements are the amounts of domestically produced inputs used per unit of production of the commodity represented by that column.

The columns of Table 9 give the total requirements of domestically produced goods in each industry per unit of final demand in the industry which labels the respective columns.

When the value added per unit of output for each commodity is multiplied by the requirements of domestically produced goods from each industry per unit of final demand and summed, we obtain the value added per unit of final demand for each industry. This is presented in Table 10. The value added is broken into compensation of employees (wages), capital consumption allowances (depreciation), indirect taxes minus subsidies (net taxes), and other value added (mostly profits).

Table 8

NET DIRECT REQUIREMENTS FOR DOMESTIC INPUTS (1-A,AM)
WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1970 LEVEL

COMMODITIES	RBY GRAINS	FRT VEG OTH	IND. CROPS	LIVSTK	FOREST AGG	FISH	FOOD PACKNG	GRAIN MILLNG	TOBACC MFR.	TEXTIL
	1	2	3	4	5	6	7	8	9	10
1 RBW GRAINS	.9801	-.0152	-.0117	-.2152	-.0005	.0000	.0000	-.1049	.0000	-.0001
2 FRT VEG OTH	.0000	.9645	-.0005	-.0409	.0000	.0000	-.0128	-.0005	.0000	.0000
3 IND CROPS	.0000	.0000	.9663	-.0288	-.0007	.0000	-.0003	.0000	-.1385	-.0029
4 LIVESTOCK	-.0071	-.0089	-.0197	.9671	-.0000	-.0002	-.0000	.0000	.0000	-.0259
5 FOREST AGG	-.0163	-.0670	-.0755	-.0498	.8474	-.0251	-.0054	-.0005	-.0260	-.0050
6 FISHERIES	.0000	.0000	.0000	.0000	.0000	.9850	.0000	.0000	.0000	.0000
7 FOOD PACKING	.0000	.0000	.0000	-.0042	.0000	.0000	.9878	.0000	.0000	.0000
8 GR MILLING	-.0462	-.0012	.0000	-.0007	.0000	.0000	-.0001	1.0000	.0000	-.0003
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000
10 TEXTILE	-.0000	-.0001	-.0016	-.0031	-.0045	-.0031	-.0001	-.0170	.0000	.6987
11 OTH PROCESS	.0000	-.0001	-.0045	-.1124	-.0014	-.0172	-.0061	.0000	-.0021	-.0007
12 FERTILIZER	-.0498	-.0360	-.0400	.0000	-.0040	.0000	-.0000	.0000	.0000	.0000
13 MISC CHEM	-.0054	-.0203	-.0149	-.0050	-.0081	-.0008	-.0013	-.0026	-.0045	-.0591
14 GI MACHINES	-.0001	-.0005	-.0011	-.0006	-.0015	-.0112	-.0007	-.0025	-.0013	-.0036
15 MKTG-SERV	-.0358	-.0280	-.0499	-.0566	-.0595	-.0592	-.1300	-.0494	-.0267	-.0817
16 CHEM PET RUB	-.0002	-.0045	-.0005	-.0050	-.0171	-.0717	-.0013	-.0025	-.0073	-.0100
17 IRON STEEL	.0000	.0000	.0000	-.0004	-.0010	-.0002	-.0001	.0010	-.0001	-.0072
18 ELEC MACH	-.0015	-.0020	-.0082	-.0006	-.0033	-.0062	-.0003	.0219	-.0336	-.0011
19 RESIDUAL	-.0067	-.0145	-.0180	-.0276	.0006	-.0691	-.0185	-.0798	-.0106	-.0526

