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Chapter Author: Erik Thorbecke, Alfred J. Field

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Relationships Between Agriculture, Nonagriculture, and Foreign Trade in the Development of Argentina and Peru

ERIK THORBECKE

IOWA STATE UNIVERSITY

AND

ALFRED J. FIELD

UNIVERSITY OF NORTH CAROLINA

THE PRESENT STUDY is an attempt to analyze the economic development of Argentina and Peru in terms of vital relationships within the principal productive sectors and between these sectors and foreign trade.

Section 1 is devoted to the formulation of the analytical framework used in the study. The main elements of the framework are: (a) a sectoral breakdown in terms of agriculture, industry and the service complex, (b) a specification of the major relationships between sectors (e.g., technological, income and price relationships), and (c) the formulation

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of a policy framework within which the national performance can be evaluated.

Section 2 applies the above analytical framework as the basis for a review of the experience of Argentina from the beginning of this century to the present. Three phases are distinguished in this review.

Section 3 presents a simple multisectoral model that incorporates a number of the elements of Section 1. The structure of the model and the causal relationships between the relevant variables is discussed before applying the model statistically to the case of Argentina. The model illustrates quantitatively some of the assertions made in the previous part particularly the key role of agriculture as a determinant of Argentina's growth and stagnation.

Finally, Section 4 analyzes the performance of the Peruvian economy during the post-World War II period. Again the function of the agricultural sector is emphasized, but within a very different context than that of Argentina. A comparison of the two countries provides interesting insights into (a) the relationship between agriculture and foreign trade when the balance of payments is and is not a binding constraint, and (b) the contrast between the contribution to developmental objectives of an entirely commercialized agricultural sector (Argentina) and a dual agricultural structure (Peru).

1

The Framework of Analysis

The literature of theoretical economic development has been built largely upon a two-sector model analyzing the relationships between agriculture and nonagriculture and/or between a backward (traditional) sector and an advanced (modern) sector. In a few instances this framework was extended to three sectors by adding foreign trade. Valuable insights into the physiology of the development process were derived from these models and fruitful hypotheses formulated. Yet very few attempts have been made at testing these models empirically.

The present study is a modest attempt at specifying and examining within a quantitative and policy framework the relationships within and between the agricultural, nonagricultural, and foreign trade sectors. Argentina and Peru offer interesting contrasts that will be brought out explicitly by empirical studies.

Sectoral Breakdown

Four sectors are distinguished in the present framework: agriculture, industry, the service complex,[1] and foreign trade.

It is clear that, from the supply side, the first three sectors above undergo, throughout the process of development, certain important changes affecting the sectors' relative importance and interdependence. Note that foreign trade is viewed as a subset of agriculture and industry, not of services. The agricultural and industrial sectors produce either for the domestic or for the foreign market, but the service section is assumed to produce exclusively for home consumption. This assumption would not be valid for every developing country. In some, the service sector can be a major export contributor (e.g., because of tourist receipts), but in neither Argentina nor Peru is it more than a marginal contributor to exports.

From the consumption side, changes also take place. Here again imports can be considered as a subset of the other sectors through their allocation to the sectors of destination (use). Agriculture, industry, and services, then, can be thought of as producing and consuming spheres of home and foreign goods and services.

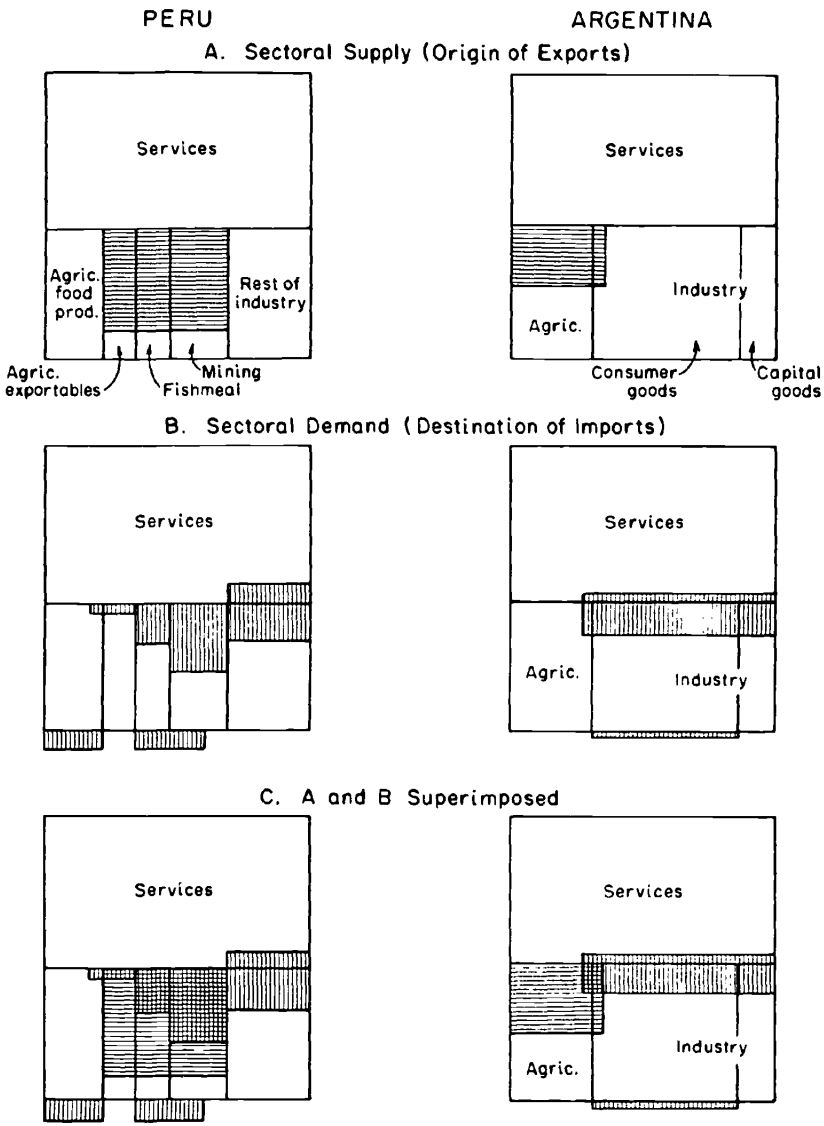
Figure 1 shows the interrelationship between sectors: A from the supply side; B from the demand side; and C from the supply and demand sides by superimposing A and B. The boxes are drawn approximately according to scale. The industrial complex is broken down into production of consumer and capital goods in the case of Argentina and into fishing, mining, and the rest of industry, respectively, for Peru. The shaded area represents the portion of total sectoral output presently exported or imported. The upper pair A reflects the current sectoral value added. The middle pair B reveals the sectoral destination of imports. It should be noted that final-demand imports (e.g., consumption goods and food) are additional to, not overlapping with, value added. The bottom pair C gives a good picture of the sectoral pattern of foreign trade.

In the case of Argentina, it can readily be seen that the great bulk of exports (about 90 per cent by value in the early 1960's) originates in agriculture. Raw materials and fuel, constituting about 60 per cent of import value, are used mainly for consumption and capital goods production. Only a relatively small proportion of imports is directed to the

[1] This complex of activities which includes, among others, construction and government is to be referred to as "services" in the subsequent discussion.

Figure 1

Sectoral Origin and Destination of Value Added: Exports and Imports



Note: Based on data in Tables 2, 3, 8–10

agricultural sector. The share of capital goods in total imports amounts to about one-third.

In C it can be seen that agriculture provides practically all of Argentina's exports while receiving only a fraction of the nation's imports. The major beneficiaries of imports appear to be the service sector and the industrial consumer goods subsector, as opposed to the capital goods subsector.

The agricultural sector of Peru in contrast with that of Argentina is highly dualistic. As a whole, Argentina's agriculture had, for all practical purposes, reached the commercialization stage by the early 1900's. Peru on the other hand, while it contains a commercialized and highly efficient agricultural subsector on the coast (producing mainly the traditional crops, cotton and sugar) also has a food-producing subsector in both the coast and in the backward (subsistence) region. A meaningful analysis of Peru, therefore, requires a division of agriculture into these subsectors. Currently, about one-fourth of exports originates in agriculture (see Figure 1). The remainder consists of fishmeal, 28 per cent of total exports [2] and of mining products 45 per cent. The relative importance of exports to value added is high and provides, as will be seen, the major stimulus to growth. Imports consist of capital goods, 42 per cent of total; food, 18 per cent; consumption goods excluding food, 16 per cent; and raw materials and fuel, 23 per cent. A considerable share of imports is used by the industrial sectors particularly by the export-producing activities of which mining and fishmeal are the principal. In addition, as illustrated in B of Figure 1, Peru is not self-sufficient in food. Imports of capital goods and inputs (raw material) into agriculture are fairly limited, constituting only 4 per cent of imports.

The Peruvian box in C captures well the sectoral trade structure. One characteristic is a relatively large degree of overlap between the sectoral origin and destination of foreign trade for the fishmeal and mining subsector. A part of this overlap can be explained by the limited linkages between these export activities and the domestic economy. Both the fishing and mining industries tend to spend a large share of export earnings to import capital goods and raw materials required for the production of exports. Agriculture, on the other hand, receives only a very small share of imported inputs and capital goods.

Argentina and Peru present a significant contrast in their sectoral trade structures. In Argentina the balance of payments gap has clearly been the binding constraint on economic development since the early

[2] The percentages refer to 1965. See Tables 7 and 8.

1930's. It can be argued convincingly that the development of Argentina would have been (and in fact may still be) best served by a heavier allocation of imports to agriculture and to exportable consumer goods. Such an allocation would have increased the supply of exportables thereby improving the capacity to import scarce capital goods. The type of import substitution that Argentina followed appears, furthermore, to have impeded the growth of the capital goods subsector by favoring the production of consumer goods. It will be seen later that Argentina's attempt at insulating her economy from that of the world in the early 1930's led to a neglect of agriculture, the country's almost unique source of foreign exchange. At the same time, the import substitution policies strangled the supply of capital goods further by favoring consumer goods. The result was the short-circuiting or interruption of economic growth in an already semiindustrialized country.

Peru offers a very different situation. It is a classic example of a dual economy, with the export sector providing the stimulus to growth. This sector, which is very large (more than one-fifth of the GNP) and highly diversified, is essentially divorced from the domestic economy to which, in fact, it tends to be a kind of appendage. Imports flow into both export activities (with the exception of agriculture) and final demand and yet contribute to a high rate of growth of aggregate income. The economy is truly export led.

Thus, the contrast is between, (a) a semideveloped country that attempted to insulate itself from the world economy and embarked on policies that led to the stagnation of the previously dynamic sector (agriculture) and to curtailed over-all growth, and (b) a less-developed, dual economy whose income (but not development) performance was superior because of a dynamic and diversified export sector assisted by liberal trade policies.

If Argentina might have benefitted from policies favoring agricultural development and the production of exportables—given that the balance of payments was the main constraint to growth—Peru, on the other hand, has been blessed throughout most of the post-World War II period with a strong balance of payments situation that permitted the maintenance of a large capacity to import. The need for import substitution was not felt, and the refusal to resort to this policy had numerous effects, among them, a rise in food imports from $39 million in 1950 to $134 million in 1965. The limited contribution of exports to some of the developmental objectives, such as employment creation and a more equal income distribution, together with the bleak export prospects may necessitate substantial changes in the production

and import structure. For example, greater agricultural food output may be required to replace food imports. Graphically, this means that in the Peruvian boxes in B and C of Figure 1 the shaded rectangle representing food imports would have to be replaced by equivalent domestic food production.

Relationships Between Sectors

There are at least three major ways in which sectors are related: (a) technically or technologically, (b) by income, and (c) by price.

A. TECHNICAL RELATIONS

The technical relations determine the sectoral production functions through the input-output framework. Given a certain level of technology, the production functions can be assumed constant. A prerequisite as well as a consequence of economic development is a change in the technical (input-output) coefficients. The process of economic development entails the transformation of an essentially agrarian economy in which labor is abundant, technology traditional, and capital scarce, to a modern technological economy with a high ratio of capital to labor. In the process, labor and capital are transferred from agriculture to industry, and agriculture itself is modernized through increased use of capital. A comparison between the input-output structure of agriculture, industry and services in a developing and a developed country is very instructive.[3] It reveals that in both types of countries agriculture has a high internal requirement and a high requirement for services. There is, however, a significant difference in manufacturing deliveries to agriculture. The per-unit direct and indirect industrial inputs to agriculture are very substantially higher in a developed than in a developing country.[4] As Falcon points out, "This is simply another measure of the long recognized fact that purchased industrial inputs into agriculture are the *sine qua non* of agricultural development." [5] On the other hand, the contribution of agriculture to industry appears to differ less than the converse coefficient.

