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9. ABSTRACT

This dissertation deals primarily with income distribution, employment patterns, and economic growth in the Philippines. The pattern of unemployment rates in the Philippines has been relatively unchanged since data has been collected. In any case, it can be argued that employment is a means towards reducing poverty so that the latter objective reflects both income redistribution and employment creation. More specifically, the objective of this dissertation is to construct an inter-sectoral consistency model of the Philippines, and to test in a consistent manner, various policies proposed to improve both income distribution and growth performances of the Philippine economy. The consistent framework will follow closely previous workdone by Thorbecke and Sengupta, as related to the Colombian economy.

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AN INCOME DISTRIBUTION AND EMPLOYMENT CONSISTENCY MODEL OF THE PHILIPPINES

by

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CHAPTER I. INTRODUCTION

In recent years, there has been an active interest in income distribution and employment objectives in developing countries, besides the traditional objective of high growth in gross national product. It is felt by most development economists that past development policies, despite their successes in generating rapid economic growth, have not contributed to the social objectives of income equality and efficient utilization of labor force. High growth rates had essentially not affected the welfare, social outlook, and life styles of population in the traditional rural areas. This coupled with a high growth rate of population, implies that a large and increasing number of people in the economy of most developing nations, are still living in poverty conditions. The problem is generally referred to as the income distribution and employment problem in developing countries. A more detailed definition and discussion of this problem can be found in the beginning of Chapter II.

This dissertation deals primarily with income distribution, employment patterns, and economic growth in the Philippines. The pattern of unemployment rates in the Philippines has been relatively unchanged since data has been collected. In any case, it can be argued that employment is a means towards reducing poverty so that the latter objective reflects both income redistribution and employment creation. More specifically, the objective of this dissertation is to construct an intersectoral consistency model of the Philippines, and to test in a consistent manner, various policies proposed to improve both income distribution and growth

performances of the Philippine economy. The consistent framework will follow closely previous work done by Thorbecke and Sengupta (45), as related to the Colombian economy.

In Chapter II, we examine the past historical performance of the Philippine economy, particularly in the context of income distribution and employment. In Chapter III, we begin by defining and discussing in detail the income distribution and employment problem of developing countries. The discussion will rely heavily on a two sector theoretical model. Policies for income equality and growth are then formulated using this two sector model. These policies will be analyzed and tested on the empirical level using a consistency model to be constructed. In the second half of Chapter III, we review briefly past consistency models, especially noting their disadvantages, as a preliminary step toward formulating a better model. In Chapter IV, a generalized Thorbecke - Sengupta consistency model is developed at a theoretical level. The model is then quantified and tested in Chapter V. In Chapter VI, policies derived in Chapter III are tested on an empirical level using the consistency model. Chapter VII is a concluding chapter with policy recommendations, and recommendations for future research.

CHAPTER II. A BRIEF ECONOMIC HISTORY OF THE PHILIPPINES

The Republic of the Philippines came into existence on July 4, 1946, shortly after the end of World War II, bringing an end to half a century of U.S. control. Before independence, the dynamic segment of the Philippine economy consisted of the production and export of agricultural commodities and forest products, with the main export crops being sugar, copra, tobacco and abaca (Manila hemp). Manufacturing consisted of the processing of these agricultural commodities, i.e. sugar refining, rope making, cigar making, etc. As the nation consists of approximately 7,000 islands, only half of which are named, interisland shipping was well developed.

World War II and occupation by Japanese military forces brought serious dislocations to export oriented crop production and interisland shipping. In 1946, crop production was less than 10 percent of the 1940 total, with the sugar industry working at less than 10 percent of the 1940 level. The vital interisland shipping fleet had been almost entirely lost.

The Growth of Industries

Economic recovery after independence, encouraged by favorable export prices and the postwar reconstruction program, largely financed by the United States, was rapid. Gross domestic product grew at rates of 43 percent and 29 percent in the years 1946-1947 and 1947-1948 respectively. This is in contrast to a GDP growth rate of only 1 percent between 1948 and 1949. This severe reduction in growth rate was brought about by an almost 30 percent reduction in export earnings, largely triggered by the U.S.

recession in 1949. The U.S. has traditionally been the main market for Philippine exports because of close political ties in the past. With the level of imports remaining unchanged from 1948 to 1949, and a termination of U.S. reconstruction aid, a balance of payments crisis was precipitated. In 1949, the level of international reserves held by the Central Bank was 230 million U.S. dollars compared to a level of 587 million U.S. dollars in 1945.

The remedy prescribed for this foreign exchange crisis, in those years of fixed foreign exchange rates, was a typical one for developing countries in that period. Foreign exchange control and import restrictions were instituted in 1950. Total imports were not to reach a high of 1395 million pesos, achieved in 1949, until 1957.[1] Declining world prices of primary commodities also gave a powerful impetus to the policy of export diversification, reduction of import dependence and import substitution. Further, the common belief then that economic development was essentially an industrialization process was used to argue for a policy of import substitution and industrialization.

Lacking a capital goods industry and modern technology, imported capital goods were essential to the program of import substitution and industrialization. Therefore, while the level of total imports was reduced and restricted, the restriction was especially severe on imported consumer goods. Accordingly, the share of consumer goods in total imports fell from 28 percent in 1950 to 17 percent in 1957.

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[1]Total export earnings did not recover to the 1948 level until 1958.

From 1950 to 1957, real manufacturing output grew at 11 percent per year as a result of import substitution policies. Growth tended to be in assembling and finishing stages of manufacturing, with high import contents of materials, spare parts, etc. As could be expected, this growth of manufacturing provided virtually no contribution to foreign exchange earnings, as they were stimulated by protective tariff walls and import quotas.

Meanwhile the primary sectors, agriculture, forestry, and mining were relied on to provide foreign exchange needed for the protected growth of manufacturing. Although the growth rate of mineral production was high during the 1950's (in the order of 11.5 percent), other primary commodities still faced depressed markets. Continued growth of GDP also implied further increase in demand for imports. Therefore, balance of payment difficulties were again experienced in 1957. By this time, international reserves had reached a low of 70 million U.S. dollars. Further import controls were imposed, but the situation did not improve in the following years. At the end of 1961, foreign reserves were at an all time low of 44 million U.S. dollars. In 1962, the government boldly opted for the easing of import controls and a series of exchange rate devaluations. However, easing of import controls swiftly permitted the high protective tariff structure, enacted in 1957, to surface as the dominant instrument for limiting imports.

It is clear that exchange rates prevailing in the 1950's can be considered as overvalued. Imports had to be restricted by high tariffs and quotas although a high demand for imports, especially of capital goods, was indirectly due to import restrictions on consumer goods. A

relaxation of import restrictions on consumer goods will result in a decline in the share of capital goods in total import, and increase in total imports. Thus, a balance of payments crisis would have resulted and some other adjustment mechanism activated.

It can be easily seen that a policy of import restrictions of consumer goods essentially subsidized investment and importation of capital goods. Protected industries are usually assembling and finishing industries, or industries operating on a smaller scale than their counterparts in industrialized countries. As such they are not economical as separate entities under world prices for their outputs. In a system of tariff walls and import quotas, prices for their output are raised artificially, thereby justifying their existence. By raising output prices, the returns to investment and capital utilized in these industries are increased artificially to make such investments perfectly rational decisions in the private market.[1] It is in this manner that investments in protected industries, which contributed to a large part of capital goods importation in the 1950's, were subsidized.

High capital intensities in protected industries were partly due to overvaluation of exchange rates. If exchange rates were overvalued, then imported capital goods were cheap relative to labor, inducing a higher capital labor ratio than optimal. Further, protected firms were usually in monopolistic or oligopolistic positions and therefore had no incentive

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[1]Note that the rational for protection is that the social rate of return on these investments exceeded social costs, while the private rate of return was below private costs.

to pursue cost minimization policies. Technologies from developed countries, usually capital intensive in nature, were simply duplicated in the Philippines.[1]

The period after 1962 is best described as a period of economic stabilization, balanced growth, or even stagnation in the manufacturing sector. The growth rate of the manufacturing sector was approximately 5 percent. As the GDP growth rate was about 5.2 percent, a slight relative slowdown in the industrialization effort is implied. The highly protective tariff structure encouraged continued import substitution, though at a slackened pace. Having exhausted easily substituted consumer goods industries, import substitution became of the "backward linkage" or secondary variety. Moreover, sluggish performance of exports was a constraint on imports of capital goods.

Balance of payments difficulties were encountered again in the late 1960's. By this time, the government had recognized the important link between exports generation, capital goods imports, and economic growth. The policy package prescribed consisted of the reimposition of imports controls in the late 1960's and the floating of the peso in 1970. To stimulate exports and investments, the Investment Incentive Act (1967) and the Exports Incentive Act (1970) were passed. The Board of Investments (BOI) was established to administer the system of fiscal and industrial promotion incentives under these two acts. Emphasis was on the promotion of investments in labor intensive manufacturing, and exports of manufactured outputs.

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[1]This point will be discussed in more detail in Chapter III.

The manufacturing sector in the Philippines today can still be characterized as highly protected, with a host of protective legislations and policies left over from the past two decades. However, it is likely that future growth of the manufacturing sector will rely heavily on labor intensive industries and foreign demand for their output, since these are the industries which the Philippines has a comparative advantage in. Foreign capital will be relied on heavily to finance the anticipated growth. The Investment Incentive Act, and The Export Incentive Act contain attractive incentives for foreign capital inflows.

Since the 1970 devaluation, there has been a minor export boom in combination with an improving international climate for Philippine manufactured exports. The volume, however, is still small. The inflow of foreign capital has also been considerable. The 42 percent devaluation (in relation to the U.S. dollar) no doubt contributed significantly to this inflow. At the same time, increasing labor costs in other Asian countries such as Japan, Taiwan, Hong Kong, and political uncertainties in Taiwan, have resulted in the relocation of some labor intensive industries away from these countries. Increasing political stability, and other fiscal and monetary incentives have no doubt attracted many of these industries to the Philippines.[1]

It is too early to predict the potential of the industrial and export reforms which occurred in the late 1960's and early 1970's. Two decades of heavy protectionist policies in manufacturing had resulted in a badly distorted industrial structure in terms of output mix, and capital bias in

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[1]The declaration of martial law in 1972 was widely interpreted as politically stabilizing.

terms of input mix. Manufacturing concentrated on large scale capital intensive manufacturing at the expense of medium and small scale traditional industries. The growth of manufacturing exports, if sustained, could result in the correction of this overall imbalance, eliminate the dependence on agriculture and primary commodities for export earnings,[1] and improve the income distribution and employment situation within the manufacturing sector. Essentially, what is needed is a shift from import substitution to export substitution. Overall performance of the economy, however, still depends critically on the performance of the rural-agriculture sector, which accounts for approximately half of total employment.

The Rural Sector

The rural sector in the Philippines is similar in character to that found in other Southeast Asian countries. At one end of the spectrum of enterprises are the large capital intensive logging and mining (heavy metals, coal, oil) establishments, with high profit margins. At the intermediate position are various plantations with large labor forces and high growth rate of labor productivity. Main plantation crops are sugar (and refining), pineapples (and canning), bananas, and abaca. There are also various small scale logging operations and small scale mining (quarrying, etc.) enterprises. Together, these companies provide

[1]Although large price increases of primary export commodities such as copra, minerals, timber and sugar have been registered recently, dependence on these few commodities for foreign exchange earning is still undesirable. Wide fluctuations in the prices of these commodities, as demonstrated by past experiences, could easily create short-run adjustment problems. A wide spectrum of export commodities will provide stability of foreign exchange earnings.

the bulk of foreign exchange earnings and not an insignificant proportion of total domestic savings. There are no data on employment by these enterprises, but one would guess that it would be small in relation to total rural labor force. Moreover, employment growth in these enterprises will be small because of high labor productivity growth.

Average farm size in the Philippines is approximately 10 acres, but about half of the farms are five acres or less, offset by the large landed estates and corporate holdings. Hence at the other end of the spectrum of farm enterprises are small scale farms of approximately five acres, producing rice, corn, pork, beef, poultry, etc. for domestic consumption. Except for a small proportion of large and progressive farmers in this sector, the structure of this traditional sector of agriculture has remained fairly unchanged for the last two decades. Large farmers have responded satisfactorily to agricultural transformation policies pursued by the government, e.g. use of new varieties, increased use of fertilizers, insecticides, extension of irrigation, some forms of mechanization, etc.; collectively known as the "Green Revolution".