COMMODITIES	OTH PROCSS	FERTI LIZER	MISC CHEM	GI MACHIN	MKTG SERV	CHEM PT RUB	IRON STEEL	ELEC MACH	RESIDL
	11	12	13	14	15	16	17	18	19
1 RBW GRAINS	-.0331	.0000	.0000	.0000	-.0008	.0000	.0000	-.0237	-.0123
2 FRT VEG OTH	-.0796	.0000	.0000	.0000	-.0009	.0000	.0000	.0000	-.0007
3 IND CROPS	-.0163	.0000	.0000	.0000	-.0002	-.0001	.0000	-.0001	-.0023
4 LIVESTOCK	-.0004	.0000	-.0011	-.0004	-.0000	-.0007	-.0002	-.0028	-.0604
5 FOREST AGG	-.0164	-.0519	-.0152	-.0132	-.0082	-.0024	-.0017	-.0095	-.0296
6 FISHERIES	-.0345	.0000	.0000	.0000	.0000	.0000	.0000	-.0004	-.0003
7 FOOD PACKING	-.0021	.0000	.0001	.0000	.0000	-.0069	.0000	-.0041	-.0015
8 GR MILLING	-.0643	-.0003	.0000	.0000	.0000	.0000	.0000	.0000	-.0004
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	-.0004
10 TEXTILE	-.0020	-.0055	-.0056	-.0019	-.0045	-.0156	-.0007	.0000	-.0010
11 OTH PROCESS	.9042	-.0094	-.0050	.0000	-.0007	-.0008	-.0000	-.0002	-.0032
12 FERTILIZER	-.0001	.9989	-.0005	.0000	-.0000	.0000	.0000	.0000	-.0001
13 MISC CHEM	-.0096	-.0015	.9410	-.0102	-.0033	-.0073	-.0007	-.0284	-.0084
14 GI MACHINES	-.0018	-.0016	-.0016	.9587	-.0007	-.0024	-.0017	-.0038	-.0024
15 MKTG-SERV	-.1007	-.0691	-.1252	-.0891	.9366	-.0936	-.0714	.0983	-.0972
16 CHEM PET RUB	-.0154	-.1673	-.0355	-.0158	-.0395	.9650	-.0135	-.0119	-.0190
17 IRON STEEL	-.0006	-.0012	-.0009	-.1954	-.0003	-.0011	.6966	-.0183	-.0300
18 ELEC MACH	-.0018	-.0018	-.0012	-.0179	-.0042	-.0023	-.0011	.9491	-.0146
19 RESIDUAL	-.0734	-.1743	-.0715	-.1527	-.1133	-.0613	-.0646	-.1521	.8304

Table 9

TOTAL REQUIREMENTS (DIRECT/INDIRECT) FOR DOMESTIC INPUTS (I-A-JAH) INVERSE,
WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1970 LEVEL

COMMODITIES	RB# GRAINS	FRT VEG OTH	IND- CROPS	LIVSTK	FOREST AGG	FISH	FOOD PACKNG	GRAIN MILLNG	IO&ACC MFR.	TEXTIL
	1	2	3	4	5	6	7	8	9	10
1 RB# GRAINS	1.0277	.0193	.0187	.2375	.0013	.0039	.1549	.1103	.3041	.0112
2 FRT VEG OTH	.0006	1.0375	.029	.0552	.0043	.0023	.0499	.0013	.0006	.0027
3 IND CROPS	.0009	.0004	1.0360	.0335	.0011	.0013	.0223	.0007	.1439	.0053
4 LIVESTOCK	.0078	.0100	.0217	1.0906	.0005	.0099	.6728	.0019	.0034	.0393
5 FOREST AGG	.0251	.0877	.0998	.0806	1.1797	.0380	.0632	.0090	.0465	.0199
6 FISHERIES	.0001	.0001	.0009	.0047	.0001	1.0161	.0033	.0002	.0002	.0004
7 FOOD PACKING	.0002	.0002	.0003	.0049	.0003	.0009	1.0156	.0004	.0003	.0006
8 GR MILLING	.0476	.0023	.0016	.0203	.0002	.0018	.0139	1.0059	.0005	.0016
9 TOBACCO MFR	.0000	.0000	.0000	.0001	.0000	.0001	.0001	.0001	.0000	.0001
10 TEXTILE	.0027	.0023	.0051	.0086	.0072	.1250	.0679	.0267	.0039	1.4349
11 OTH PROCESS	.0029	.0031	.0100	.1320	.0026	.0234	.0936	.0035	.0046	.0100
12 FERTILIZER	.0462	.0386	.0429	.0143	.0098	.0005	.0099	.0051	.0062	.0010
13 MISC CHEM	.0072	.0244	.0192	.0126	.0117	.0121	.0112	.0075	.0095	.0930
14 GI MACHINES	.0006	.0011	.0017	.0016	.0021	.0132	.0016	.0032	.0019	.0021
15 MKTG-SERV	.0591	.0511	.0793	.1109	.0838	.1070	.2211	.0791	.0514	.1613
16 CHEM PET RUB	.0122	.0173	.0155	.0190	.0287	.0858	.0219	.0109	.0134	.0287
17 IRON STEEL	.0019	.0023	.0032	.0047	.0033	.0098	.0055	.0083	.0033	.0080
18 ELEC MACH	.0036	.0035	.0105	.0041	.0049	.0118	.0049	.0252	.0369	.0048
19 RESIDUAL	.0330	.0387	.0498	.3748	.0171	.1223	.0942	.1187	.0342	.1285