[3] See Walter Falcon, "Agricultural and Industrial Interrelationships in West Pakistan," Development Advisory Service, Harvard University Report No. 70, 1967; Karl A. Fox, "The Food and Agricultural Sectors in Advanced Economics," in Tibor Barna (ed.), *Structural Interdependence and Economic Development*, New York, 1963; and Erik Thorbecke, "The Role and Function of Agricultural Development in National Economic Growth," in *Economic Development of Agriculture*, Ames, Iowa, 1965.

[4] This ratio equals 2.5 comparing the U.S. and West Pakistan, see Falcon, "Agricultural and Industrial Interrelationships. . . ."

[5] *Ibid.*, p. 4.

Often the growth of the manufacturing sector is stimulated by a desire for import substitution in the form of a higher degree of processing for agricultural raw materials, such as textiles and non-durable consumer goods, and an increased domestic production of foodstuffs and of capital inputs for agriculture such as fertilizer.

B. INCOME RELATIONS

A second major way in which these sectors are interrelated is through income. For example, it is clear that the demand for agricultural goods, *ceteris paribus* [6] depends on the rate of growth of GNP and the income elasticity of demand for agricultural goods for the domestic component, as well as on income in the rest of the world for the export component. Thus, the rate of growth of domestic food demand (f) is entirely determined by the rate of growth of population (p) plus the rate of growth of per capita income (y) multiplied by the income elasticity of demand for food (ϵ_y). In symbols:

$$f = p + \epsilon_y y$$

A low rate of income growth means a limited effective domestic demand for food. Likewise, a slow growth of output in the agricultural sector of a developing country translates itself, given the relative importance of agricultural output in total output and income, into a low effective demand for industrial goods and services.

C. PRICE RELATIONS

The third way in which sectors are connected is through prices. At one extreme the price system may be entirely free to operate as an "equilibrating" mechanism for *ex ante* discrepancies between planned supply and planned demand. At the other, the price system can be used as a controlling or planning device to influence sectoral output and demand for home and foreign goods through changes in the internal and external terms of trade. Prices and exchange rates can be controlled, for example, to encourage agricultural production during the stage of "traditional agriculture." By moving the terms of trade in favor of agriculture the adoption of new inputs, such as fertilizer and, to some extent, of more modern methods of production, can be encouraged. On the other hand, after agricultural output and productivity has risen, the terms of trade can be used *against* that sector to help siphon off capital and labor resources and channel them into industry and the service sector.

There exists a very real risk that the terms of trade will be moved

[6] Assuming, among other factors, constant relative internal and external price relationships. The price relationships between sectors are discussed subsequently.

against agriculture (a) too early in the development process, as has happened in a number of presently dualistic economies, or (b) too strongly or for too long a period after the stage of commercialized agriculture has been reached, a situation which, as will be seen, was characteristic of Argentina from about 1930 to 1955.

The relationships in the three basic areas described above are used in a more or less quantitative way (depending on data availability) to examine and describe the intra- and intersectoral performance and links in Argentina and Peru.

Policy Framework and Developmental Objectives

To relate sectoral performance and intersectoral relations (both quantitatively evaluated) to major developmental objectives requires a policy framework. The objectives must be specified to establish a multidimensional norm against which the development performance can be judged and the conflict between objectives better understood.

Economic development is a function of a number of target variables. The most important of these are (a) the level, or rate of growth, of GNP; (b) the distribution of income on a personal, functional, and regional basis (here the criterion may be a minimum nutritional standard or a certain share of wages to national income); (c) internal equilibrium, in terms of maintaining a certain degree of price stability; (d) external equilibrium, in terms of maintaining balance of payments stability; and (e) employment in terms of percentage reduction of the unemployed labor force.

In the Tinbergen tradition, one can assume that the policymaker (the government) is trying to maximize, either implicitly or explicitly, some welfare or preference function that contains the above variables as elements. The policymaker's task is to formulate policies that will maximize this welfare function subject to the constraints imposed by the structural relations described in sections A and B above. It is obvious, however, that conflicting rather than complementary relationships may prevail between the objectives, in the sense that policies designed to achieve a higher level of attainment of some goals, such as high rate of growth of GNP or employment, may worsen the attainment level of others, such as inflation or balance of payments disequilibrium. One good illustration of the problem is the conflict between stabilization and economic growth.[7] Policies designed to achieve economic stabilization *à tout prix* may be so "successful" that they may preclude growth and

[7] On this point, see Hollis B. Chenery, *Toward a More Effective Alliance for Progress*, A.I.D. Discussion Paper No. 13, 1967.

result in stagnation. Alternatively, policies assigning an unduly high weight to long-term growth may result in balance of payments crises and run-away inflations. The existence of conflicts among targets makes the question of the priority among variables a crucial one. It is fair to say that there is a tendency on the part of policymakers, in both the developed and underdeveloped world, to underestimate the negative side effects of policies directed to the achievement of specific objectives.

The above-described framework will be applied in a general way to Argentina and Peru. In the case of Argentina it was possible to formulate a quantitative model to follow through the sectoral and policy interactions for at least one of the phases of that country's economic development. A similar model could not be constructed for Peru because of the limited sectoral information. Nevertheless, the availability of a previously built aggregate model of the Peruvian economy [8] and of a detailed agricultural sectoral study [9] made it possible to undertake the present analysis.

For both countries an attempt is made: (a) to examine sectoral performance with emphasis on the performance of agriculture compared to the industry and foreign trade sectors; and (b) to evaluate the extent to which price, income, and trade policies, as well as the sectoral allocation of investment, affected sectoral and over-all economic development as defined in terms of the above mentioned objectives.

It is felt that some insight into the role of agriculture at different developmental stages and the importance of the proper policy mix can be obtained from the analysis of these two countries within the above-described framework.

2

Argentina

General Observations

Because of the crucial role that the foreign sector has played throughout the history of Argentina, that country provides an excellent case study in the interrelationship between the foreign sector and domestic development. Argentina, after reaching a relatively high level of de-

[8] Erik Thorbecke and Apostolos Condos, "Macroeconomic Growth and Development Models of the Peruvian Economy," in Irma Adelman and Erik Thorbecke (ed.), *The Theory and Design of Economic Development,* Baltimore, 1966.

[9] Iowa Universities Mission to Peru, *Peruvian Macro-Economic and Agricultural Prospects and Strategy, 1967–1972,* Lima, 1967.

velopment by 1930, has since experienced considerable difficulty in maintaining sustained growth. The connection between economic growth, export promotion, and import substitution is fundamental to any developing country. It is believed that the Argentine experience holds lessons of value to other developing countries facing similar structural problems.

Argentina provides a good illustration of industrialization promoted without a complete understanding of the complex interdependence between the foreign sector and the other principal sectors on both the import and the export sides. The need to induce economic changes in the major sectors in an internally consistent manner was not fully appreciated until it was too late and severe structural bottlenecks had developed. It is ironical that the government policies aimed at reducing external influences resulted, if anything, in increasing the dependence on the external factors. The Argentine experience in recent years demonstrates vividly the problems that arise as a country pursues conflicting short-run targets.[10]

The development of Argentina has evolved through three very general stages.[11] The first stage, ending around 1930, can best be described as a period of export-led economic growth, with the foreign trade sector acting as the proverbial "engine of growth." The second stage, beginning with the Great Depression and ending during the late 1940's is characterized by intensive import substitution, industrialization, and an expansion of the government-service sector. Greater government intervention occurred in all phases of economic activity. The third stage, spanning the period from the late 1940's to the present, exhibits the predominance of sectoral imbalances accompanied by severe inflation and political-economic instability. (Argentina is currently engaged in attempting to reduce the dependence on imports of intermediate goods while altering the sectoral priorities towards agriculture.[12] This policy could lead to a

[10] A good example is the conflict between growth and price stability which has been evident in Argentina in recent years.

[11] The authors relied heavily in their review of the economic history of Argentina on the excellent studies by (1) Carlos F. Diaz-Alejandro, "An Interpretation of Argentine Economic Growth since 1930," *Journal of Development Studies*, Part I, October 1966, Part II, January 1967; (2) Eprime Eshag and Rosemary Thorp, "Economic and Social Consequences of Orthodox Economic Policies in Argentina in the Post-War Years," *Bulletin of the Oxford University Institute of Economics and Statistics*, February 1965; and (3) Javier Villanueva, *The Inflationary Process in Argentina, 1943–60*, Institute Torcuato Di Tella, 1966. The three-stage historical breakdown followed here corresponds closely to the treatment in the second source above.

[12] This is reflected in the National Development Plan. For an analysis of the projections contained in this development plan see the study by Larry A. Sjaastad, "Argentina and the Five Year Plan," multilith paper prepared for Latin American Conference, Cornell University, April, 1966.

new phase.) The growth rates of selected variables for these respective time periods are presented in Table 1. Tables 2 and 3 show the distribution of GDP by sectors and the composition of Argentine exports and imports.

The Pre-1930 Period

During the latter part of the nineteenth and the first part of the twentieth century Argentina experienced a rate of growth in its domestic product that has few parallels for rapidity in economic history.[13] Throughout this period the "engine of growth" was agricultural exports, which provided the means for importing the required capital goods.[14] The success of the rural sector in maintaining its competitiveness in world markets was a direct result of its ability to adapt to changing technology and world demand.

The capital stock of Argentina during this period was employed, for the most part, in economic activity connected directly or indirectly with the foreign sector. Argentine industry was principally concerned with transforming rural inputs into products that would be competitive in world markets. The railroads, built primarily to expedite the transportation of agricultural products to processing plants or exporting centers, together with the capital directly employed in agriculture, accounted for nearly one-half of the total capital stock. It is extremely significant that agriculture became "commercialized" during this period, contributing thereby to the development and industrial transformation of the country.[15]

Argentina experienced throughout the period 1900–29 a high rate of growth of GNP (4.6 per cent per annum) made possible by: (a) expanding exports (which grew at 4.1 per cent in volume terms); (b) a large inflow of foreign capital; and (c) a large rise in the size of the labor force through immigration. The structure of production was oriented towards exportable agricultural commodities.

The Period from 1930 to the Late 1940's

The major goal of the Argentine government during the second major phase was to transform the externally oriented economy, via import sub-

[13] It has been estimated that the pattern and rate of growth before 1900 was not very different to that of the early years of the twentieth century; from 1900 to 1914 GDP grew at a rate of 6.3 per cent. See Diaz-Alejandro, *op. cit.*

[14] A heavy immigration of labor was also an important factor contributing to the economic growth during this time. From 1895 to 1929 the Argentine population grew at a rate of over 3 per cent per year.

[15] The degree to which agriculture had become commercialized is reflected in the lively market for rural machinery rentals which existed in the 1920's.

TABLE 1

Argentina: Growth Rates of Selected Economic Variables, 1900–69

Variable	1900–04 to 1925–29	1925–29 to 1945–49	1945–49 to 1960–64	1960–69[a]
Gross domestic product	4.6	2.8	1.8	3.6
Agricultural output	3.5	1.2	1.2	3.7
Agricultural exportables	–	0.3	0.2	–
Agricultural nonexportables	–	3.5	3.4	–
Industrial manufacturing	3.6	4.2	3.6	–
Personal consumption	4.3	3.1	1.9	4.4
Gross investment	5.8	1.1	1.7	3.0
Exports (volume)	4.1	-1.2	1.3	4.1–6.2
Imports (volume)	4.4	-1.4	0.7	0.2
Retail price level	n.a.	4.7[b]	25.5[c]	–
Terms of trade				
Internal[d]	n.a.	-1.9[e]	1.0[f]	–
External[g]	0.5	-0.2	-2.2[f]	–
Wages share of national income	n.a.	1.1	-0.3[f]	–
Total capital stock	4.8	1.4	2.4[h]	–
Capital stock in agriculture	3.3	0.4	1.2[i]	–
Labor force in agriculture	2.5	0.5	-1.8	–
Land area in agriculture	4.4	0.4	0.5	–
Domestic consumption of agricultural commodities	3.8	3.0	n.a.	–
Population	3.4	2.0	1.8	1.7

Note: These figures must be looked upon as tenuous because of the questionable quality of the underlying data.

Source: C. F. Diaz-Alejandro, "An Interpretation of Argentine Economic Growth Since 1930," *Journal of Development Studies, October 1966, January 1967;* United Nations, ECLA, *Analisis y Proyecciones del Desarrollo Economico de la Argentina,* Consejo Nacional de Desarrollo, Plan Nacional de Desarrollo, 1965–69, Buenos Aires, 1965; Republica Argentina, Secretaria de Asuntos Economicos, *Producto y Ingresso de la Republica Argentina en el Periodo 1935–54,* Buenos Aires, 1955; L. Sjaastad, "Argentina and the Five-Year Plan," Paper prepared for Latin American Conference, Cornell University,

[a]Target rates included in the National Plan.