In a nation of 7,000 islands, the fisherman is a familiar scene in rural life. The fishing industry consists mainly of small fishermen and catches are small. However, total catch increased from 407,500 metric tons in 1957 to 623,500 metric tons in 1964. Much of the rise is a result of the development of fish pond cultures along the tidal swamps. Bangos (milk fish), a rapid growing fish adapted to the brackish waters found in the swamps, are raised here. Considering that fish, next to rice, is the most important item in the Philippine diet, and self-sufficiency in food

has yet to be attained, the fisheries sector represents a potential to be exploited in development efforts and in terms of protein intake of the population. Mechanization and improved fishing techniques will allow wider coverage of fishing grounds, with high marginal returns. However, this method of development is capital intensive, and costs and benefits have to be considered in relation to the whole development program. Fish culture is more labor intensive and also provides efficient use of tidal swamps which have no alternate uses. This method could also result in better employment and income distribution performances in the rural sector.

Since 1950, total agricultural output increased at an annual rate of about 4 percent, about 2 percent lower than the GDP growth. Table 2.1 tries to disaggregate this growth rate by four main crops and sources of growth, i.e. by increases in cultivated area of yield increases.[1]

In general, it can be said that the decade of the 1950's was a period of land expansion, and the decade of the 1960's was a period of yield increases. Yield improvements in rice and corn in the 1960's have been the consequences of the "Green Revolution".

There is considerable doubt as to how much cultivable land still remains unutilized. Rough estimates range from nothing to 8.6 million hectares by the ILO (21). More realistically, the amount of unused potential agricultural lands is a function of investment cost. To bring

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[1]Care should be exercised in the interpretation of such data for tree crops (such as coconut), whose yield per cultivated acre depends heavily on age distribution of trees over cultivated areas. Note that for coconuts, high growth rate of cultivated area implies low or even negative growth rate in yields.

Table 2.1. Annual growth of output, area and yield of four major agricultural crops[a]

Crop	Annual Growth in Output (%)		Annual Growth in Area (%)		Annual Growth in Yield (%)	
	1949/1959	1959/1969	1949/1959	1959/1969	1949/1959	1959/1969
Rice	3.8	2.6	4.2	-0.3	-0.4	2.9
Corn	7.0	5.5	8.3	1.6	-1.3	3.9
Sugar	8.4	2.7	6.7	3.6	1.7	-0.9
Coconut	3.3	3.9	0.5	6.0	2.8	-2.1

[a]Source: (21).

all of the estimated 8.6 million hectares into cultivation would involve prohibitive costs as some of them have a slope of more than the conventional 20°. Moreover, cultivation of increasingly unsuitable land without adequate investments such as terracing increases the danger of erosion, which not only affects the land in question, but also threatens well-established cultivated land with silting and flooding.

Future expansion of cultivated areas is limited by other considerations. Certain areas should be left forested for logging or water catchment purposes. A certain proportion of presently cultivated land will be going out of cultivation through removal of topsoil. Big land owners are not hard-pressed to cultivate additional land as they are tempted to withhold land from cultivation for speculative reasons.

In summary, even if the land frontier has not been reached, it is sufficiently close to start thinking about increasing agricultural output through intensification of cultivation techniques.

Employment, Income Distribution, and Population Movements

Employment

Unemployment as a percentage of labor force in the Philippines is presented in Table 2.2, with the average figure from 1957 to 1968 being 7.3 percent. It can be easily seen that except for cyclical variations, the unemployment rate has remained fairly stable around the average rate. Any statement concerning the high rate of open unemployment in the Philippines, in relation to developed countries, should bear in mind that small changes in the definition of labor force or employment could result in significant changes in the unemployment rates calculated.

Table 2.3 presents some disaggregation of unemployment in the Philippines. The distribution as indicated in this table has been rather stable--at least since 1965 when such data were collected. The distribution indicates, as can be expected, high unemployment figures among urban population, and nonheads of households. Figures on age distribution of unemployment also indicate an extremely high rate among the younger age group, probably due to unemployed new entrants in the labor force. With a growth rate of the labor force in the region of 3 percent, the proportion of new entrants can be considerable, thus resulting in heavy unemployment in younger age groups. The number of new entrants into the labor force annually is approximately 800,000,

Table 2.2. Unemployment as a percentage of labor force in the Philippines[a]

Year	Unemployment rate (%)
1957	7.9
1958	8.2
1959	6.8
1960	6.3
1961	7.5
1962	8.0
1963	6.3
1964	6.4[b]
1965	7.1
1966	7.1
1967	8.0
1968	7.8

[a]Source: (46).

[b]Monthly date different from those used elsewhere in the series

Table 2.3. Measured rates of unemployment by household status groupings: August 1972 (in percent of labor force)[a]

	Total unemployment	Heads of household	Others				
			Total	Married	Never Married	15-24 years	25 years and over
Total	6.1	2.1	9.3	5.2	11.7	12.4	3.6
Male	5.7	2.1	11.4	8.2	12.0	12.0	3.4
Female	7.0	1.3	7.5	4.4	11.1	13.1	4.2
Urban	10.8	5.0	14.7	7.8	18.6	19.8	7.0
Male	12.4	5.2	24.1	15.6	26.8	26.9	7.8
Female	8.3	2.2	8.8	5.2	11.5	13.0	5.5
Rural	4.0	0.9	6.6	4.0	8.2	8.9	2.0
Male	3.1	0.9	6.6	3.6	7.1	7.2	1.4
Female	6.2	0.8	6.7	4.1	10.8	13.2	3.4

[a]Source: (21).

while annual withdrawals account for approximately 300,000.

Indicators of labor absorption capabilities of the Philippine economy show increased efficiency in labor utilization. In the early 1970's, more than half of the openly unemployed were looking for work for less than six weeks, a decline from a period of twelve weeks in the late 1950's. Meanwhile, the average work week increased from 40 hours to 45 hours. At the present moment, only about 3 percent of the openly unemployed have been without work for more than six months.

However, indicators on the performance of aggregate employment provide only partial, and sometimes misleading, evaluation of social welfare gains from development efforts. The pattern of labor absorption is a most important consideration. From a social welfare point of view it is desirable to have labor absorbed and reallocated to highly productive jobs while not creating too many disparities in productivity and earnings among different types of employment. In other words, employment, growth, and income distribution have to be evaluated simultaneously for social welfare considerations.

Table 2.4 presents structural changes in the sectoral pattern of employment between 1960 and 1971. As mentioned earlier, the mining sector was the high growth sector in terms of output during the 1960's. Accordingly, this sector increased its share of total employment, despite an increase in relative productivity. Sectors which showed an increasing share of employment, accompanied by significant decline in relative value added per employee, are construction, transportation, commerce and services. It is interesting to note that these sectors are characterized by large traditional subsectors in the Philippine economy. These

Table 2.4. Aggregate trends in sectoral net value added and employment: 1960-1971[a]

Sectors	Shares in Net Value Added and Employment					
	1960			1971		
	Net value added (1960 prices)	Employ-ment	Relative value added per employee	Net value added (1971 prices)	Employ-ment	Relative value added per employee
1. Agriculture	33.5	61.2	0.55	36.5	50.4	0.72
2. Mining	1.2	0.3	4.00	2.3	0.5	4.60
3. Manufacturing	19.6	12.1	1.62	19.8	11.5	1.72
4. Construction	3.6	2.7	1.33	2.6	3.4	0.76
5. Transport utilities	5.1	3.4	1.50	3.4	4.6	0.74
6. Commerce	17.1	8.8	1.94	14.2	12.4	1.15
7. Services	20.0	11.5	1.74	21.2	17.2	1.23
Totals	100.0	100.0	1.00	100.0	100.0	1.00

[a]Source: (21).

traditional sectors are capable of absorbing unskilled workers on a large scale mainly through work-sharing (partial employment), lower remuneration and lower productivity. The period of the 1960's was characterized in the Philippine history as the decade of heavy rural-urban migration. The migrants, mainly unskilled and overresponding to high expected earnings in urban areas, could not be completely absorbed into the modern sectors. They were therefore residually absorbed in the urban traditional sectors, or as manual workers, depressing labor productivities. Supportive evidence of this phenomenon is the rapid increase in employment of manual workers between 1965 and 1971, with the rate of increase being approximately 9 percent annually. As can be seen from Table 5.8, manual workers are heavily used in the sectors forestry, construction, transportation, trade, and services.

A high rate of rural-urban migration also implies a low rate of growth of rural agricultural employment. In the 1960's, employment classified as farm employment grew at a low annual rate of approximately 1 percent, while the rate during 1965-1971 was approximately 0.8 percent. This is in contrast to a growth rate of agricultural employment averaging 3.3 percent during the 1950's. Recall that the 1960's was a period of yield expansion. Thus the shift from land to yield expansion could be a push factor in rural-urban migration because of the decline in the growth rate of demand for labor implied in the switch.

On the question of underemployment, the increase in the number of hours worked per week from 1950 to 1970[1] certainly indicate an improvement in the extent of underemployment. However, most economists will agree

[1]See page 15.

that the problem is serious. The International Labor Office guesstimated open unemployment plus an inadequate income measure of underemployment to be in the vicinity of 25 percent (21). However, such figures should not be relied on too heavily in serious empirical work, as they serve merely as rough indicators.

Income distribution

Data on family income distribution, as calculated by the International Labor Office Employment Mission to the Philippines (21), is presented in Table 2.5. The table indicates that, before 1971, rural family incomes were distributed more evenly than urban family incomes. The table also indicates that, there is a deterioration of rural, urban and all family income distributions from 1956, when data was first collected, to 1965, by every indicator reported in the table. Share of the bottom 60 percent, for rural, urban and all families, declined significantly, while share of the top 10 percent for urban and all families increased. The situation was further aggravated by the increasing relative spread between rural and urban incomes, as the ratio of mean urban income to mean rural income increased from 2.45 in 1956 to 2.51 in 1965.

The worsening of income distribution from 1956 to 1965 was definite. The worsening trend in urban areas could be partly attributed to import substitution policies in the 1950's and early 1960's. Import substitution policies had resulted in high growth of capital intensive industries in urban areas, with little employment effects. Increases in incomes accrued to a narrow segment of highly paid skilled workers and capital owners, thus worsening the income distribution in urban areas. In the rural areas, the

Table 2.5. Indicators of income distribution in the Philippines by total rural and urban, 1956 1961, 1965 and 1971[a]

	1956			1961			1965			1971		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Quintile of families	Percent of total family income											
First 20%	4.5	7.0	4.5	4.2	5.9	3.8	3.5	5.0	3.8	3.8	4.4	4.6
Second 20%	8.1	11.1	8.0	7.9	11.8	7.5	8.0	9.5	8.0	8.1	8.9	9.4
Third 20%	12.4	14.7	12.2	12.1	13.5	12.1	12.8	15.3	12.0	13.2	13.9	13.4
Fourth 20%	19.8	21.1	20.0	19.3	21.9	19.5	20.2	23.0	18.7	21.1	21.8	21.9
Fifth 20%	55.1	46.1	55.3	56.4	46.9	57.1	55.4	47.2	57.5	53.9	51.0	50.7
Top 10%	39.4	30.1	39.6	41.0	31.1	40.9	40.0	30.0	41.7	36.9	34.4	33.4
Top 5%	27.7	n.a.	n.a.	29.0	n.a.	n.a.	28.7	n.a.	n.a.	24.3	22.6	22.6
Index of quintile inequality	0.44	0.34	0.44	0.46	0.36	0.46	0.45	0.38	0.47	0.40	0.41	0.41
Gini coefficient	0.48	0.38	0.49	0.50	0.40	0.52	0.51	0.42	0.53	0.49	0.46	0.45
Mean income, current pesos	1471	989	2427	1804	1203	2970	2541	1755	4405	3736	2818	5867
Index, current price	100	100	100	123	123	123	173	178	182	254	285	242
Index, constant price	100	100	100	111	110	111	126	130	133	117	132	111
Mean urban income/ mean rural income	2.45	--	--	2.47	--	--	2.51	--	--	2.08	--	--

[a]Source: (21).

slight worsening of income distribution could perhaps be explained by the increasingly uneven distribution of land, although empirical evidence in this respect is hard to come by. Meanwhile, expansion of cultivated areas in this period had kept rural-urban migration at a low level, which contributed to a slow growth of mean household income in rural areas, compared to urban areas. The widening rural-urban income gap, and worsening income distribution within both rural and urban areas, contributed to overall deterioration of income equality.