COMMODITIES	OTH PROCSS	FERTI- LIZER	MISC CHEM	GI MACHIN	MKTG SERV	CHEM PT RUB	IRON STEEL	ELEC MACH	RESIDL
	11	12	13	14	15	16	17	18	19
1 RB# GRAINS	.0502	.0097	.0026	.0045	.0035	.0031	.0023	.0309	.0184
2 FRT VEG OTH	.0921	.0018	.0010	.0009	.0010	.0009	.0005	.0012	.0038
3 IND CROPS	.0194	.0012	.0006	.0010	.0008	.0007	.0005	.0076	.0040
4 LIVESTOCK	.0044	.0019	.0020	.0014	.0009	.0065	.0008	.0076	.0027
5 FOREST AGG	.0404	.0730	.0258	.0284	.0170	.0089	.0094	.0241	.0779
6 FISHERIES	.0390	.0007	.0009	.0003	.0002	.0002	.0002	.0008	.0015
7 FOOD PACKING	.0028	.0018	.0005	.0007	.0006	.0075	.0004	.0049	.0022
8 GR MILLING	.0739	.0018	.0008	.0007	.0006	.0005	.0004	.0020	.0034
9 TOBACCO MFR	.0001	.0002	.0001	.0002	.0002	.0001	.0001	.0002	.0012
10 TEXTILE	.0130	.0153	.0119	.0075	.0095	.0251	.0040	.0302	.0108
11 OTH PROCESS	1.1113	.0177	.0095	.0069	.0052	.0046	.0038	.0075	.0326
12 FERTILIZER	.0067	1.0017	.0008	.0009	.0004	.0003	.0002	.0019	.0015
13 MISC CHEM	.0177	.0079	1.0661	.0162	.0067	.0114	.0035	.0366	.0143
14 GI MACHINES	.0036	.0031	.0025	1.0446	.0015	.0032	.0031	.0052	.0037
15 MKTG-SERV	.1587	.1331	.1655	.1602	1.0942	.1225	.1297	.1511	.1509
16 CHEM PET RUB	.0336	.1864	.0796	.0346	.0790	1.0445	.0288	.0268	.0343
17 IRON STEEL	.0086	.0140	.0077	.3045	.0079	.0070	1.4424	.0388	.0553
18 ELEC MACH	.0076	.0071	.0042	.0244	.0074	.0047	.0045	1.0365	.0200
19 RESIDUAL	.1417	.2484	.1218	.2476	.1571	.0994	.1349	.2236	1.2419

Table 10

VALUE ADDED PER UNIT OF FINAL DEMAND BY COMMODITY (AV * (I-A+AM) INVERSE)
WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1970 LEVEL