[b]1936–45.

[c]1945–66.

[d]The ratio of wholesale prices of all rural to nonrural products.

[e]1926–29 to 1945–49.

[f]1947–49 to 1962–64.

[g]The ratio of export unit values to import unit values.

[h]1945–49 to 1962.

[i]1945–49 to 1955–59.

TABLE 2

Argentina: Distribution of Gross Domestic Product by Sectors, Selected Years
(value in billions of 1960 pesos; percentage distribution in parentheses)

	1950	1959	1963
Value added in:			
Agriculture	125.3 (17)	150.7 (16.2)	145.5 (15)
Industry	201.1 (27.2)	274.3 (29.4)	280.9 (28.7)
"Service complex"	412.7 (55.7)	505.2 (54.3)	544.5 (56.2)
GDP	739.1 (100)	930.2 (100)	970.9 (100)
Industrial production			
Investment goods	20.5 (3.9)	52.1 (7.3)	66.8 (9.3)
Consumption goods	293.4 (55.5)	372.3 (52)	349.2 (48.5)
Exports	48.6 (9.2)	50.4 (7)	65.2 (9.1)
Intermediate goods	165.7 (31.4)	241.0 (33.7)	237.7 (33.1)
Total	528.3 (100)	715.7 (100)	718.8 (100)

Source: Presidencia de la Nacion Argentina; Consejo Nacional de Desarrollo, *Plan Nacional de Desarrollo, 1965–1969*, Buenos Aires, 1965.

stitution, to a more balanced economy less dependent upon the foreign sector for both consumption and capital goods. As world trade (and foreign investment in Argentina) dropped off sharply during and after the great depression, the value of Argentine exports suffered a considerable decline and so consequently did the country's ability to import needed capital and raw materials.[16] It is interesting to note, however, that Argentina maintained its competitiveness in world markets throughout the period.[17]

[16] Argentine exports declined 35 per cent in volume over the period 1925–29 to 1935–39 while its volume of imports declined 24 per cent over the same period. See U.N. Economic Commission for Latin America [ECLA], *Analisis y Proyecciones del Desarrollo Economico de la Argentina*, Mexico D.F., 1959.

[17] Ruth Kelly points this out in noting that Argentina's ". . . export performance in the thirties, compared with the rest of the world, may be considered satisfactory. Indeed . . . it gave rise to expressions of optimism concerning the country's future prospects as one of the world's major exporters of agricultural products" (Ruth Kelly, "Foreign Trade of Argentina and Australia, 1930 to

TABLE 3

Argentina: Composition of Exports and Imports, Selected Years
(value in millions of dollars; percentage distribution in parentheses)

	1951	1955	1959	1963
Exports				
Agricultural goods	1100 (94.1)		965 (95.5)	1192 (87.3)
Forest products and minerals	46 (3.9)		22 (2.2)	36 (2.6)
Others	24 (2)		22 (2.2)	138 (10)
Total	1169 (100)		1009 (100)	1365 (100)
Imports				
Consumption goods		85 (7.2)	33 (3.3)	46 (4.7)
Raw materials and intermediate goods		847 (72.3)	733 (73.8)	558 (56.8)
Capital goods		241 (20.5)	228 (22.9)	377 (38.5)
Total		1173 (100)	993 (100)	981 (100)

The short-run success of the programs during this period is evident when it is realized that real consumption rose at a rate of 2.7 per cent annually from 1925–29 to 1940–44 and that real GDP grew at a rate of 2.2 per cent over the same period in spite of world conditions that caused export volume to decrease.

The manufacturing and service sectors contributed to this income growth, in contrast to agriculture which lagged behind the over-all growth of the economy.[18] In spite of these internal adjustments, Argentina still remained highly dependent upon exports for the financing of needed raw materials and capital goods. This capacity to import was increased during the late 1930's and early 1940's as the terms of trade of, and world demand for, agricultural exports improved.[19] However, the desired capital imports were difficult, in fact often impossible, to obtain as the major industrial suppliers transformed their industry into war production. As a result, Argentine industry could neither expand

1960," *Economic Bulletin for Latin America,* ECLA, Vol. X, No. 1, March 1965).

[18] The use of multiple exchange rates during the 1930's, whereby exchange rates for imports were higher than those for exports, appears to have had a powerful stimulus to industrialization in this period.

[19] The destruction of European agriculture permitted Argentina to negotiate huge intergovernmental contracts at almost exorbitant prices.

nor maintain the level of its capital stock via imports, and with exports at high levels, a buildup of foreign exchange reserves occurred. The capital stock in machinery and equipment fell by 30 per cent between 1938 and 1945.

The Great Depression of the 1930's and World War II did more, perhaps, toward initiating import substitution than any internal political change. However, the political atmosphere in Argentina contributed much to the *degree* to which import substitution was carried out and the extent to which the structural imbalance and economic bottlenecks were allowed to develop. This was particularly true of the early years of the Peron era during which the production of the service complex (e.g., government services, and construction) was stimulated in order to maintain high levels of urban employment and domestic demand. Because the external terms of trade were improving and the foreign exchange reserves were ample, little attention was paid to the possible development of constraints that could impair the growth of the economy in the event of a chronic import surplus resulting from the squeeze on exportables. The first six years of the Peron Administration (1943–49) were characterized by a general economic expansion in which real per capita income increased at a rate of 6.9 per cent per annum.[20] The high rate of growth of the service sector resulted, of course, in an increase in the proportion of national income accounted for by wages. The decline in agriculture's share of GNP, which accompanied this transformation, was looked upon as a necessary evil, inasmuch as a high rate of industrialization required a transfer of labor from the agricultural sector to the industrial-service sectors.[21] Argentine agriculture was already in the commercial stage, however, and the transfer of labor out of agriculture to the other sectors in the economy contributed to a reduction in output, because the labor transfer was not compensated by increased investment in capital goods for agriculture. Such investment might have been stimulated through the normal market processes had agricultural prices not been manipulated. However, the government moved the internal terms of trade against agriculture.[22] The artificial

[20] *Analisis y Proyecciones del Desarrollo Economico de la Argentina.*

[21] In those less developed countries characterized by surplus labor in the rural sector such a transfer out of agriculture would not have had the impact it did in Argentina. Argentine agriculture could not supply enough labor. however, and so the doors were opened to increased immigration. In 1947–51, a net immigration of 460,000 took place.

[22] The policies toward the rural sector were carried out in part to provide foodstuffs for urban workers even at the expense of foreign exchange earnings. In other words, the policy weight attached to a more equal income distribution in the short run compared to other policy objectives such as over-all income growth and external equilibrium was high.

price constraints may have prevented agricultural output from expanding, by removing the normal price incentive. At the same time, the increase in the industrial labor force and in per capita income resulted in a larger domestic demand for the relatively inexpensive foodstuffs. Increased domestic demand, coupled with stagnating agricultural output, reduced the agricultural surplus available for export.[23] The worsening of the external terms of trade after 1949 and the drawing down of foreign reserves altered the economic situation drastically. The structural imbalance imposed by the stagnating agricultural sector and consequent decline of Argentine exports began to impose a constraint on domestic consumption and expansion.[24] The great expansion of social services [25] and the increased industrialization in the area of consumer goods contributed to the development of a bottleneck in foreign exchange. Diaz has argued convincingly, that the problem was not simply one of too much industry and not enough agriculture, but rather, of two few exports relative to the domestic demand for imports.

In summary, this period was characterized by a major attempt at insulating the domestic economy from the world economy, a policy that was initially motivated by the fall in export demand during the Great Depression. Argentina embarked on import substitution policies, particularly with respect to consumption goods. The reduction in agricultural output caused by worsening internal terms of trade acted together with a rise in domestic demand to produce a squeeze on exports. The rate of growth of GDP (2.8 per cent per annum) was relatively high given the depression setting of the thirties. The major policy objectives appear to have been the achievement of income growth and an improved income distribution in favor of wage earners, entailing a structural shift away from agriculture.

The Period from the Late 1940's to the Present

The third major phase was highlighted by inflation and shortages of foreign exchange, symptoms of the structural imbalances existing in the economy. As W. Arthur Lewis [26] points out, "Growth without inflation

[23] The transfer of labor out of agriculture and the withdrawal of land from crop production created a domestic food shortage following the severe drought of 1949–50.

[24] Few efforts were made to expand the volume of exports, while at the same time the domestic capital goods industries were neglected. This eventually led to a severe shortage of new machines and equipment.

[25] Massive use was made of central bank credit to finance budget deficits throughout the boom of 1946–48. Substantial wage increases were decreed also in the Peron era.

[26] W. Arthur Lewis, *Development Planning,* New York, 1966.

requires either balanced development of industry and agriculture, or a breakthrough in export trade." Increased domestic production of consumer goods did result in savings of foreign exchange. However, these savings were not large enough to compensate for increased demands for raw materials and capital goods. By 1950 it was evident that little further income growth could be attained through additional investment in activities producing consumer goods and/or services, such as construction. What was required was either a more balanced growth of industry and agriculture, increased exports of manufactures, or some combination of both. Argentina at this point had reverted to the stage where its growth was dependent upon its exports. The link between a reduction in agricultural production and the capacity to import badly needed raw materials and capital goods became quite clear during the early 1950's. Consequently, authorities embarked upon a program of encouraging agricultural production via various price incentives. However, the uncertainty surrounding the stability of improved internal terms of trade and the response lag, partly attributable to the prevailing system of land tenure, led to little if any real growth in agricultural output.[27] Thus, instead of stimulating an increase in agricultural production, the primary effect of these government measures was to raise the retail price of food, thereby initiating a wage-price spiral inflation.

To counteract inflation, generally restrictive fiscal and credit policy measures were introduced. The resulting stagnation was made more severe by the fact that the steep fall in imports of raw materials and capital goods curtailed production in such industries as metallurgy, rubber, printing, and furnishings. A fall in aggregate demand followed, and soon other industries were forced to operate far below capacity. Consumer goods industries were particularly affected and some were reported operating at only 50 pèr cent of capacity.[28]

Following Peron's overthrow more orthodox policies were instituted in an attempt to slow down the rate of inflation.[29] The Peron regime had, however, left the country with a low capacity to transform. This unfortunate state of affairs was further aggravated by a price mechanism so controlled that it had become, as Diaz pointed out, more a method of income distribution than of resource allocation.

Numerous problems arose as Argentina attempted to remove the

[27] The seriousness of the situation is evidenced by the fact that the value of exports in terms of constant prices declined by nearly 50 per cent from 1947–48 to 1951–52.

[28] Diaz-Alejandro, *op. cit.*

[29] There were large devaluations in 1959 and 1962.

economic bottlenecks that were inhibiting its growth and development. The urban unemployment rate began to rise as the economy tried to shift its production away from domestically consumed goods and services towards exportables and domestically produced capital and intermediate goods.[30] The share of wages and salaries in national income fell.

Excessive price fluctuations were also a problem during this third stage following discrete adjustments of the exchange rate and sporadic changes of government-controlled prices.[31]

This third phase can be said to be characterized by an attempt to redress the discrimination against the agricultural sector by moving the internal terms of trade in its favor. Because wages were typically tied to food prices,[32] the relative increase in the latter contributed to a severe inflation of about 26 per cent per annum between the late 1940's and the early 1960's. Agricultural output failed to respond adequately to higher prices partially because of the uncertainty regarding the stability of these prices. Exports grew only marginally and the capacity to import continued to be a limiting factor to growth.

The National Plan

Before leaving the historical analysis, a word must be said about the national development plan for Argentina. The plan provides perhaps the best indication of current attitudes towards economic objectives and the means to be employed to attain them. (The growth rates of selected target variables are presented in Table 1.) The fulfillment of goals under the plan will depend to a great extent upon the capacity of the foreign sector to provide the required raw materials and capital goods. As Sjaastad[33] indicates, the realization of the objectives and projections of the plan depend implicitly upon significant upward shifts in the supply functions of agricultural commodities. Exports will have to show an increase of 18 per cent over the period 1963–69 for the low projection to be met, while the achievement of the high projection calls for a 35 per cent increase in exports. Sjaastad estimates that such an

[30] Starting around 1953–54 attempts were made to stimulate production of machinery and equipment and the intermediate goods required in their production. The *ad hoc* establishment of automobile and tractor industries stimulated increased investment in metal working such that by 1961 significant amounts of steel began to be produced domestically.