From 1965 to 1971, income distribution in urban areas showed a marked improvement, while distribution took a drastic turn for the worse in rural areas. By 1971, family incomes in rural areas were more unevenly, or just as unevenly, distributed than in urban areas. The worsening of rural income distribution can be partly attributed to the "Green Revolution", which had its main impact on incomes of large farmers. Incomes of small farmers were only marginally affected, thus worsening income distribution. The impact of the "Green Revolution" can also be seen in the rapid rise of mean rural family income, causing a substantial decline in the ratio of mean urban income to mean rural income.

The improvement of urban income distribution can be partly explained by the reduction in the growth rate of manufacturing. By the late 1960's, although import substitution was the official policy, the program was plagued by lack of substitution possibilities, and a series of balance of payments difficulties. Therefore, employment generation in the high income manufacturing sector was slowed down. The increased influx of rural-urban migrants in this period was largely absorbed in the construction, transportation, commerce and services sectors, through reduction or

slow growth of labor productivities. Consequently, the proportion of employment in these sectors increased. The proportion of manufacturing employment in total employment excluding agriculture, declined from approximately one-half in 1960 to less than one-third in 1971. Overwhelming increase of employment in the low income sectors (construction, transportation, trade and services) resulted in an improvement of the Lorenz coefficient despite a widening labor productivity gap between the manufacturing sector and the low income urban oriented sectors.[1]

A high growth rate of total agricultural income, versus a slow growth rate of total manufacturing income, reinforced by rapid rural-urban migration, had resulted in a high rate of growth of mean rural household income compared to mean urban household income. This narrowing of rural-urban income gap, and improvement of urban income distribution, contributed to improvement of overall distribution, despite a worsening rural income distribution.

Recent Developments

On September 22, 1972, citing deteriorating political, social and economic conditions, President Marcos declared martial rule in the Philippines.[2] Increasing communist oriented subversive movements, corruption of government officials, high crime rates, food shortages, balance of payments difficulties etc. had caused an unstable political situation. Sweeping political, constitutional, social and economic reforms were proposed.

[1]See Appendix A for a more rigorous demonstration.

[2]It is widely argued that martial rule was declared to allow President Marcos to remain in power while the constitution prohibited him from running for a third term as President. Martial rule effectively converted the Philippines to a dictatorial state.

Most dramatic and sensational were the purges of corrupt government officials, imposition of midnight to 4 a.m. curfews, collection of firearms and new gun control laws,[1] imposition of severe penalties for various crimes such as drug peddling and smuggling, and crackdown on various crimes and criminals. These steps have resulted in a dramatic drop in crime rates, especially in urban areas.

Economic reforms were many, but their effects are still difficult to gauge at this early stage. Reforms can be classified as efforts to i) increase food production; ii) increase exports; iii) increase available savings and capital inflows for investment purposes; and iv) eliminate urban unemployment and other social problems.

Increasing food production is one of the top priorities of the Philippines government, because of recent bad crop harvests and price increases of food imports. A major step in this direction is the proposed agrarian reform--a program seeking to free some 450,000 tenant rice and corn farmers from old tenancy practices--with the hope of increasing food production and income equality in rural areas. Agrarian Reform Secretary, Conrada Estrella reported that as of June 30, 1973, 500,000 hectares of riceland had been transferred to some 270,000 tenant tillers. Another 300,000 hectares were due for transfer to another group of 150,000 farmers by the end of 1973. At the completion of this land transfer program, it will have involved roughly 80 percent of the estimated 700,000 landless farmers.

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[1]Some 200,000 firearms and 1.3 million rounds of ammunitions were voluntarily surrendered by their civilian owners when the October 25, 1972 deadline expired. Various arm caches of political warlords were dug up.

The impact of the land reform program has yet to be felt. Together with the "Green Revolution" policies, it can have great potentials in terms of income and employment growth, and improving income distribution in the rural areas. However, most observers feel that the step was taken to neutralize a rural oriented communist movement, mainly supported by landless farmers. Most affected by the land redistribution were medium size landlords. Larger landowners, with political influences, were usually not affected. Moreover, as the reform applies only to "tenant farmers of private agricultural land primarily devoted to rice and corn under a system of sharecrop or lease tenance...", its impact in the agricultural sector is restricted. Excluded from the reform are tenant labor on other crops (notably coconuts) and hired landless labor, regardless of the crop (but notably sugar cane).

In an effort to extend credit to small farmers, the Philippine National Bank was streamlined administratively, and its capital stock increased from 300 million pesos to 1 billion pesos.

The effort to increase export earnings was directed through the Department of Trade, as an 'Export Trade Offensive'. Export diversification from traditional export products like copra, timber and sugar to new ones like bananas, handicrafts, manufactured goods was the stated official policy. Trade centers in key cities around the world were established to promote exports.

Export diversification is still at its infant stage. However, improved world prices of traditional export products in early 1973 had resulted in an export surplus of 453 million U.S. dollars, compared to 3 million U.S. dollars during the same period in 1972.

Export of light manufacturing products is closely related to inflow of foreign capital and technology. Steps taken to encourage inflow of capital to take advantage of cheap labor and natural resources are: i) foreign investors may repatriate their capital and remit profits without limit; ii) waiving of visa requirements for visiting businessmen; iii) various tax incentives for foreign capital; and iv) creation of assistant teams in the Board of Investments to service foreign investors and recommend changes that will reduce 'red tapes' involved in foreign investments. These steps, together with political stability perceived by foreign investors, had resulted in an increase of 171 percent in foreign investments, as reported by the Bureau of Investments.

Domestically, the effort to increase investible surplus relates to a tax collection campaign. There were increased tax collection efforts, and penalty for nonpayment of taxes. Income taxes and customs collections increased by 46.42 percent during the 1972-73 fiscal year. A tax amnesty was declared whereby hidden wealth declared will be taxed with no questions asked as to their origins.

In urban areas, efforts were made to resettle the squatter population. In Manila, four settlement areas were established and 60,000 squatter families relocated as of September 1973. In the field of education, two reforms stand out. Firstly, a standard college entrance examination was proposed to eliminate substandard college and college graduates. Secondly, increased enrollment of minorities, such as Muslims from Mindanao, was proposed, by increases in scholarships available to these groups.

As mentioned before, an evaluation of the whole economic reform package is difficult at this stage. However, overall performance depends critically on two areas. First, the performance of the rural and agricultural programs in terms of income growth, distribution and food production is critical because of the sheer size of the rural sector and political sensitivity to food prices. Secondly, the ability of foreign investments and manufactured exports promotion programs to solve the urban employment problem is also critical.

Hopefully, the consistency model that we will construct will be able to predict the impact of these policies such that any undesirable characteristics and influences can be corrected in time.

Summary and Conclusions

We have briefly outlined the growth of the Philippines economy from independence after World War II to the early 1970's. Industrial and balance of payments policies in this period was characterized by import substitution. While these policies had generated high industrial growth rates, increasing unequal income distribution was the result. Difficulties were encountered with import substitutions in the late 1960's because of limited substitution possibilities and balance of payments constraints.

Agriculture was characterized in the 1950's by expansion of cultivated areas and high employment growth. The closure of the land frontier and the 'Green Revolution' in the 1960's replaced increases in cultivated areas with yield increases. Increases in rural incomes accrued mainly to large and progressive farmers. Employment generation associated with the

new techniques of farming was disappointing. Consequently, income distribution deteriorated in rural areas in the late 1960's. As the employment effect was marginal, the push effect on rural-urban migration was considerable, causing increased rural-urban migration. Migrants were generally absorbed in the construction, transportation, commerce and services sectors, causing slow growth of labor productivities in these sectors. A decline in the relative size of the high income manufacturing sector resulted in an improvement in urban income distribution.

The trade-off between income distribution and growth in the Philippines was clearly illustrated in past economic performance. A high rate of productivity growth in the agricultural sector resulted in worsened income distribution. In the urban sector, slower growth of manufacturing resulted in improved income distribution. However, the trade-off between income distribution and growth, a severe constraint on economic development, was the result of policies pursued. Agricultural transformation policies directed at large and progressive farmers can only imply growth with narrow participation. Industrial policies aimed at capital intensive import substitution can only result in high capital incomes, and marginal employment generation for highly paid skilled workers whenever growth occurs.

Future development policies should be aimed at overcoming this unnecessary and arbitrary constraint, by directing growth efforts at extensive labor intensive, mass participation projects. Two important groups in the Philippines can be singled out in this connection. Firstly, the rural small traditional farmers and landless laborers, which consist of more than half (a conservative estimate) of agricultural employment.

This group of approximately 3 to 4 million people in the labor force has to be utilized effectively in future development efforts. The second group, is the urban traditional workers in construction, transportation, commerce and services. Industrialization and urban income growth policies should be directed at efficient utilization of this group. Income and productivity growth of these two segments of the labor force will contribute to both objectives of growth and equity.

Recent declaration of martial rule and economic reforms provided indications of a shift in official policies in this direction. Substantial improvements in income distribution and employment performances depend on effective and sustained implementation of the policies proposed.

The next chapter will be devoted to a general discussion of modern and traditional sectors, with the hope of proposing policies directed at improving both growth and income distribution.

CHAPTER III. THE GROWTH AND EQUITY PROBLEM AND CONSISTENCY MODELS

The issue to be explored is modern economic growth in developing countries without mass participation. It is usually referred to as the income distribution and employment problem of developing nations because its main symptons are: increasing (or high) unemployment and underemployment; and deterioration of income distribution despite high rates of economic growth. These are the general characteristics, although variations among countries are great.

A Two Sector Model

The origin of the problem is best explained by a two sector dualistic model, on which most past development policies were based. The developing country is subdivided into two sectors: modern and traditional. The modern sector encompasses all modern firms which are best characterized by combinations of one or more of the following characteristics: modern technology; modern output; high capital intensity; low proportion of self-employed and unpaid family workers; utilization of credit facilities; high wages, etc. Conversely, the traditional sector is composed of traditional units of production which are highly unorganized, household or family oriented, using labor intensive technology, paying low wages, small in scale, and seldom utilizing credit facilities provided by modern financial institutions.

The modern and traditional sector should not be identified with urban and rural areas respectively, nor should they be identified with manufacturing and agriculture respectively. This point is best illustrated by the Philippines economy. In the rural areas, the modern sector consists of heavy metals mines (chromite, copper, etc.), capital intensive large scale fishing operations, large scale logging operations, large sugar cane, pineapple and abacca plantations, and various progressive farmers. The traditional sector in rural areas consists of traditional activities such as salt evaporating, quarrying, small scale fishing, hunting, and various subsistence farming, producing rice, corn and most of the livestock. The traditional sector in urban areas consists of small sari-sari (general) stores, small contractors, vendors, domestic servants, small china and pottery factories, etc.. It can be seen from the above examples that in almost all major sectors of the Philippines economy, modern and traditional subsectors can be found.

Underdevelopment can be easily characterized by a large traditional sector. Economic development, conversely, is the process of modernization, whereby the traditional sector is eliminated or reduced, and the economy becomes dominated by the modern sector with all its implied social attitudes and institutions.