COMMODITIES	WAGES	OTHER VALUE	DEPREC -IATN	NET TAXES	TOTAL VALUE
	1	2	3	4	5
1 RBW GRAINS	.0974	.8254	.0181	.0120	.9528
2 FRT VEG OTH	.1066	.8085	.0169	.0126	.9446
3 IND CRUPS	.2575	.6356	.0265	.0189	.9385
4 LIVESTOCK	.1696	.6269	.0373	.0345	.8683
5 FOREST AGG	.2117	.3791	.0262	.0283	.6452
6 FISHERIES	.4595	.3051	.0707	.0356	.8710
7 FOOD PACKING	.2250	.5760	.0376	.0465	.8851
8 GR MILLING	.2301	.3201	.0164	.0178	.5844
9 TOBACCO MFR	.1334	.3274	.0164	.4615	.9388
10 TEXTILE	.2949	.2600	.0435	.0583	.6567
11 OTH PROCESS	.2250	.3772	.0374	.1673	.8069
12 FERTILIZER	.2339	.3388	.1413	.0357	.7496
13 MISC CHEM	.2104	.2205	.0784	.0682	.5775
14 GI MACHINES	.3520	.2379	.0548	.0616	.7063
15 MKTG-SERV	.2825	.5156	.0633	.0747	.9360
16 CHEM PET RUB	.1332	.1676	.0524	.1888	.5419
17 IRON STEEL	.1957	.1767	.0415	.0256	.4395
18 ELEC MACH	.2728	.3309	.0373	.0619	.7028
19 RESIDUAL	.4385	.3074	.0492	.0537	.8488

The sum may not add to the total value due to rounding errors.

The difference between total value added and unity is the total amount of imported inputs per unit of final demand. Table 11 provides a detailed breakdown of imported inputs per unit of output by industry of origin. The column sums of Table 11 plus the "Total Value" row entries should sum to one, except for rounding errors. The imported inputs per unit of final demand includes the amount of the customs duties on the imports, as well as the cost of the goods themselves.

The estimate of expenditure on final demand for the output of each industry that was satisfied by domestic goods is presented in Table 12. The entries for consumption, capital formation, exports and inventory change were obtained by subtracting the appropriate columns of Table 4 from the columns of Table 3. Thus, the customs charges as well as the cost of the imports are subtracted from the expenditure on final demand. The imports consist of those for final demand as well as used in the production of other goods. Tariff levels are based on the level of imports. The consistency of the imports and customs charges between Table 3 and Table 12 should be noted.

Table 13 presents the value of production necessary to satisfy the domestic components of final demand. These are obtained by multiplying the total requirements for domestic inputs per unit of final demand (Table 9) by the estimates of final demand (Table 10) and summing. While avoiding the question of the feasibility of such production, the entries in Table 13 under

Table 11

TOTAL IMPORT REQUIREMENTS PER UNIT OF FINAL DEMAND (AM, I-A, AM), INVERSE,
WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1973 LEVEL

COMMODITIES	R&B GRAINS	FRT VEG OTH	IND CROPS	LIVSTK	FOREST AGG	FISH	FOOD PACKNG	GRAIN MILLNG	TOBACC MFR	TEXTIL
	1	2	3	4	5	6	7	8	9	10
1 RBW GRAINS	.0180	.0007	.0007	.0114	.0001	.0007	.0078	.3792	.0002	.0008
2 FRT VEG OTH	.0001	.0007	.0002	.0076	.0000	.0007	.0033	.0001	.0001	.0003
3 IND CROPS	.0002	.0001	.0003	.0011	.0005	.0063	.0007	.0014	.0022	.0702
4 LIVESTOCK	.0001	.0001	.0002	.0072	.0002	.0016	.0035	.0004	.0001	.0184
5 FOREST AGG	.0060	.0195	.0221	.0184	.2487	.0118	.0149	.0036	.0198	.0073
6 FISHERIES	.0000	.0001	.0001	.0001	.0010	.0001	.0001	.0000	.0001	.0000
7 FOOD PACKING	.0001	.0001	.0002	.0071	.0000	.0001	.0077	.0000	.0000	.0004
8 GR MILLING	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0000	.0000	.0000
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0000	.0000	.0000
10 TEXTILE	.0003	.0003	.0005	.0010	.0012	.0099	.0009	.0023	.0008	.0000
11 OTH PROCESS	.0007	.0015	.0021	.0466	.0010	.0019	.0330	.0006	.0007	.0980
12 FERTILIZER	.0025	.0004	.0017	.0007	.0004	.0000	.0005	.0003	.0002	.0000
13 MISC CHEM	.0036	.0071	.0070	.0065	.0087	.0127	.0058	.0054	.0088	.0827
14 GI MACHINES	.0004	.0004	.0004	.0008	.0026	.0049	.0009	.0013	.0010	.0025
15 MKTG-SERV	.0001	.0001	.0001	.0002	.0001	.0002	.0003	.0001	.0001	.0003
16 CHEM PET RUB	.0035	.0054	.0050	.0050	.0049	.0064	.0064	.0033	.0093	.0270
17 IRON STEEL	.0010	.0012	.0017	.0024	.0013	.0050	.0029	.0042	.0017	.0042
18 ELEC MACH	.0006	.0006	.0012	.0011	.0006	.0023	.0013	.0029	.0033	.0028
19 RESIDUAL	.0101	.0167	.0179	.0185	.0835	.0646	.0249	.0107	.0121	.0208