[31] The economic instability was intensified by the fact that policymakers chose a few prices to manipulate while leaving others to fluctuate freely.

[32] Villanueva, *op. cit.*

[33] Sjaastad, *op. cit.*

increase in exports combined with an anticipated 17 per cent increase in domestic demand would necessitate an upward shift in the agricultural supply functions of some 20 per cent.

It would appear that these targets are beyond the reach of the economy. The main consideration is that whatever is achieved will depend on the technical progress in agriculture, or will require some sort of breakthrough in the exports of nontraditional industrial products. Sjaastad's conclusion that the realization of the targets in the plan will require some devaluation appears to be realistic. The degree of the devaluation required will depend of course on the elasticity of supply of exportable goods and the timing of the response.

3

A Simple Multisectoral Foreign Trade Model Applied to Argentina

General Observations

It was felt that a more formal presentation of some of the relationships discussed in the conceptual framework presented in Section 1 would prove of value for Argentina. Therefore, an econometric model was prepared to provide a clearer quantitative understanding of the structure and "modus operandi" of the Argentine economy and, hopefully, of changes that would promote its growth and development. The model is designed to describe the interrelationships of the foreign trade and the productive sectors of the economy, investigating sector by sector the effect of policy actions on the structure and levels of current exportables and on the composition and destinations of current imports. The importance of this sectoral follow-through is borne out by the experience of Argentina, where the failure of policymakers to promote exports and (in any meaningful sense) to promote import-competing industries contributed heavily to disequilibrium between the foreign sector, other sectors, and certain targets of growth and development. The Argentine experience demonstrates how, at a given point in time, supply conditions in both the import-competing sectors and the export sector can influence the growth and development of the economy. Short-run policy measures that treat only the symptoms of such a structural imbalance and do not cope with the more basic structural causes may provide temporary relief at the expense of other targets.

This model was built to reflect the Argentine conditions; it appears that the general construct might be applicable, with proper modifications, to other countries as well.

The Model

Numerous theories have been evolved to describe the interrelationships of the foreign trade sector and the major productive sectors of the developing economy, but few empirical studies have been made of the relationship between the foreign trade sector and the productive sectors and/or the import substitution process. Although it is recognized that many of the relationships are typically nonlinear in nature, the model presented is a modest attempt to illustrate the above development process problem within the framework of a set of linear equations.

The general form of the model is given below followed by the list of variables appearing in the model.

$$(1) \quad Y_s = V_a + V_b + V_o$$

$$(2a) \quad V_a = v_a(\overline{L}, \overline{N}_a, K_a, \overline{RF})$$

$$(2b) \quad V_a = v'_a(\overline{L}, \overline{N}_a, \overline{K}_{a_{-1}}, \overline{RF})$$

$$(3) \quad V_b = v_b(\overline{N}_b, K_b)$$

$$(4) \quad V_o = v_o(\overline{N}_o, K_o)$$

$$(5) \quad C_a = c_o + c_1 Y^d + c_2 \overline{tt}_i + c_3 \bar{y}$$

$$(6) \quad C_b = c_4 + c_5 Y^d + c_6 \overline{tt}_i + c_7 \bar{y}$$

$$(7) \quad C_o = c_8 + c_9 Y^d + c_{10} \overline{tt}_i + c_{11} \bar{y}$$

$$(8) \quad X_o = \frac{d_o}{b_o} V_o - C_o - I_o + \frac{1}{b_o}(\overline{M}_o + \overline{Ti}_o)$$

$$(9) \quad X_a = \frac{d_a}{b_a} V_a - C_a - I_a + \frac{1}{b_a} M_a + \frac{1}{b_a}(\Delta\overline{St}_a + \overline{Ti}_a)$$

$$(10) \quad X_b = \frac{d_b}{b_b} V_b - C_b - I_b + \frac{1}{b_b} M_b + \frac{1}{b_b}(\Delta\overline{St}_b + \overline{Ti}_b)$$

$$(11) \quad M_b = M_k + \overline{M}_c + eM_{rm}$$

$$(12) \quad M_a = (1 - e) M_{rm}$$

$$(13) \quad M_{rm} = m_o + m_1 V_b + m_2 \overline{tt}_e$$

$$(14) \quad M_k = X_a + X_b + X_o + \overline{I}_f - M_{rm} - \overline{M}_c - \overline{M}_o$$

(15) $K_a = \overline{K}_{a_{-1}} + \alpha I_t - \overline{D}_a$

(16) $K_b = \overline{K}_{b_{-1}} + \beta I_t - \overline{D}_b$

(17) $K_o = \overline{K}_{o_{-1}} + jI_t - \overline{D}_o \qquad (\alpha + \beta + j = 1)$

(18) $I_t = I_a + I_b + I_o$

(19) $I_a = \Delta\overline{St}_{an}$

(20) $I_o = O$

(21) $I_b = I_d + M_k$

(22) $I_d = i_1 + i_2\overline{CAP}_{-1} + i_3(V_b - \overline{V}_{b_{-1}})$

(23) $Y^d = Y_s - \overline{T}_y$

It should be noted that through substitution the definition of GDP from the demand side can be obtained:

(24) $Y_d = Y_s = C_a + C_b + C_o + I_t + X_a + X_b + X_o - M_k - M_{rm} - \overline{M}_c - \overline{M}_o - \overline{T}i - \Delta\overline{St}$

LIST OF VARIABLES IN MODEL

(all national-income variables expressed at constant prices)

Endogenous Variables:

C_a = consumption of agricultural commodities

C_b = consumption of manufactured commodities

C_o = consumption of "services"

I_a = contribution of agriculture to gross capital formation

I_b = contribution of industry to gross capital formation

I_o = contribution of the service complex to gross capital formation

I_d = value of domestically produced gross investment

I_t = gross investment

K_a = capital stock in the agricultural sector

K_b = capital stock in the industrial manufacturing sector

K_o = capital stock in the service complex

M_a = agricultural imports

M_b = industrial imports

M_k = imports of capital goods

M_{rm} = imports of primary and intermediate goods used in the current production process (raw materials)

V_a = value added in the agricultural sector

V_b = value added in the industrial manufacturing sector

V_o = value added in the service complex (all remaining sectors)

X_a = agricultural exports

X_b = industrial exports

X_o = service exports

Y^d = disposable income

$Y_s = Y_d$ = gross domestic product

Exogenous Variables:

$\overline{CAP}_{-1}$ = capacity in machinery and equipment industry lagged one year

$\overline{D}_a$ = replacement investment (depreciation) in agriculture

$\overline{D}_b$ = replacement investment (depreciation) in industry

$\overline{I}_f$ = net foreign investment plus any changes in holdings of foreign currency

$\overline{K}_{a_{-1}}$ = capital stock in agriculture lagged one year

$\overline{K}_{b_{-1}}$ = capital stock in industry lagged one year

$\overline{K}_{o_{-1}}$ = capital stock in remaining sectors of the economy lagged ore year

$\overline{L}$ = number of hectares used in production in agricultural sector

$\overline{M}_c$ = imports of consumption goods

$\overline{M}_o$ = service imports

$\overline{N}_a$ = size of labor force in agriculture

$\overline{N}_b$ = size of labor force in industry

$\overline{N}_o$ = size of labor force in service complex

$\overline{RF}$ = index of yearly average rainfall

$\overline{St}$ = over-all change in stocks

$\Delta\overline{St}_a$ = change in stock in agriculture sector

$\Delta\overline{St}_b$ = change in stock in industrial sector

$\Delta\overline{St}_{an}$ = change in stock of livestock ($\Delta\overline{St}_{an} = \overline{St}_{an} - \overline{St}_{an_{-1}}$)

$\overline{T}_y$ = direct taxes

$\overline{tt}_e$ = external terms of trade (ratio of the price of imports to the price of exports)

$\overline{tt}_i$ = internal terms of trade (the ratio of agricultural to non-agricultural prices)

$\overline{V}_{b_{-1}}$ = value added in industry lagged one year

$\overline{y}$ = the share of wage income in total income

$\overline{T}_i$ = indirect taxes

The model consists of 23 equations in the 23 endogenous variables listed above. Eight of the equations (numbers 2, 3, 4, 5, 6, 7, 13, and 22) are behavioral, with the remaining 15 definitional or technical. A brief discussion of these equations follows.

The first is the income identity equation relating gross domestic product, Y_g, to the sum of its components. Equation 24 defining GDP from the demand side can be obtained through a substitution process involving equations 1, 8, 9, 10, 11, 12, and 18 and is therefore not an independent relation in the model.

Equations 2, 3, and 4 are the sectoral production functions for agriculture, industry, and services (V_o) respectively. For each sector the value added is posited a function of labor and capital, with the exception of agriculture where, in addition, the quantity of land and the amount of rainfall are assumed to influence the level of output. An alternative equation (2b) relates current agricultural output to the value of capital stock lagged one year rather than to the current level of capital stock. The nature of the agricultural production process is such that, in the aggregate, the net increase in capital stock may not affect output in the same period (e.g., output response to increases in the stock of livestock, the acquiring of new machines after the crop year has begun may not have an appreciable impact for one or more years). It is important to

note that agricultural production in contrast to the production process in other sectors, is essentially discontinuous. Such a response lag might well cause investment in the other sectors to appear more desirable from a policy standpoint, inasmuch as the *short-run* impact of investment in the nonagricultural sectors could lead to a higher income response than the same investment in the agricultural sector (assuming a shorter lag in output response to investment in the remaining sectors, a situation that, of course, would not hold true for social overhead capital and the mining sectors where the output lag can be very long).

Equations 5, 6, and 7 relate consumption of agricultural products, industrial manufactures, and services to changes in disposable income, the internal terms of trade, and a variable reflecting changes in income distribution, respectively.[34] The sign of the terms-of-trade variable is usually negative in the agricultural consumption function, reflecting the decline in consumption of agricultural products resulting from an increase in agricultural prices relative to nonagricultural prices, and vice-versa in the industrial consumption function. While the overall impact of improvements in the internal terms of trade upon agricultural production appears to have been slight, a relative increase in price of agricultural products leads to an increase in the potential supply of agricultural exportables by reducing the domestic demand for agricultural products. The impact of an increase in the wage share of income on agricultural consumption (C_a) would normally be positive, assuming that the propensity to consume of wage earners is typically higher than that of nonwage earners.

Exports (X_a, X_b, and X_o) are specified (equations 8, 9, and 10) essentially as the surplus available for export after consumption and investment requirements have been deducted from available supply.[35] This assumes that the foreign demand for Argentine exports is infinitely elastic, an assumption that appears reasonable, at least for the country's major export products. The exports equations are derived directly from input-output relationships. Indeed, we know that gross sector output (D_i, were sector $i = a, b, o$) is equal to the final demands components (C_i, I_i, X_i, ΔSt_i) and the sum of intermediate demands (Id_i)

$$(1a) \qquad D_i = C_i + I_i + X_i - \Delta\overline{St}_i + Id_i \qquad (i = a, b, o)$$

[34] Changes in the income distribution will be assumed to be reflected by the ratio of wage income to total income.

[35] For an application of the exportable surplus concept to Brazil, see Nathaniel H. Leff, "Export Stagnation and Autarkic Development in Brazil, 1947–1962," paper prepared for A.I.D.'s Summer Research Program 1966.

where:

D_i = gross sectoral output of sector i ($= a, b, o$)

C_i = consumption demand for goods of sector i

I_i = investment demand for goods of sector i

X_i = export demand for goods of sector i

$\Delta\overline{St}_i$ = changes in stocks for goods of sector i

Id_i = sum of intermediate demand of sector i

Likewise, gross sectoral income (S_i) is equal to value added of sector i (V_i) plus sectoral imports (M_i) and the sum of intermediate inputs (Ii_i) and indirect taxes ($\overline{Ti}_i$).

(2a) $$S_i = V_i + M_i + Ii_i + \overline{Ti}_i$$

(3a) $$D_i = S_i$$

There exists a relatively constant relationship between intermediate sectoral demand and the components of sectoral final demand, on the one hand, and between intermediate sectoral inputs and sectoral value added, on the other. Thus, it may be assumed that:

(4a) $$Id_i = a_i^1 (C_i + I_i + X_i),$$

and

(5a) $$Ii_i = a_i^2 V_i$$

Let $1 + a_i^1 = b_i$ and $1 + a_i^2 = d_i$; then through substitution of the above equations, it follows that:

(6a) $$X_i = \frac{d_i}{b_i} V_i - C_i - I_i + \frac{1}{b_i} (M_i + \overline{St_i} + \overline{Ti_i})$$

which is equivalent to the sectoral export equations (8, 9, and 10) in the model above. The sectoral parameters b_i and d_i are derived from input-output information.