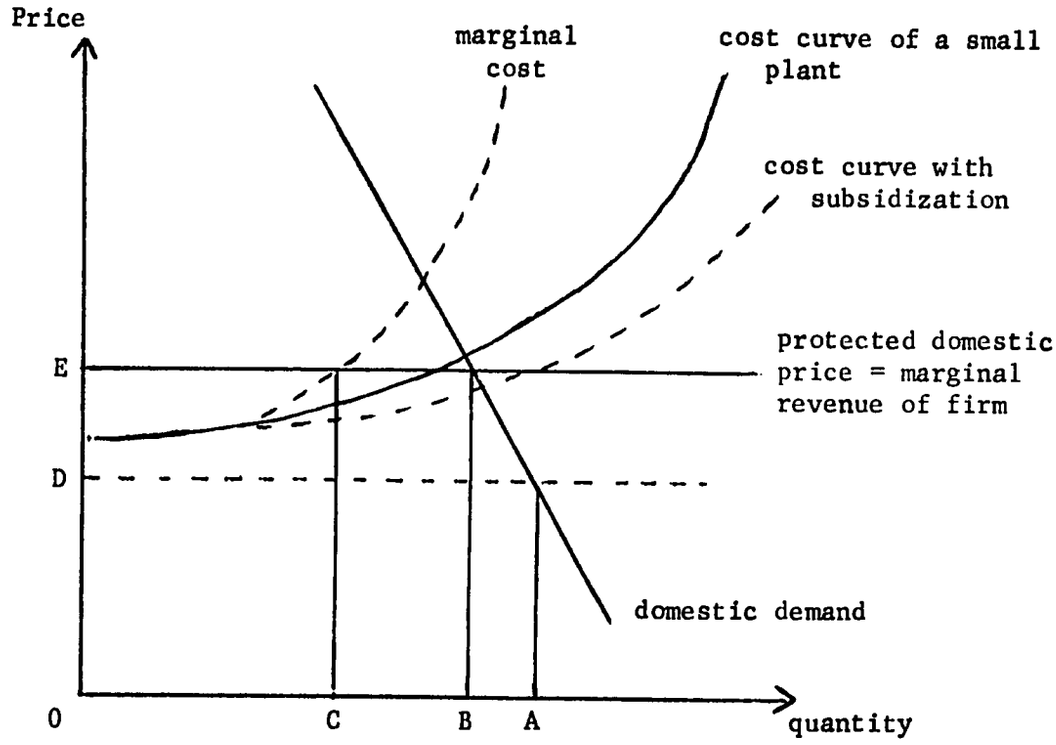
The modern sector

Firms in the modern sector can be further classified into efficient and inefficient modern firms. Inefficient modern firms are those whose existence depends on protection from foreign competition in the form of imports, i.e. their existence at world prices for their output, and

domestic prices for their inputs (at equilibrium exchange rate) is doubtful. Figure 3.1 demonstrates how the existence of such firms is the result of protection from foreign competition achieved by a high tariff wall. Figure 3.2 illustrates the case of protection achieved by an import quota system. Note that world or import price for the output is at a low level relative to the supply curve because of the existence of large scale plants, realizing huge returns to scale, in industrialized countries where markets are deep. Further, no exports are generated because domestic price is above import price by assumption. Also note that in Figure 3.1, a policy of subsidization of inputs, tax incentives, rapid depreciation, etc. will have the effect of shifting the supply curve to the right, thus realizing a higher level of output, lower level of imports, and lower domestic prices.

Examples of such inefficient modern firms are the small steel plant, fertilizer plant, and automobile assembly plants in most developing countries. The automobile assembly plants are encouraged by high import tariffs and/or low import quotas on completed automobiles but not on parts. In the absence of such protectionist policies, the complete automobile will probably be assembled at the site of production.

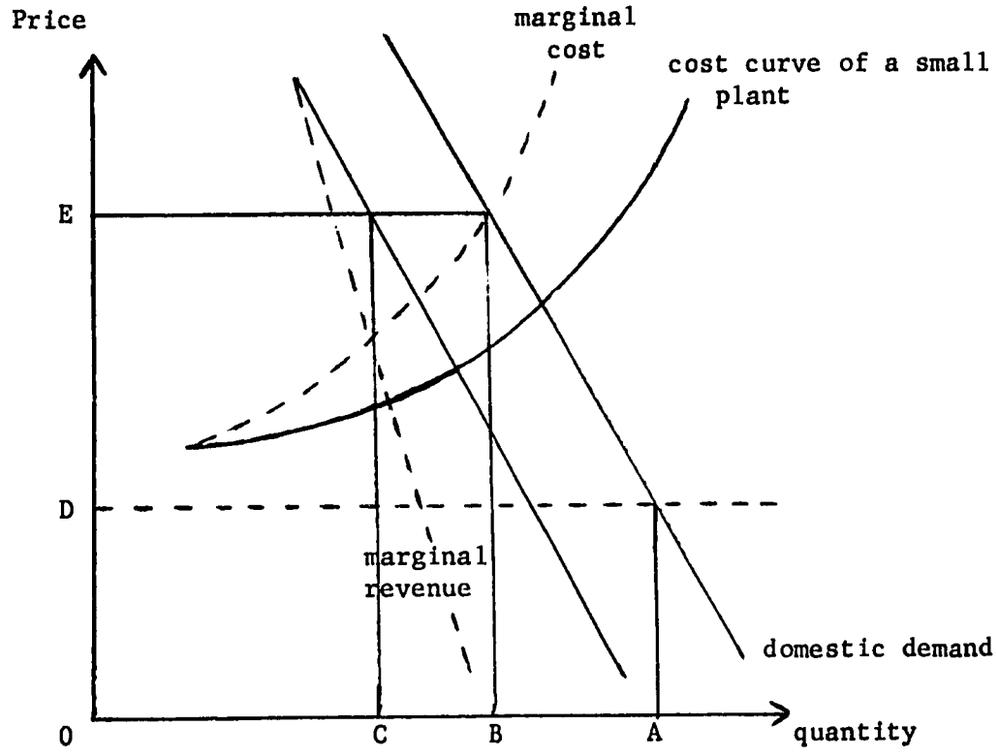
Efficient modern firms can be defined as those whose existence does not depend on protection from foreign competition and imports. In fact, a substantial proportion of foreign exchange earnings can be accounted for by these firms. High capital intensities of these firms need not depend on the assumption of factor price distortions, often invoked by economists. We shall present two explanations of high capital intensities, after which examples of efficient modern firms will be given.



Legend:

OA = import and domestic consumption at import price
OB = domestic consumption at protected price
OC = domestic production at protected price
CB = import with protective tariff
DE = tariff per unit import
OD = import or world price
OE = protected domestic price

Figure 3.1. Inefficient firm under tariff protection



Legend:

OA = import and domestic consumption at import price
OB = domestic consumption with import quota
OC = domestic production with import quota
CB = import quota
OD = import or world price
OE = protected domestic price

Figure 3.2. Inefficient firm under import quota protection

The discussion will assume that price of capital in developing countries is similar to price of capital found in industrialized countries. Firstly, prices of capital goods are similar in most countries except for differences due to transportation charges. Capital goods are usually produced in industrialized countries, and most developing countries do not place heavy import restrictions on capital goods. Then, given free flow of capital between developed and developing countries, this assumption can be easily defended as being realistic.

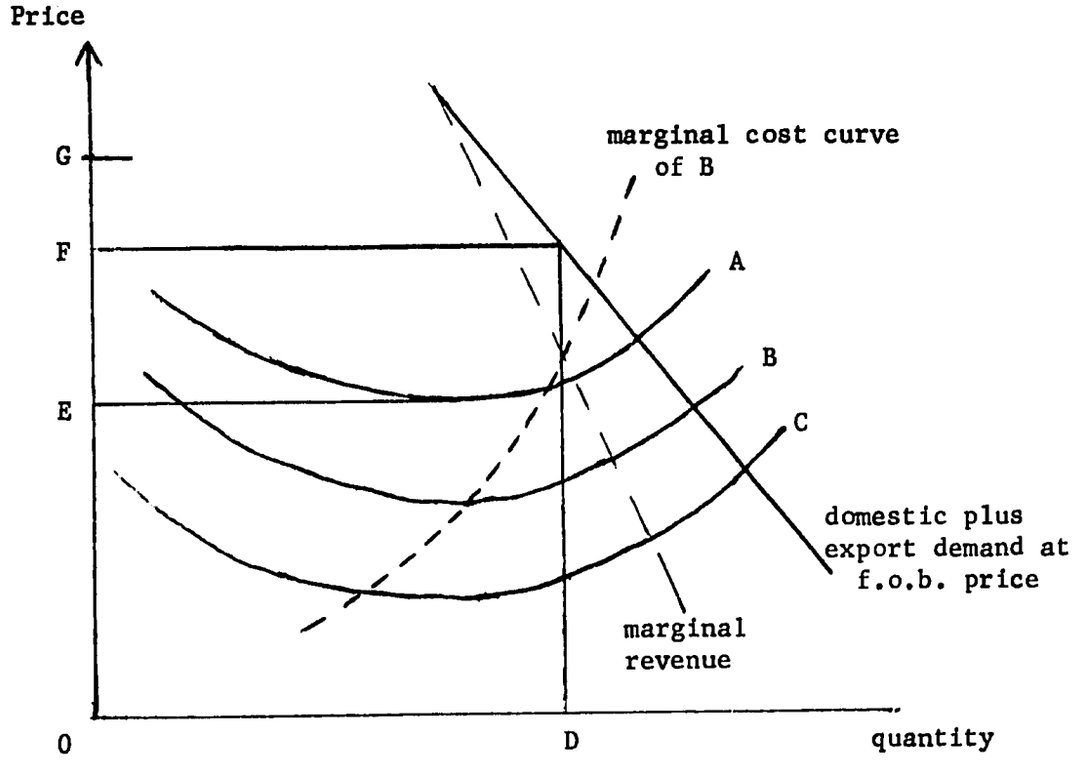
Given a certain product, suppose that demand (both domestic and export demand) considerations in a developing country are such that output price at a developed country can be obtained for production in the developing country at the scale of production in the developed country. It then becomes profitable for the entrepreneur in the developed country to duplicate, in the developing country, the plant found in the developed country. In fact, a higher profit rate, than that obtained in the developed country, can be expected because while price of output and capital remain the same, prices of labor inputs are lower. Note however, the firm is not following a cost minimization policy by mere duplication, if substitution between capital and labor can be easily achieved. A decline in the relative price of labor implies a more labor intensive technique of production.

In general, factor substitution is not encouraged because of the following reasons. Firstly, no substitution possibility might exist. Secondly, the techniques transferred are capital intensive, originally developed given factor prices in industrialized countries. A labor intensive technique, if available, can only be found and adopted after

extensive research, retooling and engineering work involving high expenditures. Thirdly, such firms because of the small market in developing countries, are usually in a monopolistic position. They therefore do not face competition from other producers, and hence have no incentive for cost minimization.

Figure 3.3 summarizes our argument for the existence of such efficient capital intensive firms. Note that the possibility of exports has been incorporated in the diagram, which shows a case of high import prices. Using this diagram, we can describe certain characteristics of these firms.

Firstly, it can be easily seen that efficient modern industries should show no large returns to scale. The absence of large returns to scale preclude the possibility of low cost production in developed countries where the markets are deep. Hence, import prices are not depressed. The absence of large returns to scale also allow for efficient small scale production for the shallow market in the developing country and surrounding areas. Secondly, high transportation cost of the finished product will increase the spread between cost of production and import price, thus encouraging the appearance of such industries in developing countries. However, if transportation cost per unit of output is low, exports are encouraged. In certain cases, total output can be completely exported to developed countries. Thirdly, resource endowment in the developing country should not be such as to prohibit production. This factor embraces such things as the existence of certain natural resources, availability of labor and entrepreneurs with the required skills, correct climatic conditions, etc.



Legend:

A = cost curve of firm in developed country (cost minimization)
B = cost curve of firm in developing country using same technique as in A
C = cost curve of firm in developing country under cost minimization
OE = equilibrium price in developed country
OG = import price
GE = transportation charges per unit
OF = domestic price and f.o.b. export price
OD = domestic production = domestic consumption + exports

Figure 3.3. Capital intensive efficient modern firm

The availability of savings and foreign exchange can be a serious constraint in the development of modern efficient industries. However, the transfer of technology can be closely associated with inflow of foreign capital. Export potentials of these firms are high and can easily generate the necessary foreign exchange for repatriation of profits.

We are now ready to give examples of industries fitting the above description. Note that in all the examples given, economies of scale is negligible or absent. Efficient modern industries whose existence depend heavily on high transportation costs, and therefore avoid competition from foreign imports are bottled beverages, soaps, tooth paste, cement, concrete products, etc. Other industries which depend on low transportation cost for export to markets in developed countries are electronic components, textiles, clothing, footwear, etc. Industries that are efficient because of the close association between localities of production and consumption are modern airlines, banking, insurance, newspapers, and various professional services. Efficient modern firms due to natural resource endowment are heavy metals mining, oil exploration and production, fruit canning, etc.