COMMODITIES	OTH PROCSS	FERTI LIZER	MISC CHEM	GI MACHIN	MKTG SERV	CHEM PT RUB	IRON STEEL	ELEC MACH	RESIDL
	11	12	13	14	15	16	17	18	19
1 RBW GRAINS	.0370	.0008	.0004	.0004	.0003	.0002	.0002	.0008	.0016
2 FRT VEG OTH	.0189	.0003	.0002	.0001	.0001	.0001	.0001	.0001	.0006
3 IND CROPS	.0064	.0007	.0007	.0005	.0005	.0013	.0002	.0016	.0010
4 LIVESTOCK	.0002	.0002	.0002	.0002	.0001	.0004	.0001	.0007	.0003
5 FOREST AGG	.0118	.0237	.0165	.0107	.0067	.0332	.0040	.0221	.0212
6 FISHERIES	.0007	.0001	.0000	.0001	.0000	.0000	.0000	.0010	.0001
7 FOOD PACKING	.0026	.0001	.0001	.0000	.0000	.0001	.0000	.0001	.0001
8 GR MILLING	.0007	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
9 TOBACCO MFR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
10 TEXTILE	.0012	.0025	.0014	.0007	.0012	.0049	.0007	.0045	.0014
11 OTH PROCESS	.0553	.0015	.0389	.0011	.0007	.0016	.0005	.0021	.0024
12 FERTILIZER	.0003	.0030	.0000	.0000	.0000	.0000	.0000	.0001	.0001
13 MISC CHEM	.0104	.0334	.1790	.0089	.0062	.0413	.0027	.0875	.0098
14 GI MACHINES	.0015	.0021	.0011	.0454	.0017	.0011	.0013	.0028	.0057
15 MKTG-SERV	.0003	.0003	.0003	.0003	.0016	.0002	.0003	.0004	.0006
16 CHEM PET RUB	.0107	.0377	.1480	.0082	.0074	.0294	.0038	.0157	.0095
17 IRON STEEL	.0045	.0073	.0039	.1407	.0043	.0035	.4542	.0210	.0319
18 ELEC MACH	.0018	.0024	.0016	.0095	.0027	.0012	.0026	.0826	.0098
19 RESIDUAL	.0270	.1343	.0302	.0672	.0332	.3397	.0895	.0538	.0554

Table 12

1970 ESTIMATE OF
DOMESTIC COMPONENT OF EXPENDITURE CATEGORY BY COMMODITY
WHEN COMPETITIVE IMPORTS ARE 1.5 TIMES THE 1970 LEVEL