It is assumed that in the service sector changes in stocks are negligible and imports are given exogenously (see equation 8). As noted previously, total agricultural output increased only marginally after 1930, while domestic agricultural consumption grew substantially. The combined effect of these two forces was a squeeze on exports. Inasmuch as agricultural exports fluctuated between 80 and 96 per cent of total exports throughout this period, the relative importance of industrial and

service exports is marginal for Argentina, although these may become more important in the future.

Imports are broken down into their basic categories, i.e., imports of raw materials and intermediary goods M_{rm}, capital goods M_k, and consumption goods $\overline{M}_c$. $\overline{M}_c$ are specified exogenously. The rationale for this stems from the fact that in Argentina, and most developing countries, imports of consumption goods are regulated almost entirely by government import controls. It makes little sense, therefore, to relate this demand to any economic variable in the system when the yearly variations in its size are in fact determined by certain *a priori* government policy decisions. Imports of raw materials (equation 13) are specified endogenously as a function of the level of output in the industrial sector and of their purchasing price as reflected by the external terms of trade. It is recognized that this relationship presupposes that imported and domestically produced raw materials and intermediate goods are more nearly complementary than may be the case in Argentina.[36] The remaining import equation, 14, defines imports of capital goods M_k residually after all claims on foreign exchange earnings have been deducted. This implies that Argentina's capacity to import is always fully utilized and that the demand for imports of capital goods is bounded only by the availability of foreign exchange. The first claimant on foreign exchange will be raw material imports. With the relatively high level of industrial capacity in Argentina, it is obviously necessary to utilize existing capacity to the fullest before applying foreign exchange to the importation of capital goods. Equation 11 defines industrial imports M_b as equal to the sum of capital goods and consumer goods imports plus a share of raw materials imports. The remainder of the latter are agricultural imports (equation 12). It follows from equations 11 and 12 that $M_a + M_b = M_k + \overline{M}_c + M_{rm}$. The proportion of M_{rm} consisting of "industrial" imports $(=e)$ is presumed given.

Equations 15 to 17 are self-explanatory. Note, however, the α, β, and j coefficients included in the respective capital stock equations. These are policy parameters that reflect the shares of total investment to be allocated to the three major sectors. (By definition the sum of the three parameters is equal to one.) Apparently policymakers in Argentina did not fully understand the implications of varying these parameters. In general, it is clear that fiscal and monetary policy undertaken to change

[36] A certain degree of substitutability between domestic and imported raw materials does in fact exist (e.g., petroleum in the 1960's). In any case there appears to be a justification for such a specification of average import content in the short run.

the size of these coefficients, *ceteris paribus,* could reasonably be expected to have a considerable impact upon the structural development and growth of a less developed country. In the case of Argentina, it is important to note that the supply of exports can only be affected through increases in α, and (less frequently) β.

Equations 18 to 21 provide the definitions of the investment components. Total investment I_t is equal to the contributions of the three sectors to investment demand (equation 18). Agriculture's contribution to investment is assumed to be confined to changes in the stock of livestock, a hypothesis that appears to hold true in Argentina (equation 19). No services are assumed to enter into investment ($I_o = 0$). Finally industrial investment is subdivided into two parts: domestic investment I_d and capital goods imports, equation 21.

A behavioral relationship explaining the output of domestic investment goods as a function of a lagged capacity variable and the annual change in industrial value added is given in equation 22.[37]

Equation 23 defines disposable income. As previously mentioned, the last identity in the model (equation 24) is not an independent relationship. It can be derived by substitution from a set of other equations in the model, thereby providing a check on the equality of GDP from the supply (value added) side and demand side.[38]

Figure 2 presents the causal links between the major variables in the above model. The diagram excludes many exogenous variables for the sake of clarity. The variables listed with a bar are those assumed to be exogenous to the system.

The interpretation of the diagram should be relatively straight-forward. The interdependence of the relationships in the model is essentially an expression of the distribution of total investment among the three pro-

[37] Some other forms of the investment demand function were tried. It is interesting to note in this regard that significant results were obtained relating I_d to raw materials imports and lagged capacity:

$$I_d = \underset{}{64{,}045} + \underset{(4.10)}{1.328}\ M_{rm} + \underset{(4.05)}{738.4}\ \bar{CAP}_{-1}$$

$R^2 = .89$

Period: 1950–63 t ratios are given in parentheses below coefficients

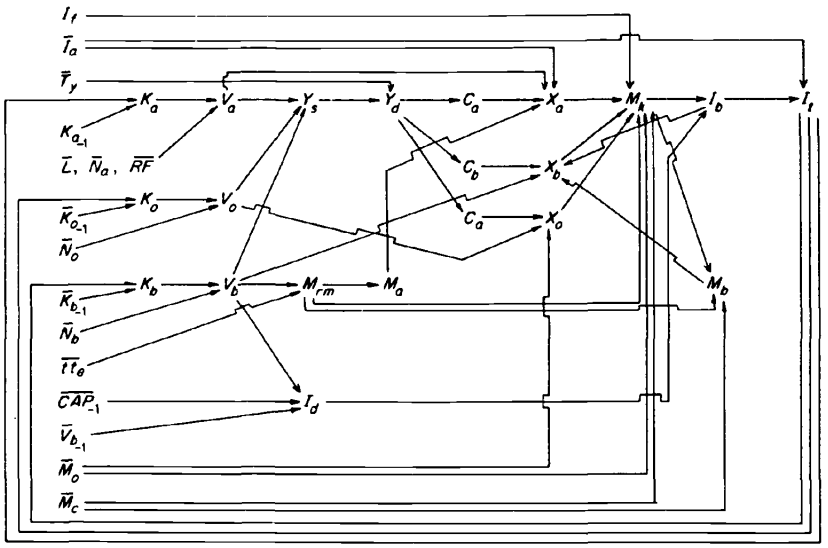
[38] It is worth noting that in the substitution process, V_a, V_b and V_o are derived from equations 8–10. The sum of the three sectoral value added equals GDP in equation 1, i.e.,

$$\Sigma_i V_i = \Sigma_i C_i + \Sigma_i I_i + \Sigma X_i - \Sigma_i M_i + \Sigma_i \Delta\bar{S}t_i + \Sigma_i \bar{T}i_i + \Sigma_i Id_i - \Sigma_i I_{i_i} \qquad i = a, b, o$$

The last two terms cancel out since the sum of intermediate demands is equal to the sum of intermediate inputs.

Figure 2

Causal Arrow Diagram: Argentine Model



Note: See list of variables, pp. 186–88

ductive sectors. The proportion of total investment destined to each sector is represented by the coefficients α, β and j discussed earlier, the relative sizes of which determine indirectly the static level of equilibrium output in the economy. The supply of investment funds is simultaneously determined by the domestic production of investment goods and the capacity to import capital goods. The capacity to import is determined by the level of agricultural and manufactured output available for export. Since historically the agriculture sector has accounted for 90 per cent or more of total exports, the amount of agricultural products available for export becomes the principal determinant of the capacity to import and, hence, of capital goods imports.[39]

An increase in α would imply the channeling of additional investment into the agricultural sector, thereby increasing agricultural output and in turn the quantity of agricultural products available for export. Exportable surplus could also be increased by reducing domestic consumption of

[39] It must be recognized that expansion of the industrial-manufacturing sector into exportable products could alter the current agriculture domination of the supply side of the foreign trade sector.

TABLE 4

Argentina: Per Capita Consumption of Meat Compared with United States

Period	Argentina		U. S.		Pounds Difference (col. 1 minus col. 3)
	Pounds (1)	Index (2)	Pounds (3)	Index (4)	
1951–55	222	100.0	151	100.0	71
1956–60	218	98.2	160	106.0	58
1961–63	210	94.6	164	108.6	46

Source: U.N. Economic Commission for Latin America.

agricultural commodities. There is little doubt that such a drop in domestic consumption could make a significant contribution to reducing the foreign exchange bottleneck. In fact, a reduction in Argentine per capita consumption of meat to levels similar to those prevailing in the U.S. would have led to a 60 per cent increase in the value of meat available for export and to a 14 per cent increase in the total value of Argentine exports in 1963 (*see* Table 4).

The restrictive effects of the flow of investment funds into the service sector is also evident. Since this sector does not produce needed capital, intermediary, nor manufactured goods, its expansion neither contributes to a reduction in import demands nor increases the availability of exportables (except in a few countries through tourism). Whereas the other two sectors have the capacity to promote growth and development through exports and/or import substitution, the direct effects of the service sector on trade tend to be much more limited. In fact they are often negative, drawing resources away from agriculture and industry.

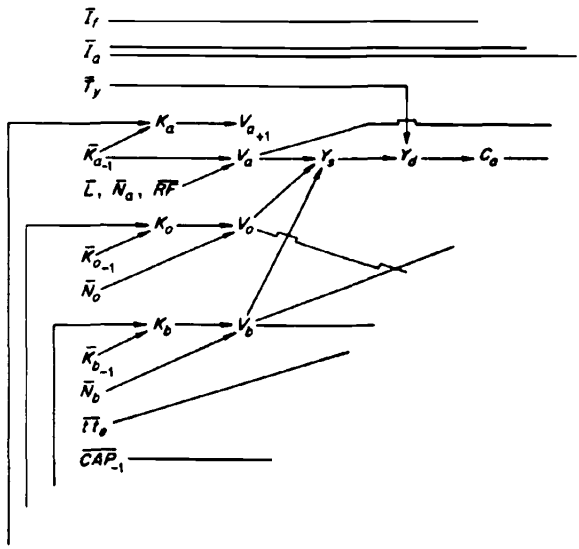
The proposed model can also be used to demonstrate why, in the short run, additional investment in nonagricultural sectors is more effective in increasing output and employment than additional investment in agriculture.[40]

[40] If V_a is postulated as being dependent upon the capital stock in the preceding time period, the output response to *current* investment in agriculture is effectively zero. In the other two sectors, in contrast, investment is assumed to be related to current investment. In this case, increasing agriculture's share of

The Statistical Application of the Model to Argentina

In the statistical estimation of the behavioral equations for Argentina a serious handicap was encountered in the form of a lack of reliable and continuous time-series data for many of the variables included in the model. However, by using assorted time periods and several proxy variables, estimates were obtained for eight of the behavioral equations in the model. The results of these estimates are presented below and described thereafter. The remaining equations in the previously presented model are identities, definitional or technical relationships, and form together with the eight estimated behavioral relationships the present model.

current investment (implying a high α) results in smaller increases in *current* over-all (but not future) output than would be the case with a smaller α. Investment in agriculture, in this light, represents a type of short-run investment leakage because of the longer gestation period involved. The upper left-hand corner of the arrow diagram presented in Figure 2 can be redrawn to point out the impact of the above production function (equation 2b) as follows:



This framework also clearly shows how the transition from a foreign trade sector dependent upon agricultural exports to one more balanced between commodities originating in both agriculture and industry provides another way of breaking out of the structural bottleneck. It is, of course, obvious that the ability to produce competitively manufactured as opposed to agricultural exports grants a developing country a strong advantage because of the higher income elasticity of demand enjoyed by the former.