Output from modern firms, efficient and inefficient, described above can easily be differentiated from output from the traditional sector. We have yet to explain the simultaneous existence of modern and traditional firms producing exactly the same output. Examples in the Philippines are export crops such as coconuts, pineapples produced by large scale plantations and small holdings; small and large scale logging operations; and traditional and modern rice farmers. This phenomenon can be partly explained by recognizing the state of affairs as being a disequilibrium

situation, where the more efficient firms will dominate the industry in the long run. In industries where scale of production, and technique of production have no appreciable impact on costs, the existence of both modern and traditional firms can be largely explained by ownership and distribution of natural resources. This factor is especially important in the logging industry where logging rights are granted as political favors.

Factor price distortions As we have argued earlier, high capital intensity in the modern sector does not depend on the assumption of factor price distortions in favor of capital goods. High capital intensity can be explained by profitable transfer of capital intensive technology to developing countries, monopolistic positions of modern firms, limited substitution possibilities, and high costs involved in the search for labor intensive technologies. However, if price distortions do exist, this will tend to induce nonoptimal mix of inputs, and retard the efforts to locate labor intensive technologies.

Most economists will agree that factor price distortions are common occurrences in most developing countries, primarily as a result of overvaluation of foreign exchange rates. As most capital goods are imported, and not usually subjected to import restrictions in the form of high tariffs, an overvaluation of exchange rate will result in a subsidy to capital goods purchasers, at the expense of consumers of imported goods. Other policies that can result in subsidization of investments in capital goods are subsidized loans at low interest rates, accelerated depreciation of capital, and various tax incentives for investments.

The impact of factor price distortions on capital intensity will be more pronounced in the modern sector, as compared to its effect on the traditional sector. The use of modern capital goods is limited in the traditional sector. The lack of credit institutions in rural areas, limited information, illiteracy, etc. have in effect alienated a large segment of the traditional sector from taking advantage of various capital subsidization programs.

When substitution possibilities exist, factor price distortions will result in nonoptimal factor mix. When substitution possibilities do not exist, factor price distortions will reduce expected returns from search of labor intensive technology, and therefore will retard efforts in this direction.

The traditional sector

It would be false to say that the traditional sector is static in terms of growth. In the Philippines, traditional agriculture has grown because of expansion of cultivated areas, and increases in demand for food due to income and population growth. Especially dramatic is the growth of urban traditional services such as vendors and domestic servants.

However, growth in the traditional sector is best characterized by "extensification" with little change in techniques of production and labor productivities. For example, growth of the agriculture sector in the Philippines during the 1950's was achieved mainly through expansion of cultivated areas, absorbing large quantities of labor. The closure of the land frontier in the 1960's severely constrained this type of "extensification". Increases in output were produced by larger and more

progressive farmers through productivity gains and yield increases, thus creating a worsening of income distribution in the rural areas.

Growth in the traditional service subsector is not constrained by limitations of natural resources or land. Responding to a high growth rate of demand because of growth in per capita income and high income elasticity of demand for such services, high growth rates of traditional services can be achieved. Increases in supply of traditional services can be easily accounted for by the large influx of rural-urban migrants, expecting to be absorbed into the urban modern sector. Employment in the modern sector not only brings higher monetary rewards, but also advancement in terms of social status. Mass education in rural areas and appearance of mass communication media such as radio, movies, television and magazines, no doubt contributed to the formation of high expected income and social status related to urban employment, thus contributing to rural-urban migration. Capital requirement in the traditional service sector is also minimal. Further, most capital goods required are traditional in nature and can be easily produced domestically or by the service workers themselves. Savings required for investments in such capital goods are usually generated within the traditional sector itself. Therefore, savings and investments represent no serious constraint on the growth of supply in the traditional service sector.

Growth of the traditional manufacturing subsector is very similar in nature to the growth of traditional services, although a slower growth rate is implied by the lower income elasticity of demand for output from this sector. Besides facing the constraint of land availability, growth of the traditional agricultural sector is also severely limited by the

slow growth of demand implied by Engel's law stating that the income elasticity of demand for food is less than one.

The impact of technological innovation in the traditional sector had been marginal in the past. Government sponsored agricultural transformation programs had, as a matter of policy, affected the larger and more progressive farmers. In the traditional service and manufacturing subsectors, the need for technological progress has not been felt. Increases in demand can be met by "extensification" of production, involving abundant resources such as labor and traditional capital goods. Further government had not encouraged technological progress in these two subsectors.

It is generally believed that underemployment in the traditional sector is high, and the sector can therefore be considered as a pool of surplus labor. Empirical studies or evidence on this subject are conflicting, and usually concerned themselves with the marginal product of labor in traditional agriculture. To the casual observer, the unorganized nature of production, high proportion of unpaid family workers, long leisure hours, etc. is sufficient evidence for the conclusion of high underemployment. However, with production centered around the household, and all capital owned by the household, the concept of regular working hours cannot be applied rigorously. The relationship between head of household and unpaid family workers is not the same as that between employer and employee. The participation of unpaid family workers should not be interpreted as zero wage and therefore zero marginal product of labor. Besides receiving renumeration in kind, unpaid family workers are

motivated by family ties, obedience to parents, and expected inheritance of family enterprise. Further, the proportion of production for home consumption is high, especially in agriculture and fisheries. Work in these activities should be taken into consideration in the calculation of labor utilization, although they produce no visible output for commercial sale. Long leisure hours can be explained by low marginal product of labor, hence resulting in rational choice for large consumption of leisure. Taking all these factors into consideration, it can be safely concluded that underemployment in the traditional sector is usually overestimated.

A more general and correct interpretation of underemployment in the traditional sector is the availability of labor to be reallocated to other more productive sectors, rather than idleness of labor in the traditional sector. With low labor productivities and incomes, the traditional sector represents a potential pool of labor resources available if complementary resources could be attracted.

The pressing problem of efficient labor utilization in the traditional sector is that of seasonal unemployment. In areas of seasonal demand for agricultural labor, and where fishing patterns are strongly affected by monsoon winds, the problem can be acute. Profitable activities, which has a labor demand pattern countercyclical to that of agriculture and fisheries, are hard to come by.

The Growth and Equity Problem

Past development policies were based on the premise that economic development can be achieved through industrialization. In the Philippines, given the balance of payments problems in the 1950's, a policy of import substitution was adopted to simultaneously satisfy both objectives of balance of payments adjustment and economic development.

As a consequence of import restrictions, high growth in the manufacturing sector was generated. Growth was characterized by the appearance of highly protected industries, or modern inefficient firms by our earlier definition. These firms were characterized by high capital intensity and low employment generation. Further, employment generation was limited to high income groups, especially skilled workers and entrepreneurs. Low employment generation was generally attributed to high capital intensity, which in turn was attributed to factor price distortions by various investments subsidization programs.

Although lowering of capital intensity would have induced larger employment generation, it is plausible that low employment generation was partly due to import substitution policies themselves. Growth of inefficient or protected industries was limited by growth in domestic income. Export markets were precluded as these firms were not competitive internationally. Hence, low employment generation was directly caused by import substitution policies.

Note, however, industrialization based on modern efficient firms is not subjected to this constraint. Even if employment generation per unit of output is small because of high capital intensity, "extensification" of

efficient industries into export markets can provide substantial employment generation. Further, being efficient firms or firms having a comparative advantage in international trade, these firms rely heavily on unskilled or easily trained labor which is abundant in developing countries. Employment generation in these low income groups will contribute significantly to the overall development effort.

We now examine the basis of the conflict between past economic growth and income equality. As the modern sector in developing countries consists of a small proportion of the total population, any growth in size of the modern sector will imply a worsening of income distribution, as measured by the Lorenz coefficient of inequality. This assertion is proved rigorously in Appendix A under the assumption of a constant ratio of per capita income in modern to traditional sectors. The appendix also shows that as the proportion of population in the modern sector becomes larger, any growth in size of the modern sector will result in greater equality of income distribution as measured by the Lorenz coefficient. Therefore, as past economic growth did not result in narrowing the income gap between modern and traditional sectors, it had resulted in greater inequality of income distribution, as measured by the Lorenz coefficient.

This phenomenon is closely related to the measurement of income dispersion by the Lorenz coefficient. The Lorenz coefficient implicitly assumes that the mean income is best, and a coefficient of zero is achieved only when all persons in the economy have the mean income. As Morley and Williamson (30) pointed out, in the case of a developing economy, this implicit assumption is equivalent to the assumption 'misery loves company'.

In a predominantly traditional economy, overall mean income is closer to mean income in the traditional sector. A small shift of population out of the traditional sector will hardly affect overall mean income because of the heavier weight of the traditional sector in terms of population. However, deviations from the mean are increased because mean income in the modern sector, compared to mean income in the traditional sector, is further away from overall mean income. Therefore, the Lorenz coefficient of inequality becomes larger. A similar argument will show that growth of the modern sector will improve income distribution if the modern sector is dominant.

Other measures of income dispersions, such as that proposed in the last half of Appendix A, may not show a trade-off between income distribution and growth during the initial phase of growth. This is clearly the case if we let the set A in Appendix A denote modern characteristics. Note that this is not to say per capita income growth in the traditional sector will not improve income distribution as measured by the index suggested in Appendix A.

The relationship between modern growth and worsening of income distribution (as measured by the Lorenz coefficient) can be broken if growth in the modern sector also implies narrowing of the income gap between modern and traditional sectors. In this connection, growth based on modern efficient firms, preferably export oriented, mentioned earlier is important. High growth and high employment generation in the efficient modern sector will primarily draw its labor supply, as unskilled or easily trained labor from the traditional sector. Having to compete with the modern sector for its prime resource, unskilled labor, the traditional

sector will have to resort to technical progress or increase in labor productivity if demands are to be met. In this manner, the income gap between modern and traditional sectors can be narrowed and the link between growth and worsening of income distribution be broken. An export orientation to growth is desirable as imports of capital goods will continue to be important for growth in the modern sector. Further, the export orientation will stimulate growth in industries with comparative advantage internationally and hence have a high content of unskilled or easily trained labor.

To achieve a heavy export orientation, it may be necessary to rely on financing by foreign capital inflow. Foreign investments, and hence foreign ownership of production processes, will allow easy entry of products into foreign markets. This is especially true if foreign investments are undertaken by multinational corporations with well-established world wide marketing systems. Thus, reliance on foreign capital will partly solve the difficult problem of foreign marketing related to an export drive involving mainly new products. Reliance on foreign savings also increase total investible savings, and hence a higher GDP growth rate.

In anticipation of the need for productivity increases in the traditional sector, the government can undertake programs to stimulate technical progress in the traditional sector. The 'Green Revolution' policies aimed at labor productivity in agriculture should be reorganized and redirected at traditional farmers. Various social overhead capital such as irrigation projects and transportation systems should be constructed. In traditional services, past experiences have indicated that increases in

labor productivity can be achieved by entrepreneurs without any help from government.

We have essentially outlined a broad framework of economic development designed to generate both growth and income distribution. It consists of the following elements: i) high growth of the modern efficient sector, preferably export oriented; ii) large absorption of unskilled and easily trained workers into the modern sector; and iii) productivity increases in the traditional sector. The positive role of the government is to facilitate this pattern of growth. Specific government actions can be, for example: i) "extensification" of 'Green Revolution' policies to include traditional farmers; ii) facilitate and encourage inflow of foreign capital to finance growth in the efficient modern sector; iii) provide social overhead capital such as electricity, roads, ports, education, etc. needed for the growth of the modern sector; and iv) encourage rural-urban migration, and hence absorption of traditional workers in the modern sector. In order to avoid various urban social problems such as urban slums and high crime rates, the rate of rural-urban migration must be consistent with labor absorption in ii) above. Rural-urban migration can be encouraged by such government policies as availability of mass media such as radio and television in rural areas, and increase of education level in rural areas.

The rest of this dissertation is devoted to the construction of a consistency model for the Philippines, and testing on an empirical level, the policies proposed above. As there had been past work related to the use of consistency models for the analysis of income distribution, growth,

and employment policies, we shall devote the second half of this chapter to a brief review of literature.

Consistency Models

A consistency model consists of essentially four main elements: i) sectoral demand; ii) sectoral supply and employment; iii) income distribution; and iv) sectoral output and growth. The incorporation of these four components makes the consistency model most suitable for the analysis of questions posed in the first half of this chapter. The model is especially useful when sectoral disaggregation is along the modern-traditional line described earlier.