COMMODITIES	PRIV CONS	GOV CONS	PRIV CAPITAL	GOV CAPITAL	INVEN -TORIE	EXPORT	IMPORT	TARIFF	TOTAL
	1	2	3	4	5	6	7	8	9
1 RBW GRAINS	339.1040	.4910	.0000	.0000	17.0560	.0100	70.1518	.1260	356.6610
2 FRT VEG OTH	157.2090	.1800	.0000	.0000	5.8450	.7300	6.7540	.8101	163.9640
3 IND CROPS	5.9650	.1100	.5400	.0000	-.8780	7.5100	21.5594	.9739	13.2470
4 LIVESTOCK	60.6670	.2100	1.6000	.0100	5.6980	1.1600	5.7906	.9189	69.6450
5 FOREST AGG	14.1470	1.1160	18.4790	.2590	-5.5800	29.5200	58.2711	2.6499	57.9410
6 FISHERIES	39.6810	.0200	.0000	.0000	.0000	15.8400	.3140	.2150	55.5410
7 FOOD PACKING	66.7490	.2200	.0000	.0000	.2320	4.2200	4.4018	.4641	71.4210
8 GR MILLING	18.9920	.6870	.0000	.0000	.4000	.0300	1.0420	.0010	20.1090
9 TOBACCO MFR	65.1590	.0000	.0000	.0000	-.1100	.0900	.1320	.0190	65.1390
10 TEXTILE	133.6120	.3290	.6140	.0140	4.6630	99.9400	29.0360	.6760	239.1720
11 OTH PROCESS	152.1980	1.3480	.0000	.0000	3.8370	12.5100	22.4598	3.2931	169.8930
12 FERTILIZER	.0000	.1000	.0000	.0000	1.2440	1.7300	1.4200	.0000	3.0740
13 MISC CHEM	17.8230	.6710	.0000	.0000	1.6400	2.7000	49.1708	7.8528	22.8340
14 GI MACHINES	1.0370	.2210	11.2590	.9870	1.7510	.8700	83.1242	5.7480	16.1250
15 MKTG-SERV	511.5600	17.5630	24.7500	1.7500	6.4100	69.5500	3.9041	.1720	631.5830
16 CHEM PET RUB	9.1150	4.3170	.0000	-.0020	1.1750	15.3400	27.3586	6.8257	29.9450
17 IRON STEEL	-.1500	.0000	-1.4000	-.4700	6.3260	4.2700	45.6183	4.2673	8.5760
18 ELEC MACH	25.5930	.8750	10.0810	.9250	1.6320	49.6500	42.9654	4.5152	88.7560
19 RESIDUAL	307.0580	253.1950	320.1920	165.1860	6.7860	60.0300	156.6047	17.2163	1112.4470
20 TOTAL	1925.5189	281.6530	386.1150	168.6590	58.1270	376.0000	633.0791	56.7445	3196.0728

THE TOTAL COLUMN IS THE SUM OF COLUMNS ONE THROUGH SIX.

Units: Billion Won

Table 13

1970 ESTIMATE OF
 PRODUCTION NEEDED TO SATISFY DOMESTIC FINAL DEMAND ((I-A)AM) INVERSE • (B-BM)
 WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1970 LEVEL