OLS ESTIMATES OF BEHAVIORAL EQUATIONS—ARGENTINA

(t ratios are given in parentheses below coefficients; equation numbers refer to model in text)

(2a) $V_a = -47{,}884 + 2.14\,\overline{L} - 57.4\,\overline{W}_{d_e} + 501.2\,\overline{RF} + .247\,K_a$
$R^2 = .80$ (.80) (2.19) (1.38) (.86)
Period: 1948–59

(2b) $V_a = -60{,}381 + 1.45\,\overline{L} - 58.3\,\overline{W}_{d_e} + 510.1\,\overline{RF} + .34\,\overline{K}_{a_{-1}} + .247\,I_a$
$R^2 = .81$ (.36) (2.05) (1.30) (.68) (.80)
Period: 1948–59

(3) $V_b = -12{,}983 + .366\,K_b + 283.4\,\overline{W}_{d_e}$
$R^2 = .80$ (6.01) (1.53)
Period: 1948–64

(4) $V_o = 110{,}439 + .119\,K_o + 75.4\,\overline{W}_{d_e} + 1.07\,\overline{G}$
$R^2 = .83$ (4.28) (2.75) (1.12)
Period: 1948–59

(5) $C_a = 7{,}399 + .128\,Y^d - 53.4\,\overline{tt}_i + 365.1\,\overline{y} + 25{,}654\,\overline{DV}_{40-45}$
$R^2 = .74$ (3.80) (.24) (.42) (3.05)
Period: 1935–56

(6) $C_b = -11{,}052 + .326\,Y^d - 14{,}341\,\overline{DV}_{50-55}$
$R^2 = .98$ (9.33) (2.03)
Period: 1950–63

(13) $M_{rm} = -12{,}984 + .366\,V_b - 283.4\,\overline{tt}_e$
$R^2 = .80$ (6.01) (1.53)
Period: 1950–63

(22) $I_d = 64{,}045 + 1.328\,M_{rm} + 738.4\,\overline{CAP}_{-1}$
$R^2 = .89$ (4.10) (4.05)
Period: 1950–63

The behavioral equations in the first group are estimates of the three production functions. The only time series found for capital stock by sectors was for the period 1944 to 1959.[41] It proved to be impossible to find a reliable time series for size of labor force by sector. Therefore, a

[41] The industrial sector was the exception here. ECLA (*Analisis y Proyecciones del Desarrollo Economico de la Argentina*), gives a longer time series of the value of capital stock in the manufacturing sector (1948–64).

proxy variable was used in the place of the size of the labor force. The proxy variable was derived as follows. A study of Argentine development suggests that the principal labor migration throughout the period was out of agriculture and into the manufacturing and services sectors. Much of this transfer of labor was accomplished through the attraction of higher wages in the urban areas. On the assumption that short-run variations in the supply of labor in the three sectors were due, in part, to relative wage differentials, it seemed reasonable to conclude that these differentials could, in some measure, explain changes in output attributable to changes in the size of the labor force. Therefore the absolute difference between monthly wages paid to common labor employed in industry and that of common labor employed in agriculture was selected as the variable ($\overline{W}_{dc}$).[42] In the case of agriculture, an increase in the size of the differential would be anticipated *a priori* to reduce output, since a greater amount of labor would be drawn into the other sectors—hence the negative sign in the agricultural production function (equations 2a and 2b). The opposite would be true for the other sectors. In addition to these two variables, an index of rainfall, $\overline{RF}$, and the quantity of land used in the agriculture sector were included in the agricultural production function.

In 2a the current value of the capital stock is included, whereas in 2b both the capital stock lagged one year and the current level of net investment are used. The resulting coefficients conform to what one would have expected on *a priori* grounds. The lack of statistical significance of three out of the four explanatory variables is not surprising in view of the stagnating character of the agricultural sector throughout this period characterized by little year-to-year variation in total land and capital employed. One possible explanation for the nonsignificance of the rainfall index is that the impact of changes in rainfall have a lagged (delayed) effect upon cattle output and a more immediate impact upon field crops.[43] Correct signs and reasonable values were obtained for the elasticities implied by the regressions for capital and land with regard to their measured value at the means. It must also be recognized that log-linear estimates of the production functions may have better described the production relationships. Because of the limited reliability of the data and because several proxy variables were being used, other possible forms of

[42] Salaries in current pesos converted to constant 1955 prices by deflating through the cost of living index.

[43] However, attempts to disaggregate agricultural output did not turn out more significant results.

the aggregate agricultural production function relationship were ignored.

A reasonable fit was obtained when value added in industry V_b is regressed on the capital stock in industry and the wage differential (equation 3). Value added in the "service" sector V_o can largely be explained by the same wage differential, the capital stock in the sector, and government expenditures $\overline{G}$ (equation 4).

The income variable was significant in both of the OLS estimates of the two consumption functions (equations 5 and 6). Higher coefficients of determination were obtained in both cases by including the respective dummy intercept variables. It seems evident that consumption of agricultural products was abnormally high during the years of World War II.[44] Neither internal terms of trade nor the income distribution variable appeared to be significantly correlated with the sectoral consumption variables.

Variations in V_b and the external terms of trade afforded a relatively satisfactory explanation of imports of raw materials (equation 13). The domestic investment equation was estimated on the basis of the lagged capacity in the domestic production of machinery and equipment and current levels of raw material imports, both of which were significant at the 0.05 level. The impact of current capital imports upon the productive capacity of the investment goods industries appears *a priori* so slight that it can be left out of the domestic investment equation.[45]

All other parameters appearing in the remaining equations were determined *a priori* from cross-sectional, historical, or input-output sources. Thus, the parameters b_i and d_i $(i = a, b, o)$ in the export equations (8–10) were obtained from input-output information, and the parameter e in equation 11—representing the share of industrial raw materials imports out of total primary and intermediate goods imports—was based on the historical share.

Economic model building is essentially an exercise in specifying the reasonable and the feasible relations between economic variables. It is, of course, impossible to capture the structure of a complex economy in fifteen to twenty equations. However, if the structure of an economy is not mirrored completely, it may be assumed that the interdependence

[44] In the case of C_b, the dummy variable is included to show the differing political impact of the Peron and post-Peron governments upon consumption of manufactures. The explanatory ability of the consumption function for agricultural commodities would probably have been higher in the absence of the government's interference with agricultural prices.

[45] This was borne out by the OLS estimate of domestic investment where imports of capital goods were included. In all cases the coefficient carried by capital imports was extremely small and not statistically significant.

between major variables and sectors is sufficiently well reflected to enable new insights and a better knowledge of the economy to be obtained.

The statistically specified relations were incorporated into the model presented in Section 4 with some parameters determined on an *a priori* basis. The system of linear equations solved to derive the reduced form, providing the matrix of multipliers that relate the set of endogenous variables to the set of exogenous variables. The model was run for both versions of the agricultural production function (equations 2a and 2b). Furthermore, two sets of multipliers were obtained corresponding to two sets of values for the sectoral shares of investment. By varying α, the proportion of total investment devoted to agriculture, as well as β and j, the corresponding shares for industry and the service complex, the sensitivity of the system to these policy parameters could be ascertained *ceteris paribus*. When the nonlagged version of the agricultural production function V_a and two sets of investment parameters corresponding, respectively, to the situation existing in 1925–29 and 1955–59 were used, the results proved highly revealing. As previously noted, the sum of the three sectoral investment shares is, by definition, equal to unity. Thus, the multiplier of the lagged capital stock in agriculture ($K_{a_{-1}}$) on gross domestic income was about 11 per cent higher using a high value for α of .21 (value of β, .11; of j, .68) than when using the value corresponding to the later period, which was .15 (β, .12; j, .73). Likewise, the multiplier relating $K_{a_{-1}}$ to agricultural exports was about 12 per cent higher in the earlier than in the later period as was the impact on capital goods imports and total investment. The above results provide a quantitative indication of the sensitivity of the major variables to investment in agriculture. It seems clear that income, given the model specification, is very responsive to agricultural investment. Two notes of warning should however be sounded: first, given the tenuous nature of the underlying data (or their proxy variables derived therefrom) and the limited statistical significance of a number of the coefficients in the original system (and the fact that a few *a priori* parameter values were used), the multipliers in the reduced form should be taken with more than one grain of salt.[46] Second, the multipliers hold true only over a limited range. For example, if more investment were to be directed to agriculture, the marginal productivity of this investment would drop after a certain level was reached. Conversely, the marginal productivity of investment in the other sectors

[46] This, incidentally, is the reason that the reduced form is not presented here. Efforts to improve the statistical specification of the model are continuing. At this time the most that one can expect from the reduced form is that it provide us with very rough orders of magnitude of the effects of the exogenous variables on the endogenous ones.

TABLE 5

Peru: Growth Rates of Selected Variables, 1950–66
(percentages based on constant 1963 prices)

	1950–52 to 1958–60	1958–60 to 1964–66	1950–52 to 1964–66
Gross domestic income	4.0	6.6	5.2
Exports of goods and Services + terms-of-trade effect	4.6	9.9	6.9
Consumption	4.3	5.3	4.7
Gross investment	3.1	10.1	5.9
Imports of goods and services	5.6	9.3	7.0

Source: Data supplied by Instituto Nacional de Planificacion.

would increase. There is little doubt, however, even in the light of these qualifications that Argentina would have benefited from more investment in agriculture.

4

Peru

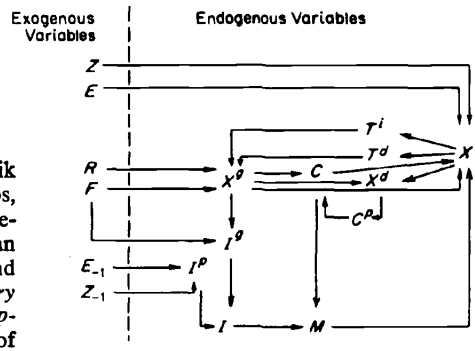
The Over-all Structure and Development of the Economy Since 1950

The analytical framework was applied to the Peruvian economy over the post-World-War-II period (1950–66).[47] The main characteristics of the economy are its dualism and the dynamic and diversified nature of its exports with their limited backward linkages. Throughout this period Peru enjoyed a relatively high growth rate of GDI. Between 1951 and 1965, the annual cumulative rate amounted to 5.2 per cent. It can be seen from Table 5 that the rate of growth of GDI appears to be correlated with that of exports. In the first subperiod (1951–59) GDI grew at an annual cumulative rate of 4 per cent, slightly below that of exports

[47] The two reasons for limiting the analysis to this period are: first, national income data are simply not available for the preceding period and, second, Peru, in contrast to Argentina, is still essentially in the same developmental phase as it was forty years ago.

Figure 3

Causal Arrow Diagram: Peru Model



Source: Based on Model C in Erik Thorbecke and Apostolos Condos, "Macroeconomic Growth and Development Models of the Peruvian Economy," in Irma Adelman and Erik Thorbecke (ed.), *The Theory and Design of Economic Development,* Baltimore, 1966. The list of symbols is as follows:

Exogenous Variables

- Z = terms-of-trade effect
- E = exports
- Z_{-1} = terms-of-trade effect lagged one year
- E_{-1} = exports lagged one year
- R = net revenue from nontax, nonforeign sources
- F = net inflow of foreign public investment

Endogenous Variables

- C = total consumption
- C^p = private consumption
- I^p = private gross investment
- I^g = public gross investment
- I = total gross investment
- M = total imports of goods and services
- T^i = indirect taxes
- T^d = direct taxes
- X = gross domestic income
- X^d = disposable gross domestic income
- X^g = government gross domestic income

(4.6 per cent). In the second subperiod (1959–65) exports grew at an amazing 9.9 per cent annually and the GDI at 6.6 per cent, suggesting that the acceleration in the growth rate of national income after 1959 was generated by activity in the export sector. The ratio of exports (corrected for the terms-of-trade effect) to GDI increased from 16.5 per cent to almost 21 per cent between 1950–52 (average) and 1964–66 (average). These figures reveal that the relative importance of exports in the economy is high and still increasing.

An econometric model of the Peruvian economy explained quite accurately the course of the major macroeconomic variables over the period under consideration. This model confirmed the role of exports in propelling the economy.[48] Figure 3 presents the causal relationships between

[48] Thorbecke and Condos, *op. cit.*

variables in the model. It can be seen that private investment is determined by exports and the terms-of-trade effects lagged one year. Private investment in turn is a major determinant of income, of which private consumption as well as direct and indirect taxes are functions. Finally, imports are explained by consumption and total investment.

It is of particular significance that a foreign-demand-oriented model would describe very accurately the structure and the growth of the Peruvian economy.

There appears to be a near consensus among students of the Peruvian economy that the main growth-generating force was exports, rather than investment *per se*.[49] Actually, as was previously implied, a very good statistical fit was obtained by regressing private investment I^p on lagged exports E_{-1} and the lagged terms-of-trade effect Z_{-1}.[50] Thus I^p is determined completely exogenously through the changes occurring in the export sector. This appears to be a reasonable hypothesis given: (1) the relative importance of the export sector; (2) the highly capital-intensive nature of export industries; and (3) the virtual absence of a domestic capital-goods-producing sector.

In summary, the performance of the export sector contributed to a relatively high rate of income growth and to a strong balance of payments (and a large capacity to import). Furthermore, the favorable balance of payments situation made it possible to maintain relative price stability by allowing imports to compensate for shortages in domestic production of foodstuffs and other consumer goods as demand increased in consequence of rising population and income.

The contribution of the high rate of export and income growth to some of the other developmental objectives, such as creation of employment and improvement of the very unequal income distribution, appears to have been marginal. Most of the export commodities are produced with highly capital-intensive methods (e.g., mining, fishmeal and sugar) and therefore did not provide many new job opportunities either directly or

[49] *Ibid.*; Michael Roemer, *The Dynamic Role of Exports in Economic Development: The Fishmeal Industry in Peru, 1956–1966,* unpublished doctoral dissertation, Department of Economics, Massachusetts Institute of Technology, 1967; and, René Vandendries, *Foreign Trade and the Economic Development of Peru,* unpublished doctoral dissertation, Department of Economics and Sociology, Iowa State University, 1967.