In the real world, these four elements are interdependent, and a consistency model should reflect this state of affairs. However, lack of data usually limit the incorporation of such complex interactions, and most authors limit themselves to the study of certain aspects of this complex system. For example, Morley and Williamson (30) studied changes in income distribution and employment as caused by changes in demand resulting from import substitution policies. The effects of changes in income distribution on sectoral output and employment were studied by Thorbecke and Sengupta (45); Weisskoff, Levy, Nisonoff and Wolff (48), Paukert, Skolka and Maton (38), etc. Some conclusions on labor absorption and sectoral employment can be gained by the study of sectoral production functions with emphasis on substitution possibilities. These are too numerous to mention but a few related to developing countries are Eriksson (10), Katz (23), Sicat (41) and Oyelabi (36).

The most comprehensive consistency models are those developed by the International Labor Office (ILO) (16) for Iran, and by Thorbecke and Sengupta (45) related to the Colombian economy. Using essentially Leontief models, income distribution and sectoral output were derived endogenously. Sectoral employment were related to sectoral output by the use of exogeneous labor productivities. In the ILO model, a supply constraint check was done to determine the feasibility of projected growth rate.

It should be mentioned that analysis of growth, employment and income distribution problems is by no means limited to studies using consistency models. The ILO conducted a series of comprehensive employment missions to various developing countries which resulted in a series of impressive reports (13), (14), (15), (17), and (21) on employment, income distribution and growth problems. Though comprehensive in nature, some of these reports lack rigorous empirical basis for their recommendations. Thorbecke (44) wrote that at least in some of these reports, the policy recommendations could have been substantially strengthened by the use of intersectoral consistency frameworks for projection purposes.

The demand component of a consistency model essentially consists of a Keynesian macroeconomic model for the projection of demand aggregates such as consumption, investments, exports, imports, government expenditures, etc. These aggregates are then broken down into sectoral components by the use of sectoral demand elasticities, sectoral expenditure functions, or constant proportions, thus constructing a final demand vector F. This vector can then be incorporated into a Leontief input-output model. Sectoral output necessary to satisfy this demand vector

is then calculated by the formula

$$X = (I - A)^{-1}F$$

where X is the vector of sectoral output and A is the matrix of technical coefficients. Sectoral value added, assumed to be a constant proportion of sectoral gross output, is then calculated. Using constant growth of sectoral labor productivity, sectoral employment, possibly by occupational groups, is also calculated. From these data, income distribution is then constructed assuming certain behavior of sectoral income distributions. The impact of any changes in income distribution on sectoral consumption can now be calculated, and a consistency check made. If serious inconsistencies arise, the model can be iterated until consistency is achieved.

Note that certain relationships, such as the effect of income distribution on sectoral allocation of consumption, necessarily imply nonlinear functions. Solution of the model can only be achieved by iteration in certain cases. However, in the ILO model for Iran (16), linear segments were used to approximate nonlinear functions, resulting in a linear model. Endogenous variables, including income distribution, were then solved by finding the solution to a set of simultaneous linear equations.

We now briefly review difficulties encountered by authors of previous models. Such a review is necessary for the purpose of incorporating improvements in the consistency model to be proposed in the next chapter.

Supply constraints

Authors of previous consistency models realized that a major disadvantage of their models is the lack of supply constraints. Although employment was calculated, and was checked against available labor force, the labor supply constraint was usually not binding in most developing countries where labor is abundant. The critical constraint was the supply of capital goods--both domestically produced and imported. Therefore, projections without taking this factor into account could lead to serious complications. For example, constrained projection of personal income for Iran by the ILO (16) was 12 percent lower than unconstrained projections.

In the ILO study for Iran, the imposition of supply constraints was achieved by converting the model into a supply determined model. Growth of sectoral supplies were estimated independently. Interaction between supply and demand was not taken into account explicitly. This approach is similar to neoclassical growth models where evolution of the economy is completely determined by investment and population growth.

Given supply capacities, and demand levels, two types of interaction between supply and demand are usually incorporated in economic models. Price adjustment models rely on the assumption that supply and/or demand are functions of prices. Equilibrium between supply and demand is then achieved, provided some stability conditions are satisfied, by adjusting prices. Stock adjustment models are recursive in nature. Discrepancies between supply and demand are accumulated or drained as stocks. Supply and investment behavior in the next period is then assumed to depend on the relation between expected demand and stock levels. Again, if certain stability conditions are satisfied, long run equilibrium of supply and

demand can be achieved. It is also feasible to merge both price and stock adjustments by assuming some partial price adjustment mechanism. For example, the assumption that price changes are proportional to excess demand is usually made. Note that price equilibrium is not achieved instantaneously as in a pure price adjustment model. Stock accumulations and decumulations are allowed.

In a dynamic model, dynamic supply changes are most difficult to simulate. Difficulties can be expected in the simulation of sectoral investments, productivity growth and in particular, the relationship between these two variables. Most studies, for example (45), (16), and (24), simply assume exogenous growth rates of labor productivities. This simplification is understandable given that data on sectoral investments and capital stocks are nonexistent in most developing countries.

Sectoral disaggregation

It is desirable that sectoral classification in the consistency model be based on a modern-traditional breakdown. Such a disaggregation will allow us to analyze the policies proposed earlier. For example, the usual United Nations one-digit classification of sectors, with each sector subdivided into modern and traditional subsectors, will serve the purpose adequately. Such a classification will result in an input-output table of approximately fifteen sectors, as certain sectors, such as utilities and communications, can be assumed to be wholly modern.

Such an input-output table can be easily constructed if a highly disaggregated table is available. As we concluded earlier, output in secondary and tertiary sectors can be classified as modern or traditional.

This was the method followed by the ILO employment mission to the Philippines (21). Two main criteria were used in the classification of nonagricultural sectors: i) the average number of employees per establishment; and ii) the proportion of unpaid family workers and self-employed workers to total employees. These two criteria were highly correlated and appeared to provide a reasonable approximation of modern versus traditional. In agriculture and other primary sectors, modern and traditional firms coexisted because of uneven ownership of natural resources such as land, mineral rights and timber rights. As modern and traditional firms in each of primary sectors produce the same output, i.e. there is no product differentiation, any empirical division of the sector between modern and traditional subsectors is difficult to make. The ILO mission therefore classified all agriculture sectors as mixed. Mining was classified as modern because of the dominance of heavy metals mining. Other mixed sectors were construction and government. The mixed characteristics of construction can be attributed to the existence of heavy construction firms, which are highly organized and capital intensive. Light construction work was mainly dominated by small contractors, carpenters, etc.

The above example illustrated the empirical feasibility of a modern-traditional disaggregation in input-output models. However, their use is severely restricted because of the lack of supplementary data collected on similar lines of disaggregation. Data on sectoral employment, for example, are usually reported on a fairly aggregated basis in developing countries. Therefore, it is understandable that a standard one-digit sectoral classification system was utilized in most consistency models

(45), (16), (24), and (30). A consistency check of policy recommendations was then made with this fairly aggregated macroeconomic model.

Labor absorption

The pattern of labor absorption is crucial to the determination of income distribution. The labor absorption submodel is therefore important in the evaluation of employment and income distribution implications of various development policies.

Most authors of consistency models, such as Kayir (24), Thorbecke and Sengupta (45), Morley and Williamson (30), relied on independent estimates of sectoral growth rates of labor productivity. Sectoral pattern of labor absorption was therefore related to the sectoral pattern of demand. The implicit assumption was that of excess labor supply. Unabsorbed labor was classified as unemployed.

An exogenous labor productivity approach to labor absorption raises some serious questions concerning the feasibility of assumed growth rates of labor productivities, and therefore the accuracy of derived income distribution In a situation of projected high unemployment, the assumed growth rates of labor productivities are certainly too high. In smoothly functioning labor markets, surplus labor will be absorbed by declining labor productivities, or growth rates of labor productivity. The converse is true in a situation of labor shortages. Therefore, if projected unemployment is in excess of historical rates, an overestimation of unemployment can be inferred. Overestimation of unemployment will lead to overestimation of income inequality if no income is imputed to the unemployed. However, if unemployment is assumed to take the form of equal

proportional underemployment, the equality of income distribution will be overestimated.

A more relevant approach to labor absorption, especially from the income distribution viewpoint, is to force complete absorption of a given amount of labor. This type of calculation is especially realistic given that the labor markets have in the past produced fairly constant unemployment rates.

A complete labor absorption approach was utilized by the ILO (20) in its economic demographic simulation model BACHUE. Labor absorption in the modern sectors was dependent on growth rates of labor productivity and growth rates of output. Labor not absorbed into the modern sectors was completely allocated to the traditional sectors, with labor productivities determined endogenously. The basic hypothesis was that labor not absorbed into the modern sectors will be forced into employment in traditional sectors because of survival problems, or the need to earn a living.

The same idea of labor absorption can be generalized by allowing different labor absorption capacities in different sectors, at the same time specifying complete absorption of a given amount of labor. At the sectoral level, labor absorption capacity can be generalized to include labor of different skills and occupations. This is desirable as labor of different skills are generally absorbed at different rates in different sectors. For example, unskilled labor can be absorbed easily in traditional sectors, especially traditional services, where capital requirements are low. Absorption of skilled labor, however, depends on the availability of complementary capital goods.

Income distribution

Thorbecke and Sengupta (45) computed distribution of national income over the entire population from sectoral income distributions. The entire distribution was constructed from sectoral income distributions on the basis of a series of steps and simplifying assumptions.[1] Essentially, it was a pooling of sectoral and subsectoral income distributions, whose variances were assumed to be zero. A technical appendix explained that the Lorenz coefficient of inequality so calculated was not sensitive to the assumption of zero variances. Empirically, the Lorenz coefficient so derived agreed remarkably with actual data.

The method of pooling is a treacherous exercise, involving difficult conceptual problems. Pooling implicitly assumes that no individual is employed in, and earns income from more than one sector in the economy. However, empirical difficulties from this point can be minimized by adopting a sectoral classification scheme so as to minimize the frequency of individuals with multiple income sources.

From the point of view of social welfare and economic behavior considerations, it is desirable to compute family of household income distribution instead of income distribution over the entire population. Consumption, savings and investments decisions are household decisions, and therefore a function of household income and demographic characteristics. Social welfare evaluation of household utility instead of individual utility internalizes the externalities between different

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[1]See (45, pp. 26-27) for specific information on these assumptions.

members of a household.[1] Returns to scale in family economic activities can also be internalized. Therefore, social welfare is more appropriately a function of the joint distribution of household income, household demographic characteristics, and other social indicators. Note that we have specified the joint distribution of household income, household demographic characteristics and other social indicators, instead of separate distributions of these variables. Household income and other social indicators cannot be evaluated independently of household demographic characteristics. For example, two families of equal income will be considered differently if they are of different sizes in terms of household members. In Appendix A, a method is proposed to compute a social welfare indicator of such joint distributions.

If household income distribution is to be derived from sectoral distributions by pooling, the multiple income source problem mentioned earlier will become more severe. Typically, the number of households is considerably less than the number employed,[2] indicating that the average family contains more than one active member in the labor market. However, if employed members of the same household are from the same sector, a different approach to pooling might be acceptable. Mean sectoral household income is total sectoral income divided by the number of households in the sector. Sectoral income distribution by households can then be formed assuming some variance behavior of sectoral household income

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[1]For example, it is meaningless to talk about income and utility of a two year old child.

[2]Number of families in the Philippines is approximately half of total employment.

distribution. Overall household income distribution is then constructed by pooling of sectoral household income distributions.

Because of all these difficulties, it is recommended that an earnings distribution be computed, assuming some allocation of nonlabor income. Parameters of household income distribution, perhaps the Lorenz coefficient of inequality, is then related to parameters of earnings distribution by some statistical method. A worsening of earnings distribution should imply a worsening of household income distribution. Note that with two parameters (mean and variance) distributions, only one parameter need to be computed for each distribution. Mean earnings (household income) is merely total earnings (total income) divided by total employment (total number of households). Therefore, only variances need to be computed and related.