COMMODITIES	PRIV CONS	GOV CONS	PRIV CAPITAL	GOV CAPITAL	INVEN -TORIE	EXPORT	IMPORT	TARIFF	TOTAL
1 RBW GRAINS	396.3745	5.5028	6.7489	3.0774	19.5289	5.9530	81.2457	1.1631	437.1855
2 FRT VEG OTH	186.2799	1.3103	1.3453	.6291	6.8072	2.9095	10.6252	1.3148	199.2763
3 IND CROPS	24.8840	1.1916	2.0225	.6699	-.3727	9.4497	24.4532	1.2453	37.6451
4 LIVESTOCK	120.3020	1.1195	2.6738	.9591	6.5124	9.3057	12.5260	1.4936	140.3725
5 FOREST AGG	86.7759	13.9617	38.2889	8.2888	-4.2832	44.7666	88.5897	4.9591	187.7787
6 FISHERIES	47.5070	.4710	.5190	.2558	.1972	16.8015	1.6035	.3906	65.7515
7 FOOD PACKING	69.9802	.8453	.8033	.3766	.3233	4.9553	5.4972	.6092	77.2840
8 GR MILLING	50.7505	1.7015	1.1736	.5677	1.6731	1.6108	7.0970	.3643	57.4774
9 TOBACCO MFR	65.6934	.3103	.3965	.2006	-.0964	.2096	.3793	.0452	66.7091
10 TEXTILE	211.2786	3.5658	5.1347	1.8515	7.0961	149.1813	48.1056	1.7308	378.1081
11 OTH PROCESS	200.4902	9.9329	10.9755	5.4042	5.4675	18.8485	33.8195	4.6126	251.1188
12 FERTILIZER	25.9707	.5444	.6445	.2499	2.3305	2.6901	6.8505	.1778	32.4302
13 MISC CHEM	52.3301	4.6245	5.5915	2.4244	2.7837	16.5176	63.1360	9.1812	84.2738
14 GI MACHINES	5.8572	1.2205	13.0695	1.6445	1.9587	2.5178	91.6155	6.1749	26.2682
15 MKTG-SERV	718.3201	58.6423	80.2387	27.0191	12.7135	119.8791	86.4167	8.2770	1016.8078
16 CHEM PET RUB	70.0548	14.2435	13.3903	5.7972	2.8864	29.1741	47.0856	8.8423	135.5462
17 IRON STEEL	27.2254	17.3176	19.7894	8.8149	10.3126	13.5832	103.8754	9.1993	94.0430
18 ELEC MACH	44.2171	6.1747	17.4146	4.3014	2.0953	54.3284	51.5209	5.3136	128.5314
19 RESIDUAL	547.9513	318.3993	406.9411	205.8207	13.9964	117.6224	253.8221	26.8738	1410.2313
20 TOTAL	2951.7426	458.0795	627.1617	277.8428	71.7306	620.3012	1018.2645	91.9685	5024.8585

THE TOTAL COLUMN IS THE SUM OF COLUMNS ONE THROUGH SIX.
 IMPORTS AND TARIFFS ARE PRINTED IN ORDER TO ASSESS THE POTENTIAL GAINS FROM TOTAL IMPORT SUBSTITUTION IN THE ABSENCE OF GROWTH.

Units: Billion Won

the headings of "Import" and "Tariff" indicate the amount of each commodity that must be produced if all final demands were satisfied by domestic production. It is worthwhile to note that the total column of Table 13 is identical to the grand total column of Table 3, as it should be.

When the domestic final demand (Table 12) is multiplied by the gross value added per unit of final demand (Table 10), the total value added for the economy is obtained. This can be apportioned into the various factor shares as well as the portions that are attributed to the various expenditure categories. These results are presented in Table 14. If it were possible to replace all imports by domestic production, the sum of the "Import" plus "Tariff" columns of Table 14 indicate the amount that Korean Gross Value Added would increase.

The relation of this concept from input-output analysis to national income accounting is also shown in Table 14. Gross Domestic Product (GDP) is the sum of Gross Value Added and Customs Duties. Gross National Product (GNP) is the sum of GDP and net factor income from the rest of the world. National income is GNP minus capital consumption allowances and net taxes. Since "Net Factor Income From the Rest of the World" is not currently at our disposal we are limited to demonstrating these theoretical linkages.

Table 14

1973 ESTIMATE OF
GROSS VALUE ADDED BY FACTOR SHARES AND BY EXPENDITURE CATEGORY
WHEN COMPETITIVE IMPORTS ARE 1.0 TIMES THE 1970 LEVEL