[50] $I^p = \underset{}{2887} + \underset{(.077)}{.773}\, E_{-1} + \underset{(.291)}{.660}\, Z_{-1} \quad R^2 = .90$

Sample period: 1950–65.

The standard errors of the coefficients are given in parenthesis. From Thorbecke and Condos, *op. cit.*, and *Peruvian Macro-Economic and Agricultural Prospects and Strategy, 1967–1972.*

indirectly. The income distribution, both personal and regional, appears to be as uneven now as ten years ago. The highly dualistic structure of the Peruvian economy, with the Coast as the advanced export sector and the Sierra as the backward subsistence sector, has not been altered.

Peru has maintained an essentially open economy. The level of tariffs is the lowest in Latin America. There was no exchange control over the period under consideration and the rate of exchange showed amazing stability, remaining constant between 1959 and 1967, in September of which, a worsening balance of payments and a large budget deficit led to a devaluation. The export prospects over the next five years are quite bleak because of supply limitations for fishmeal and mining products and stagnant world demand for cotton and sugar. From a detailed projection of the nine major export commodities it has been concluded that the rate of growth of exports is not likely to exceed 3 per cent annually between 1967 and 1971.[51]

Thus, Peru presents in retrospect a classical example of export-led growth with limited linkages to the production of home goods.

Sectoral Performance

Table 6 indicates the sectoral distribution of gross domestic product (GDP) for 1950, 1959, and 1966. It reveals clearly the sharp decline in the relative share of agriculture in GDP from 25 per cent in 1950 to 16.3 per cent in 1966. This rapid relative drop is not surprising in view of the very modest growth of agriculture (2.5 per cent per annum between 1950 and 1965), a growth that did not even keep up with the rate of population growth (2.8 per cent). The relative loss in agriculture's share in GDP was fully compensated by an equivalent gain in the share of industry, which increased from 20.4 per cent of GDP to 29.2 per cent over the same period. Half of the percentage gain in the share of industry is attributable to two essentially primary export activities, fishing and mining. The growth of the fishmeal industry has been well documented,[52] and provides perhaps the most spectacular case of staple-induced growth since World War II.

It is important to distinguish between two subsectors in evaluating the performance of agriculture: (a) production of industrial crops (cotton and sugar) for exports taking place mainly on the Coast, and (b) production of foodcrops, about 45 per cent of which originates in the Sierra

[51] *Peruvian Macro-Economic and Agricultural Prospects and Strategy, 1967–1972.*

[52] Roemer, *op. cit.*

TABLE 6

Peru: Sectoral Distribution and Growth of Gross Domestic Product, 1950–66

	Distribution[a]			Cumulative Rate of Growth,
	1950	1959	1966	1950–66
Agriculture -	11,024 (25)	13,189 (20)	16,409 (16.3)	2.5
Food Crops	–	–	–	3.9[b]
Industrials[c]	–	–	–	.8[b]
Industry	9,004 (20.4)	15,595 (23.7)	29,378 (29.2)	7.7
Fishing	130 (0.3)	590 (0.9)	2,131 (2.1)	19.1
Mining	1,996 (4.5)	3,295 (5)	7,159 (7.1)	8.3
Remainder	6,878 (15.6)	11,711 (17.8)	20,088 (20)	6.9
Service complex[d]	24,083 (54.6)	34,985 (56.3)	54,756 (54.5)	5.3
GDP	44,111 (100)	63,769 (100)	100,543 (100)	5.3

Source: Data supplied by Instituto Nacional de Planificacion.

[a]In millions of constant soles at 1963 prices; percentages of total shown in parenthesis.

[b]1951–64.

[c]Cotton and sugar.

[d]Includes: construction, energy, commerce, banking, housing, transport, communications, public administration and defense, education, health, and other services.

and is mainly self-consumed.[53] The output of cotton and sugar has stagnated, growing at only 0.8 per cent annually between 1951 and 1964, in comparison with food output, which grew over the same period at an annual rate of 3.9 per cent. Of agricultural output at the present time, about two-thirds consists of food crops and one-third of industrial crops.

Figure 1 (in Section 1) reveals the relative importance of the three sectors and their subsectors) in terms of value added and the sectoral origin of exports. Three subsectors (industrial crops, fishing and mining) provided 99.2 per cent of all exports in 1965. Furthermore, only a marginal share of the output of these subsectors was used domestically. Table 7 illustrates the shift in the commodity composition of exports. The most significant factor is the modest growth of agricultural exports in comparison with the exports of the other two subsectors. Agricultural exports (mainly cotton and sugar) increased at an annual rate of 3 per cent between 1950 and 1965, while the corresponding rates for fishmeal and mining exports were respectively 26 and 9.9 per cent. As a result of the phenomenal performance of fishmeal exports and the spectacular performance of mining products combined with the low growth of agricultural exports, the share of the latter in total exports has declined from 57 to about 26 per cent over the period under consideration. On the other hand, the relative importance of fishmeal exports skyrocketed from 3 to 28 per cent of total exports, while the share of mining exports went up from about 38 to 45 per cent. The low growth rate of agricultural exports was largely the effect of the limited world demand for cotton, sugar, and coffee.

Figure 1B depicts the sectoral destination of imports. It can be seen from Table 8 that the percentage share of capital goods and raw materials has risen, at the expense of consumer goods and foodstuffs.

The great bulk of capital goods and raw materials imports are destined for the industry and service sectors; the amount used by the agricultural sector (mainly by the nonfood sector) is estimated only at about $30 million in 1965. It is impossible, in the absence of an input-output table, to determine accurately the sectoral destination of imports. Nevertheless "guesstimates" would place the proportion of imports of capital goods and raw materials absorbed by the fishmeal and mining subsectors at about 30 and 60 per cent of output, respectively. Final demand imports (food and consumer durables and nondurables), because they do not contribute to value added, appear as rectangles at the bottom of Figure 1B. The bottom diagram in Figure 1 effectively illustrates: (a)

[53] It is estimated that not more than one-fifth of the Sierra's food output is marketed commercially.

TABLE 7

Peru: Sectoral Distribution and Growth of Exports, 1950–65

Exports	Distribution[a]			Cumulative Rate of Growth		
	1950	1959	1965	1950–59	1959–65	1960–65
Agricultural	110 (57.1)	138 (43.8)	172 (25.8)	2.5	3.8	3
Fish and fishmeal	6 (3)	44 (14.1)	186 (28)	25	27	26
Mining	73 (37.9)	122 (38.8)	303 (45.4)	5.8	16.4	9.9
Others	4 (2.1)	10 (3.2)	5 (0.8)	–	–	–
Total	193 (100)	314 (100)	666 (100)	5.5	13.4	8.6

Source: See Table 6.

[a]Value in millions of dollars; percentages of total shown in parentheses.

TABLE 8

Peru: Commodity Composition of Imports, Selected Years
(value in millions of dollars; percentage distribution in parentheses)

Imports	1950	1959	1965
Food and food products	39 (22.2)	63 (19.8)	134 (18.4)
Consumption goods (excl. food)	37 (21.0)	40 (12.6)	119 (16.3)
Raw materials and fuel	29 (16.5)	78 (24.5)	165 (22.7)
Capital goods	69 (39.2)	135 (42.5)	308 (42.3)
Others	2 (1.1)	2 (0.6)	3 (0.4)
Total	176 (100.0)	318 (100.0)	728 (100.0)

Source: See Table 6.

the relatively small amount of imports that go into agriculture (a reflection of the small flow of investment, e.g., farm machinery, into that sector); and (b) the relatively large amount of food imports.

The large capacity to import that provided the basis of, or at least a permissive factor in, Peru's income growth is likely to become a bottleneck, given the bleak export prospects mentioned earlier. The weakening of the major stimulus to growth combined with the small size of the domestic manufacturing sector (producing for home consumption) and the limited scope for industrial import substitution are likely to result in a low growth rate of GDI.[54]

It will be argued that the agricultural sector can play an essential role in attenuating the undesirable consequences to a number of developmental objectives (e.g., employment creation) that would accompany a low rate of income growth. Agriculture in Peru, as in many developing countries, fulfills two major functions. First, the commercialized subsector has historically been an important contributor to foreign exchange earnings. (The performance of agricultural exports however has been relatively disappointing as was indicated previously.[55])

The second function of the agricultural sector is to provide food for

[54] Using Model C in Thorbecke and Condos, and plugging in projected values for the exogenous variables (e.g., exports, terms-of-trade effect, net public investment) we predicted a rate of growth of GDI of about 3 per cent for 1967–71.

[55] Industrial crops grew at less than one per cent between 1950 and 1964, and the share of agricultural exports in total exports declined from 57 to 26 per cent over the same period.

TABLE 9

Peru: Rate of Growth of Agricultural Output by Crops and by Regions, 1950–64

	Coast	Sierra	Selva	Republic
All food crops	6.9	1.4	4.7	3.9
Cereals	4.7	0.5	3.8	2.9
Tubers and roots	3.5	1.1	4.6	1.7
Beans and pulses	6.1	2.6	4.2	4.5
Fresh vegetables	8.6	3.3	8.2	6.4
Fresh fruits	10.4	5.4	5.0	8.0
Industrials	0.8	2.2	2.0	0.8
All crops	3.5	1.4	3.7	2.7

Source: Iowa Universities Mission to Peru: *Peruvian Macroeconomic and Agricultural Prospects and Strategy, 1967–1972*, Lima, Peru, 1967.

itself and for the other sectors. Even though the production of domestic food crops rose at 3.9 per cent per annum during the postwar period, it did not rise steeply enough to keep up with the growth of food demand. Consequently, the level of food imports increased substantially from $39 million in 1950 to $134 million in 1965 (see Table 7). The relatively poor performance of agricultural exports and the higher dependence on food imports turned the balance of trade in agriculture from a large positive one to a negative one. Indeed, the excess of agricultural exports over imports of agricultural products and inputs was almost $60 million in 1960. By 1966, this balance had become slightly negative, the agricultural sector having become a drain from the balance of payments standpoint.

It is necessary to examine Peruvian agriculture regionally in order to understand its structure. Table 9 gives the postwar rates of growth for the output of various agricultural crops in the three natural regions of Peru: (a) the Coast (the commercialized export subsector), (b) the Sierra (the subsistence subsector), and (c) the Selva (jungle).[56]

The table reveals that agricultural growth in the Sierra was substantially lower than on the Coast. Practically all the output in the Sierra

[56] The Selva produces less than 5 per cent of total agricultural output.

TABLE 10

Peru: Annual Growth Rates for Urban and Rural Population by Regions

	Coast	Sierra	Selva	Nationwide
Urban	4.8	2.5	5.8	4.1
Rural	2.9	1.0	3.9	1.8
Total	4.4	1.3	4.5	3.0

Source: See Table 9.

consists of food crops that grew at an annual rate of only 1.4 per cent. In contrast, agricultural output on the Coast rose at a corresponding rate of 3.5 per cent, the result of a marginal (0.8 per cent) increase in the production of industrial crops and a large (6.9 per cent) growth in food crops.

Since agriculture is the only productive activity in the Sierra,[57] the rate of growth of food output provides a good approximation of the over-all growth of income. Table 10 indicates the population dynamics by regions. The heavy labor migration from the Sierra to the Coast is revealed by these data. It is also clear that per capita income in the Sierra must have remained stagnant as judged by the equivalence between population growth (1.3 per cent after migration) and agricultural growth (1.4 per cent).

The Contribution of Agriculture to Developmental Objectives

In Section 1, five major developmental objectives were outlined. In this part an attempt will be made to assess the contribution of agriculture to these various targets. It has already been seen that the agricultural sector, as a whole, has recently become a net claimant on foreign exchange, a contrast with its previous status of contributor to the balance of payments. The imports of food products have risen to an alarmingly high level. Of the major food imports—wheat, meat, milk products, rice and oils—meat, milk, and rice offer fairly large scope for import substitution. The existence of a strong balance of payments situation through-

[57] The mining activity in the Sierra is clearly an enclave-type operation with marginal economic linkages.

out the period 1960–66 and the maintenance of a fixed exchange rate between 1959 and 1967 explain the high level of food imports. The export stagnation anticipated for the next few years makes import substitution of foodstuffs essential. This, of course, will necessitate increased domestic food production, but the scope for import substitution in other areas is very limited. (The recent devaluation is likely to provide the price incentive for the import substitution of foodstuffs.)

The contribution of agriculture to over-all income has already been discussed. It was seen that the growth rate of agriculture (2.7 per cent) was quite modest compared to that of GDP. Agriculture has been a lagging sector in an otherwise highly dynamic economy. The agricultural stagnation has important implications from an income distribution standpoint (discussed below), given that almost one-half of the labor force is employed in that sector.