Generalization of the labor absorption submodel by occupation and sector will result in considerable improvement in the income distribution submodel. Variance within each occupation and sector can be expected to be more stable than variance within a sector. Changes in the variance of sectoral income distribution can be largely accounted for by changes in labor usage and wages by occupation within the sector. However, wages within each occupation cannot deviate excessively from the mean wage because of competition, therefore resulting in a more stable variance.[1] In short, by computing labor income by occupation and sector, a large

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[1]This of course depends on the degree of aggregation within each occupational group. In general, one can expect the variance within each occupation to approach zero as a finer and finer occupational classification scheme is used.

measure of changes in variance of sectoral income distribution can be endogenized, thus doing away with arbitrary assumptions concerning behavior of sectoral variances.

Technical change

An important instrument in the development of the traditional sector is the inducement of technical progress. An excellent example is the 'Green Revolution' program to increase productivities in the agricultural sector.

Changes in production techniques, cannot be captured by the constant coefficients Leontief input-output model. However, alternative computations can be done using different technical matrices, and comparisons of results made. This was the approach used by Thorbecke and Sengupta (45) when investigating the income distribution and employment impacts of technical change in agriculture.

More generally, technical progress can be theoretically incorporated into a generalized input-output model by using sectoral production functions of the following form:

$$x_j = f_j(x_{1j}, \ldots, x_{nj}, l_{1j}, \ldots, l_{kj}, cap_j, t) \qquad (3.1)$$

$$j = 1, \ldots, n;$$

where:

x_j = real output of sector j;

x_{ij} = input from sector i to sector j;

l_{kj} = input of labor occupation k in sector j;

cap_j = capital stock in sector j;

t = a time variable representing technical progress.

Inclusion of intermediate inputs is desirable, as technical progress, especially in agriculture, usually involves increases in the use of intermediate inputs such as fertilizers, insecticides, etc. Linkages between sectors through intermediate flows are therefore altered.

Note that the above production function, if not linear in nature, could cause considerable, if not impossible, computational problems. Further estimation of such a sectoral production would seem impossible given the data limitation problems in most developing countries.

Conclusion

In the first half of this chapter, we derived on a theoretical level, a policy package that will generate growth with improvements in income equality. This policy package will be tested on an empirical level with the help of a consistency model to be constructed in the following chapters. We, therefore, devoted the second half of this chapter to a review of problems associated with previous works in the area of consistency models, related to income distribution and employment problems.

The next chapter will be devoted to the construction of a generalized Thorbecke-Sengupta consistency model. In this generalized model, most of the problems mentioned in the second half of this chapter will be corrected.

CHAPTER IV. A GENERALIZED CONSISTENCY MODEL

In this chapter, we shall present a generalized version of the consistency model. The generalizations are specifically aimed at overcoming some of the disadvantages of the basic model mentioned in the last chapter. Sectoral production functions will be incorporated to provide constraints on the possible level of real output. An improved methodology will be developed to compute the effects of income redistribution on sectoral distribution of consumption. In the generalized model, the effects of underemployment on income distribution can also be investigated explicitly, although the extent of underemployment cannot be determined endogenously.

The presentation in this chapter will be mostly theoretical. Quantification and estimation of the parameters will be the subject of the next chapter. In the presentation of any economic model, it is customary to begin with a list of accounting equations to indicate the extent of disaggregation, and we shall do so accordingly. Behavioral equations are then discussed as to whether they are demand or supply oriented. Finally, a computation method will be devised to arrive at a solution of the model.

To simplify the presentation of equations, we shall adopt the notational convention outlined in Table 4.1.

Table 4.1. Notation used in chapter IV

$\underline{x}$	denotes the matrix with elements x_{ij};
$\bar{x}$	denotes the column vector with elements x_j;
$\underline{\bar{x}}$	denotes the diagonal matrix derived from the vector $\bar{x}$;
$\underline{x}'$	denotes the transpose of the matrix $\underline{x}$;
$\underline{x}^{-1}$	denotes the inverse of a square nonsingular matrix $\underline{x}$;
I_n	denotes the nxn identity matrix where the subscript n will not be written if the dimension of the matrix can be easily inferred;
ln	is the natural logarithm function for all positive arguments, and ln(0) = 0;
ln $\underline{x}$	is the matrix with elements ln x_{ij}, for a nonnegative matrix $\underline{x}$;

All variables are functions of time and we will write so when necessary. Otherwise, variables such as $\underline{x}(t)$ will be simply written as $\underline{x}$.

The Accounting System

The accounting framework is essentially an input-output table. It is presented below in terms of receipts and expenditures equations of the main economic agents. All variables are in thousands of Philippines pesos unless otherwise specified. Since input-output accounts can be given in either valuation at producers' or purchasers' prices, a distinction has to be made. Variables valued at purchasers' prices, i.e. at prices including trade and transport margins, will be denoted with a superscript asterisk. Variables valued at producers' prices, i.e. at factory prices, will be denoted without a superscript asterisk. Thus for example:

x = variable at producers' prices;

x^* = variable at purchasers' prices.

The accounting identities below are in producers' prices. However, a similar set of identities can be written for variables in purchasers' prices.

The business sectors

The business sectors include all private production units, and corporations. Excluded are the government sector and private housing (including owner-occupied dwellings) sector. Receipts of these sectors consist of sales, i.e.:

$$X_i = \sum_j X_{ij} + C_i + GC_i + D_i + \Delta STKS_i + E_i - MP_i \qquad (4.1)$$

$$i, j = 1, \ldots, n.$$

where:

X_i = value of gross demand (output) from sector i;

X_{ij} = value of input from sector i to sector j;

C_i = value of sales from sector i for consumption;

D_i = value of sales from sector i for investments;

GC_i = value of sales from sector i for government consumption;

$\Delta STKS_i$ = value of changes in inventories in sector i;

E_i = value of sales from sector i for exports;

MP_i = value of imports to sector i, (i.e., final and intermediate sales of imports by sector i), including import taxes.

Note that imports are treated as negative sales. Hence, the term X_i can be interpreted as gross sales of domestically produced output. Also note that all positive sales items in the above equation should be interpreted as having an import content. Thus for example, X_{ij} includes sales of domestically produced output from sector i to sector j, plus raw materials imported by sector i but used in sector j. In this manner, no distinction is made between competitive and noncompetitive imports.

Total receipts from sales of output are distributed between returns to factors of production, raw materials, inputs from other sectors, and indirect taxes, i.e.:

$$X_i = \sum_j X_{ji} + \sum_k W_{ki} + GRC_i + RENT_i + TI_i \tag{4.2}$$

$$i, j = 1, \ldots, n;$$

$$k = 1, \ldots, m;$$

where:

X_i = value of gross output (demand) of sector i;

W_{ki} = labor income of occupation k in sector i;

GRC_i = gross return to capital in sector i;

$RENT_i$ = rents in sector i;

TI_i = value of indirect taxes paid by sector i.

The distinction between rents and gross return to capital is arbitrary. In the actual input-output accounts, only two sectors, agriculture and mining, register nonzero rents. These represent returns to ownership of farmlands by persons outside of the agriculture sector, and returns to mineral rights ownership by persons outside of the mining sectors respectively. These two elements are included in the accounting framework so that a more accurate picture of income distribution can be derived.

The private sector

The private sector consists of all private individuals, and nonprofit organizations. Income of the private sector is made up of payments to factors of production by government, foreign and domestic firms, plus transfer payments, less value added retained by corporations, businesses, and governments. In equation terms:

$$YP = \sum_k W_{kg} + \sum_j \sum_k W_{kj} + \sum_j (GRC_j + RENT_j) - \sum_j DEP_j$$
$$+ C_h - GYP - TB - SB + TRRTP + TRGTP + NF \qquad (4.3)$$

where:

YP = personal income or income of the private sector;

W_{kg} = labor income of occupation k in government;

DEP_j = depreciation allowance in business sector j;

C_h = rent payments in the private housing sector, including owner-occupied housing;

GYP = government income from government owned factors of production;

TB = corporate taxes;

SB = corporate savings, or retained earnings;

TRRTP = foreign transfer payments to the private sector;

TRGTP = government transfer payments to the private sector;

NF = net factor payments from abroad.

Personal income is allocated between taxes, personal consumption, and personal savings, i.e.:

$$YP = TP + YD = \sum_i C_i + C_h + SP \tag{4.4}$$

where:

TP = personal direct taxes;

YD = personal disposable income;

SP = personal savings.

The government sector

The government sector consists of all government agencies at the national and local level. Government income is derived from tax revenues, returned from government owned properties, and transfer payments to government. In equation form, this can be written as:

$$YG = TP + TB + TM + \sum_i TI_i + GYP + TRRTG \tag{4.5}$$

where:

YG = government income;

TM = import taxes;

TRRTG = foreign transfers to government.

Similar to personal income, government current income can be consumed, transferred to nongovernment entities, or saved:

$$YG = \sum_i GC_i + \sum_k W_{kg} + TRGTP + SG \tag{4.6}$$

where:

SG = government savings, or the excess of government current income over current expenditures.

The foreign sector

Philippines' transactions with the rest of the world can be summarized in the balance of payments accounts:

$$BOT = \sum_i E_i - (\sum_i MP_i - TM) + NF + TRRTP + TRRTG \tag{4.7}$$

where the term BOT represents the balance of payments on current accounts. It can be most conveniently thought of as current domestic savings invested in foreign assets.

We have now essentially completed the presentation of the accounting framework. The accounts are most conveniently presented in table form, as shown in Table 5.3 for calendar year 1965.

Aggregated variables more closely related to national accounts are defined in Table 4.2. Given these definitions, the usual national income identity:

$$GDP = C + D + G + \Delta STKS + E - (MP - TM) \tag{4.8}$$

can be easily derived from equations 4.1 to 4.7. The usual savings-investments identity:

$$SB + SP + SG = (D - DEP) + \Delta STKS + BOP \tag{4.9}$$

can also be derived in a similar manner.

Table 4.2. Definition of aggregate variables

1)	$C = \sum_i C_i + C_h;$	total consumption
2)	$D = \sum_i D_i;$	total investments (gross)
3)	$MP = \sum_i MP_i;$	total imports including import taxes
4)	$G = \sum_i GC_i + \sum_k W_{kg};$	total government current expenditures (government investments excluded)
5)	$E = \sum_i E_i;$	total exports
6)	$\Delta STKS = \sum_i \Delta STKS_i;$	total change in inventories
7)	$TI = \sum_i TI_i + TM;$	total indirect taxes
8)	$GDP_j = \sum_i W_{kj} + GRC_j + RENT_j + TI_j;$	gross domestic product originating from sector j
9)	$GDP_g = \sum_k W_{kg};$	gross domestic product due to government
10)	$GDP = \Sigma\, GDP_j + GDP_g + C_h + TM;$	gross domestic product
11)	$NRC_j = GRC_j - DEP_j;$	net return to capital in sector j

Supply

Sectoral supply constraints

A major criticism directed at input-output models is that they are demand oriented. The multiplication of the final demand vector $\bar{F}$ by the Leontief inverse of the technical coefficients matrix involves the assumption of supply equals demand in each and every sector. Hence, everything demanded is produced.

Attempts to incorporate sectoral supply constraints involve the use of sectoral supply functions, derived from sectoral production functions. Simple capital-output ratios, though crude, are simple and empirically manageable. Moreover, they do not conflict with the constancy of the technical coefficients matrix, a usual assumption in input-output studies. More sophisticated studies have incorporated sectoral production functions of the form:

$$GDP_i = f^i(K_i, L_i, t)$$

where K_i, L_i and t represent capital, labor and time respectively. Production functions of this form also do not conflict with the constancy of input-output coefficients.

Continuous production functions involving intermediate inputs, or raw materials, as arguments violate the constancy of input-output coefficients, if substitutions between intermediate and primary inputs are allowed. However, Klein's interpretation of the Leontief system is based on Cobb-Douglas sectoral production functions involving intermediate inputs (25). Ratios between values of intermediate inputs and value of

sectoral gross output are held constant for each sector, while substitutions between real inputs are allowed.

It is Klein's interpretation of the Leontief system that we will adopt. Econometric models using this interpretation have been extensively developed by Saito, Morishima and Murata for the Japanese economy in (29) and (40). We therefore do not claim originality. But while the Japanese authors are primarily interested in the general equilibrium properties of such a system, and the analysis of disguised unemployment, we are interested in using such a model for long and medium term economic projections for the Philippines, and its subsequent use as a development planning model.

This section briefly describes Klein's sectoral production function, as related to the input-output framework. Readers interested in more details are referred to (25), (29) and (40).