COMMODITIES	PRIV CONS 1	GOV CONS 2	PRIV CAPITAL 3	GOV CAPITAL 4	INVEN -TORIE 5	EXPORT 6	IMPORT 7	TARIFF 8	TOTAL 9
1 WAGES	475,2871	118,0201	158,3289	73,4915	12,0895	112,7174	176,4902	16,4625	950,6349
2 OTHER VALUE	996,5706	90,2496	125,4573	52,2415	31,0323	130,9416	230,6415	16,5876	1426,4929
3 DEPREC-IATH	80,1269	14,0422	18,8382	8,3138	2,3344	17,8265	27,6600	2,8222	191,4820
4 NET TAXES	136,1165	16,1616	20,9527	9,1178	2,7738	24,5539	35,3324	4,2700	209,6764
5 TOTAL VALUE	1688,7876	238,4751	323,5778	143,1659	18,2289	286,0304	470,1108	70,1411	2728,2657
6 CUSTOMS DUTIES									56,7445
7 GROSS DOMESTIC PRODUCT									2785,0102
8 NET FACTOR INCOME FROM THE REST OF THE WORLD									
9 GROSS NATIONAL PRODUCT									

D 1 + 2 + 8 EQUALS NATIONAL INCOME...

THE TOTAL COLUMN IS THE SUM OF COLUMNS ONE THROUGH SIX.
IMPORTS AND TARIFFS ARE ADDED IN ORDER TO ASSESS THE POTENTIAL GAINS FROM TOTAL IMPORT SUBSTITUTION IN THE ABSENCE OF GROWTH.

Units: Billion Won

Summary

This model has been derived from the Bank of Korea Input-Output tables for 1970 so that its results should be consistent with other analyses based on these results. The model is somewhat smaller in size and consequently more manageable.

All of the significant linkages between the agricultural and nonagricultural sector have been maintained. Thus this model can be used to trace through the consequences of the agricultural-nonagricultural sector interactions for policy analysis.

The model is being used to evaluate the effects of an extrapolation of 1960-1970 demand trends to the year 1975 under several assumptions regarding import substitution, but that is the subject of another paper.

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APPENDIX

Notations Used in KASS Input Output Analysis

The outputs of each of the industries are the elements of a vector which we call X . The total amount of inputs per unit of output are entries in a square matrix denoted as A , whose typical element, a_{ij} , is the amount of the i th product required as an input to produce the j th output. The A matrix is assumed to be structured so as to include both the domestically produced inputs and the imported inputs.

The imported inputs per unit of output form a similarly dimensioned square matrix denoted as AM . The 1970 rate of total imported input use will be represented as AMT and the 1970 rates of noncompetitive import use will be called AMN . The total rate of intermediate import usage are assumed to form a convex linear combination of the 1970 rates of total imported input use and the 1970 rate of non competitive imported input use: $A_m = c AMT + (1 - c) AMN$. In this formulation c is the proportion that the prevailing use of competitive imports is of the 1970 levels, and can be conceived of as a policy parameter.

The total final demands for the outputs of each industry is a matrix, B , whose columns represent the amount each output required to satisfy that particular final demand. The amount of final demands satisfied by imports is a similarly dimensioned

matrix which will be called BM. The total amount of final demands satisfied by imports in 1970, and the amount satisfied by noncompetitive imports in 1970 are denoted by the matrices BMT and BMN. The imports for final demand are assumed to form the same linear combination of BMT and BMN as the intermediate imports form of AMT and AMN: $BM = c BMT + (1 - c) BMN$.

The disposition of total inputs and outputs for the domestic economy is represented by the equation which states that production plus imports to be used in production (intermediate imports) plus imports for final demand must equal the sum of total final demand plus the intermediate demands on the outputs for use as inputs in other production activities:

$$X + AM X + BM = B + A X.$$

Thus the domestic production necessary to satisfy the final demands is given by $X = (I - A + AM)^{-1} (B - BM)$.

For the world as a whole the equilibrium equation states that total production is equal to the sum of the intermediate demands plus final demands: $X = A X + B$. Thus the output of the world economy necessary to satisfy domestic demands is $X = (I - A)^{-1} B$.

The value added per unit of output forms a matrix denoted by AV. The value added per unit of final demand is $AV (I - A + AM)^{-1}$. The total gross value added for the economy is $AV(I - A + AM)^{-1} (B - BM)$. This differs from gross domestic product by the amount of customs duties, and GDP differs from gross national product by net factor income from the rest of the world.