The substantial decline in the relative share of agriculture in total GDP (see Table 6) combined with a much slower reduction in the share of agriculture in the total labor force suggests that income distribution might have become more uneven. This inference is strengthened when income performance in the Sierra is examined. As pointed out above, per capita income probably remained at about the same level over the period 1950–64. The distribution of income between the Coast and the Sierra is therefore bound to have worsened, since GDP per capita grew at more than 2 per cent annually while per capita income in the Sierra remained constant. (At the present time about 48 per cent of the population lives in the Sierra.) The inequality in the income distribution is reflected in sharp regional differences in nutritional standards.[58]

The sectoral and regional income disparities are also reflected, of course, in wide disparities in personal income distribution. Attempts at deriving Lorenz curves reveal not only the above trend toward income inequality over time, but also the fact that Peru's income distribution is considerably worse than that of even Ecuador, Chile, Mexico, and Venezuela.[59]

The traditional role of agriculture throughout the development process is to release labor to the other sectors. However, the capacity to absorb

[58] The daily average and per capita caloric and protein intake have been estimated at 2,248 calories and 59 grams, respectively, for Peru and at 3,140 calories and 73 grams, respectively, for greater Lima (20 per cent of the total, and roughly half, of the coastal population). It follows, therefore, that the caloric intake in the Sierra must be around 2,000 calories per capita per day. (See *Peruvian Macro-Economic and Agricultural Products and Strategy, 1967–72.*)

[59] Republica del Peru, Instituto Nacional de Planificacion, *La Evolucion de la Economia en el Periodo 1950–1964*, Vol. I.

labor in the other sectors is extremely limited. The growing industrial subsectors, especially mining and fishing, have been at best fairly marginal users of labor because of the highly capital-intensive nature of their production functions.[60] The service complex has absorbed some labor, particularly in construction, but tends to be a kind of residual claimant of many disguised unemployed. A factor that further complicates the over-all employment problem is that the coastal agricultural subsector producing industrial crops, chiefly cotton and sugar,[61] has been mechanizing on a wide scale, thereby reducing absolutely the number of agricultural workers in these activities.

These various factors, together with the high migration from the subsistence subsector (the Sierra) to the Coast, combine to create an increasingly serious unemployment problem, against which it is very difficult to devise an effective strategy. It appears, however, essential from the standpoints of both income distribution (e.g., to meet minimum nutritional targets) and employment that some resources be allocated to the Sierra to increase agricultural output, which in that region is synonymous with income.[62]

The final policy objective to be examined is that of price stability and the internal terms of trade. The statistical evidence is that food prices increased at approximately the same rate as that of nonfood prices over the postwar period.[63] However, prices of food imports rose at a considerably lower rate than domestic food crops. The reasons for these differences in trends are (a) that the rate of exchange remained constant between 1959 and 1967, a factor that, combined with a higher rate of inflation at home than abroad, made food imports very attractive from the point of view of price; and (b) that the domestic supply of foodstuffs was fairly inelastic given the prevailing technology and structure. It is clear that the government was aiming for low food prices as a major instrument for improving the income distribution in the urban centers. The latter objective was achieved through a variety of measures, including price controls, subsidies, and a fixed exchange rate. However, it appears evident, in retrospect, that these policies discriminated against the agricultural sector, in general. The stability of the exchange rate reduced the profitability of the export crops and of the domestic import competing crops (e.g., meat, milk, and rice). Furthermore, the avail-

[60] See Vandendries, *op. cit.*

[61] The sugar industry in Peru is said to be run as efficiently as, or even more efficiently than, its U.S. counterpart.

[62] For an excellent discussion of an agricultural development strategy for Peru see *Peruvian Macro-Economic and Agricultural Prospects and Strategy, 1967–72.*

[63] *Ibid.*

ability of low-priced grain (wheat) might have discouraged the production of domestic substitutes (e.g., barley and potatoes) by removing the price incentive.[64]

The above discussion has brought out some of the problems resulting from a lagging agricultural sector within a dynamic export-oriented economy. The further development of Peru appears contingent on improving both the structure and the productivity of its agricultural sector.

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[64] The devaluation of September 1967 is likely to provide price incentives for the producers of industrial and food crops.

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Comment

CLARK W. REYNOLDS, STANFORD UNIVERSITY

One must applaud the emphasis of this paper on the need for increased public support for agricultural development in Latin America. Not that

this extremely important issue has been ignored in the historical and theoretical literature on economic development, only that policy-making institutions (at least in Latin America) have tended to neglect the problem until very recently. The study reveals how much the new focus of U.S./AID and international lending agencies on agricultural development as a *counterbalance* rather than *alternative* to rapid industrialization depends upon more and better research on the conditions of production and demand as essential prerequisites to effective policy formation. Ultimately the partial information derived from such research will be successfully integrated in the form of simultaneous estimating models to determine the internal consistency of the economy and its sensitivity to alternative agricultural development strategies.

The authors' model has two ostensible purposes; one is taxonomic serving to isolate sectoral relationships deemed most important in the analysis of postwar Argentina and Peru. The value of the taxonomy depends on the theoretical basis and historical importance of the disaggregation selected, and there is insufficient space devoted to this issue in the present study to warrant a detailed commentary. The other purpose of the model is predictive. The value of the predictions depends on the quality of underlying data, accuracy of specification of the equations, and statistical significance of the results. Although the monographic literature on which the authors depend for insights into the two economies tends to support their sectoral disaggregation into agriculture, manufacturing, services, and foreign trade, the model is less clear about the functional role of such a disaggregation and is particularly weak in its treatment of the service sector.

I shall limit my specific comments to that part of the paper dealing with the application of the general model presented in Section 3 to the case of Argentina. The policy relevance of the present model is limited owing to its preliminary nature. The estimated relationships add little to the insights derived from the underlying source material. It would improve the present form of the paper if the authors attempted an explicit test of the sensitivity of the system as a whole, and the balance of payments in particular, to changes in instrument variables. For example the authors' highly critical *ex post* analysis of industrialization at the expense of agriculture in Argentina suggests little more than the fact that it is possible to go to extremes in policy formation. The model does not reveal limits for alternative policies; in urging the need to increase investment in agriculture at the expense of manufacturing and services (increasing α versus β and j) the authors cite the "multiplier" effect on income of a shift in the agricultural share of marginal investment from

0.15 to 0.21. This is said to have a positive effect of 11 per cent on GNP in the next period. It would be helpful to show what alternative multiplier effects would be achieved from changes in β or j vis-à-vis α. Furthermore the strategy suggested by the model deals primarily with once-for-all adjustments of levels of income rather than with the more important questions of growth and development. A slight change in the growth rate (a possibility not considered in the paper) could rapidly offset the rather slight multiplier effect of so large a suggested change in the investment coefficient. Moreover there is little consideration in the model of the effect of alternative policies on income distribution, the level and composition of final demand, and aggregate rates of savings and investment.

It is argued that agricultural investment should be stimulated at the expense of other sectors through changes in the internal terms of trade. Such a device may raise food prices relative to manufactures, increase pressure for wage increases in industry (particularly in Argentina), lower rates of return on capital, and squeeze real wages in manufacturing and urban services as well. All of these effects may tend to depress the marginal efficiency of investment in industry and services while increasing political unrest among businessmen and the urban working class. In the absence of agrarian reform this condition would imply the redistribution of income so as to favor traditional landowners, with serious political implications in both countries. Neither in the reduced form of the model nor in the initial set of equations is there a sufficiently detailed specification of alternative policies to change investment shares. Moreover the degree to which policy space is constrained by political factors must be considered in Latin America in weighing alternative development strategies.

It is important to analyze the effect on the consumption function of a shift in the internal terms of trade, because such a shift may well produce perverse effects on the rate of growth by lowering the aggregate investment rate, especially if there is a low price elasticity of demand for foodstuffs in the cities. (That agricultural demand is not as sensitive to relative price changes as the authors' recommendations would lead us to believe is suggested by the fact that the agricultural consumption equation in the reduced form model has an insignificant internal terms-of-trade coefficient.) Under such circumstances a shift in the terms of trade toward agriculture may well increase the share of food consumed at home by raising own consumption on the farm more than urban consumption is reduced. In any case, a clarification of this relationship is essential before the model can be used as a guideline to policy.

This writer would suggest an alternative method of stimulating agricultural production by an indirect approach similar to that used successfully by Mexico. More and better intermediate inputs were made available to agriculture by industry (farm equipment, fertilizer, and improved seeds), and service activities such as transportation, commerce, and storage facilities plus rural credit were expanded with government support. Another suggested approach, again found effective in Mexico, is a dual-price policy in agriculture, with supports for the farmer plus state purchase and storage of staple crops that are then sold at subsidized prices to the urban working class. Under this plan the costs are borne by taxes on manufacturing and commerce. The preceding policies have the effect of accomplishing an increase in agricultural production, while at the same time minimizing political opposition to the transfer of resources into agriculture.

A word about the form of the production functions: the authors prefer the relationship of agricultural value-added—rather than of total output—to basic factor inputs plus rainfall. This relationship, without accommodating technical change, ignores the importance of intermediate stages of production with which import substitution policy must continually deal. It is precisely in the area of intermediate inputs that agricultural productivity has been so remarkably influenced in other developing countries such as Japan, Mexico, and Pakistan. Moreover, the use in the reduced form of the model of relative rural-urban wages as a proxy for labor inputs in agriculture and manufacturing is not appropriate in a country such as Argentina, where the urban labor market is highly imperfect because of the entrenchment of politically powerful labor unions and the use of wage policy to influence election results. Only recently has the Argentine government been effective in limiting the influence of labor union opposition to austerity programs.

The estimation of import demand functions in the model is also problematic since there is an assumption that intermediate imports are complementary rather than substitutable. Capital imports are a residual in an accounting identity (equation 14) although the authors do make use of consumer goods imports as an instrument variable, thereby making the residual subject to policy as well. Because of the specification of the import equation, the model is subject to the confines of present import-substitution strategy, which does not permit the working of comparative advantage at all levels of production. For example, the forced substitution of all final consumer goods at the same time that intermediate components are imported is precisely the kind of industrialization policy that has produced so many problems in other coun-

tries. An extreme consequence of this policy is the creation of negative value added. An alternative specification worth testing for traded goods would make import demand a residual of total domestic demand and production. This assumes importables to be competing rather than complementary goods. Such a specification allows sectoral shifts from net importer to net exporter and vice versa without altering the model.

There is much to be said for the authors' courage and imagination in working on the frontier of sectoral growth models for open economies. Their paper is a step forward, although as yet the model adds little to the source material on sectoral development of the respective economies and would, in fact, be dangerous if used in its present form as a guideline to policy. Hopefully this and similar work will continue to advance so that the profession may look forward to significant policy-related model building in the future. In the meantime the authors' reliance on historical and institutional materials on Peru and Argentina underscores the importance of continued research in these areas with particular attention to the complexities and diversities of intersectoral behavior and the importance of political constraints on public policy.

Reply

ERIK THORBECKE AND ALFRED J. FIELD

The main objective of our paper was to present a general conceptual framework within which some of the more important intra- and intersectoral relationships of developing countries could be studied and in some cases quantified. The application and quantitative specification of the general model to Argentina was for illustrative purposes only and was definitely not the central objective of the paper as Clark Reynolds infers it to be by devoting his comments almost exclusively to it. We agree entirely with Reynolds that the quantitatively specified Argentina model is of only limited usefulness for policy purposes. The lack of consistent and continuous time series proved to be a serious obstacle in the estimation of the model. However, the general framework and its application to Argentina did reveal and support quantitatively a number of observations and conclusions drawn by serious students of the Argentine economy. Furthermore, the same framework applied to Peru brought

out important sectoral differences and contrasts in the development process of Peru as compared to that of Argentina.

In addition to the general issues discussed above, there are two specific points raised by Reynolds to which we would like to reply. First, he appears to recommend using the model to measure the sensitivity of changes in the sectoral investment ratio (α, β and j) on GNP and other variables. This is in fact what was done by taking two sets of values for these ratios and indicating that a shift of 15 to 21 per cent in α (the share of total investment going to agriculture) would have resulted in a more than 10 per cent increase in gross domestic product in Argentina.

Second, Reynolds questions the use of relative rural/urban wages in the model as a proxy variable for agricultural and industrial labor inputs, respectively, on the ground that these wages are not competitively determined. Indeed the political influence of labor unions tended to favor industrial wages as opposed to agricultural wages. However, our hypothesis that labor inputs in industry are directly correlated with an increase in the ratio of the industrial wage rate to the agricultural wage rate and vice-versa for agriculture is independent of whether or not wages are competitively determined as long as entry is not restricted.