Let us assume Cobb-Douglas type sectoral production functions as follows:

$$\ln x_j = \ln a_j + \sigma_j t + \sum_i \alpha_{ij} \ln x_{ij} + \sum_k \beta_{kj}(\ln l_{kj} + \ln \eta_{kj}) + \gamma_j \ln cap_j \qquad (4.10)$$

$$\text{for } j = 1, \ldots, n;$$

where:

x_j = gross output from sector j, valued at 1965 prices, in thousands of pesos;

x_{ij} = input from sector i to sector j, valued at 1965 prices, in thousands of pesos;

l_{kj} = employment of occupation k in sector j, in thousands of people;

cap_j = capital stock in sector j, valued at 1965 prices, in thousands of pesos;

σ_j = rate of Hicks' neutral technical progress;

t = time, where t = 0 for the base year 1965;

η_{kj} = a variable such that $(1 - \eta_{kj})$ represents the rate of underemployment of l_{kj};

α_{ij}, β_{kj}, γ_j are nonnegative constants such that:

$$\gamma_j > 0; \quad \sum_i \alpha_{ij} + \sum_k \beta_{kj} + \gamma_j \leq 1 \qquad (4.11)$$

$$\text{for } j = 1, \ldots, n.$$

Note that the factors of production are: capital, and effective labor represented by the terms $\eta_{kj}\, l_{kj}$. Hence, given a certain demand for effective labor, an increase in underemployment (a decrease in η_{kj}), will increase employment in terms of persons employed. Alternatively, given the number of persons employed, a decrease in underemployment (an increase in η_{kj}), will yield a larger amount of effective labor, and hence a larger quantity of output and real income.

The constraint that the sum of the exponents in each production function be less than or equal to one, imply the possibility of decreasing returns to scale, or the presence of fixed factors of production. This phenomenon is especially relevant in sectors of primary production such as agriculture, fishing, forestry and mining, where natural resources play an important role in the production process.

If at each point in time, available capital stock cap_j is considered fixed, then the maximization of the profit function:

$$\pi_j = p_j(1 - \tau_j)x_j - \sum_i p_i x_{ij} - \sum_k w_{kj} \eta_{kj} l_{kj} \tag{4.12}$$

$$j = 1, \ldots, n;$$

where:

p_j = price index of output from sector j, where p_j at 1965 is unity, i.e. $p_j(0) = 1.00$;

p_i = price index of sector i, in the same units as p_j;

w_{kj} = price of one man-year of effective labor of occupation k in sector j;

τ_j = a constant representing the indirect tax rate in sector j;

gives the following necessary and sufficient (since the production functions given cap_j, j = 1, ..., n; are concave) conditions:

$$\frac{p_i x_{ij}}{p_j x_j} = \alpha_{ij}(1 - \tau_j)$$

$$\frac{w_{kj} \eta_{kj} l_{kj}}{p_j x_j} = \beta_{kj}(1 - \tau_j)$$

$$i, j = 1, \ldots, n;$$

$$k = 1, \ldots, m.$$

Defining:

$$X_j = p_j x_j; \tag{4.13}$$

$$X_{ij} = p_i x_{ij};$$

$$w_{kj} = w_{kj} \eta_{kj} l_{kj};$$

$$TI_j = \tau_j \, p_j \, x_j;$$

$$i, j = 1, \ldots, n;$$

$$k = 1, \ldots, m;$$

it can be easily seen that:

$$\frac{X_{ij}}{X_j} = \alpha_{ij}(1 - \tau_j); \tag{4.14}$$

$$\frac{W_{kj}}{X_j} = \beta_{kj}(1 - \tau_j);$$

$$\frac{TI_j}{X_j} = \tau_j;$$

$$i, j = 1, \ldots, n;$$

$$k = 1, \ldots, m;$$

which are some of the usual assumptions of input-output models. In order to allocate profits between return to capital (to be differentiated between net return and depreciation) and return to fixed factors of production as rents, we shall make the assumptions:

$$\frac{GRC_j}{X_j} = \gamma_j(1 - \tau_j); \tag{4.15}$$

$$\frac{DEP_j}{X_j} = \varphi_j;$$

$$\frac{RENT_j}{X_j} = (\lambda_j - \gamma_j)(1 - \tau_j);$$

$$j = 1, \ldots, n;$$

where λ_j is defined as:

$$\lambda_j = (1 - \sum_i \alpha_{ij} - \sum_k \beta_{kj}) \qquad j = 1, \ldots, n; \tag{4.16}$$

and φ_j, $j = 1, \ldots, n$; are constants.

Note that in the derivation of the profit maximization conditions, we have assumed perfect intermediate-input markets. No such assumption was made for the labor markets. We now assume that wages for the same occupation is distorted by a constant factor in each business sector, i.e., for each time period:

$$w_{kj}(t) = \theta_{kj}\, z_k(t) \tag{4.17}$$

$$k = 1, \ldots, m;$$

$$j = 1, \ldots, n;$$

where θ_{kj} are constants, and z_k is merely some sort of wage index for occupation k. Since the θ_{kj}'s are determined up to a constant multiple for each occupation, we can further specify that $z_k(0) = 1.0$ for $k = 1, \ldots, m$. Hence, θ_{kj} becomes the average wage for one full equivalent man-year of labor of occupation k in sector j at the base year 1965.

The assumption of wage distortion between sectors implies imperfect labor markets only if labor within each occupational group is homogeneous. To achieve homogeneity within each occupational group on an empirical level, a large number of occupational groups will be necessary. To avoid complications from extending disaggregation of the model in this dimension, we will limit ourselves to a one-digit or less occupational classification. To take into account the complex mix of skills and wages within each occupational group, we made the distortion assumption outlined in the previous paragraph. The implicit assumption is that although each occupational group consists of a mixture of skills, these skills tend to coincide relatively well with given sectors. As the various skills within

each occupational group are roughly similar, wages of these skill subgroups cannot deviate too far from each other.

Given the above assumption on the behavior of wages, it can be easily shown that sectoral output (supply) functions are in the form:

$$\ln x_j^s = \frac{1}{\lambda_j} [\ln a_j + \sigma_j t + \sum_i \alpha_{ij} \ln \alpha_{ij} + \sum_k \beta_{kj} (\ln \beta_{kj} - \ln \theta_{kj}) + (1 - \lambda_j) \ln(1 - \tau_j) + (1 - \lambda_j) \ln p_j - \sum_i \alpha_{ij} \ln p_i - \sum_k \beta_{kj} \ln z_k + \gamma_j \ln cap_j] \quad j = 1, \ldots, n. \tag{4.18}$$

or more simply as:

$$\ln x_j^s = \ln b_j + \frac{1}{\lambda_j} [(1 - \lambda_j) \ln p_j - \sum_i \alpha_{ij} \ln p_i - \sum_k \beta_{kj} \ln z_k + \sigma_j t + \gamma_j \ln cap_j] \quad j = 1, \ldots, n; \tag{4.19}$$

where $\ln b_j$ denotes the sum of all constants in equation 4.18. The above equation simply states that sectoral supply of real output is s function or prices, wages, and sectoral capital stock. Presumably, prices are determined by the adjustment of sectoral excess demand and supply. As we have assumed that sectoral capital stocks cap_j, $j = 1, \ldots, n$; are fixed for each time period, it can be seen from equation 4.19 that the incorporation of sectoral supply constraints is now reduced to the problem of setting lower bounds on wages. Alternatively, the problem is the setting upper bounds on the supply of different types of labor.

Supply of labor

The most conventional method of calculating available labor force, by labor of different types if necessary, is the use of labor force participation rates (LFPR's). Variations of this type of calculation are many. However, the use of an aggregate LFPR has come under criticism lately. Demographers have observed that the aggregate LFPR is highly sensitive to demographic movements. For example, in a period of high population growth, the proportion of population in younger age groups will increase, resulting in a drop of aggregate LFPR. Small changes in the aggregate LFPR, if not incorporated in a labor force projection model, can result in erroneous projections in the supply of labor. Generally, age and sex specific LFPR's are more stable, and hence preferred by most economic demographers. However, their use requires detail demographic projections, involving assumptions concerning the behavior of birth rates and death rates.

To avoid all these problems, we shall assume that total employment is exogenously given. The division of total employment into employment by educational attainment is considered as a policy instrument. Employment by occupation is then assumed to be a linear transformation of employment by educational attainment. More formally, the above assumption can be stated as:

$$\sum_q EDUC_q \text{ is exogenously given;} \tag{4.20}$$

$$EDUC_q,\ q = 1, \ldots, Q; \text{ are policy instruments;}$$

$$l_k^s = \sum_q a_{kq}\ EDUC_q,\ k = 1, \ldots, m;$$

where:

$EDUC_q$ = employment in education attainment class q, in thousands;

l_k = total employment in occupation k, in thousands;

a_{kq}, q = 1, ..., Q; k = 1, ..., m; are constants such that $\sum_k a_{kq} = 1$ for all q.

By assuming that total employment instead of labor supply is exogenously given, we have side-stepped the unemployment problem. An examination of past unemployment rates in the Philippines will reveal a fairly steady rate as shown in Table 2.2. Fluctuations were mainly caused by business cycles. Further, the introduction of unemployment in our model will involve problems far too complex to be analyzed given available data. Actual unemployment rate can only be explained by a detail examination of the labor markets. The relationship between unemployment and income distribution will also have to be examined, since the unemployed need not have zero income. We, therefore, conclude that although the incorporation of unemployment will sharpen the precision in which income distribution can be determined, the added precision gained will only be marginal given the data in Table 2.2.

The mechanical relationship between occupation and education will no doubt come under criticism of education economists.[1] The concept of a relationship between skill formation and education or training is a difficult one, involving not only economic, psychological and sociological

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[1]See for example, (31) and (37).

parameters, but also the distinction between different types of education. Hence, most economists prefer a model of the following form:

$$l_k^s = f_k(z_1, \ldots, z_m, \text{POPEDUC}_1, \ldots, \text{POPEDUC}_q)$$

$$k = 1, \ldots, m;$$

where l_k^s is now to be interpreted as the supply of occupation k and POPEDUC_q denotes population with educational attainment class q. In general the variables POPEDUC_q, $q = 1, \ldots, Q$, are not independent of earnings z_k, $k = 1, \ldots, m$, in the long run.

The above argument is essentially against assuming any one to one relationship between occupation and education, i.e., no assumption can be made concerning the education requirements of specific occupation. Data on employment by educational attainment and occupation, as shown in Table 4.3, certainly illustrates this point. Yet the argument is not against stable coefficients in equation 4.20. It is conceivable that coefficients in equation 4.20, calculated from data in Table 4.3, will show little variation over time.

Demand

Aggregate demand, and their sectoral allocation, consisting of personal consumption, government consumption, gross investments, exports, changes in stocks, and imports (as negative demand), will be projected by the usual Keynesian model. Demand and demand related variables to be projected by the Keynesian model are presented below in notation form:

Table 4.3. Employment (in thousands) by occupation and educational attainment in the Philippines, 1965[a]

Occupation	Educational Attainment				
	None	Elementary School[b]	High School[b]	College	Total
Professional, administrators, technical workers	3	39	101	408	551
Clerical and sales workers	106	655	310	254	1,325
Farmers, fishermen, and farm workers	1,124	4,042	460	51	5,677
Skilled and semiskilled craftsmen and workers	169	918	405	64	1,556
Manual workers	11	92	43	5	151
Service and related workers	68	545	178	49	840
Total	1,481	6,291	1,497	831	10,100

[a]Source: Computed from (5).

[b]Including dropouts.

$$\bar{F} = \begin{pmatrix} C_1 + D_1 + GC_1 + E_1 - MP_1 + STKS_1 \\ \cdot \\ \cdot \\ \cdot \\ C_n + D_n + GC_n + E_n - MP_n + STKS_n \end{pmatrix} \qquad \bar{W}_g = \begin{pmatrix} W_{1g} \\ \cdot \\ \cdot \\ \cdot \\ W_{mg} \end{pmatrix} \tag{4.21}$$

C_h, and TM.

As we are working towards a price adjustment model, the above variables will be projected at current prices. Projections are conditioned on the behavior of various exogenous and policy variables.[1] The actual model used will be presented and discussed in the next chapter.

Income Distribution

The relationship between income distribution and economic activities

The relationship between income distribution and economic activities is a complex one. Causation is by no means unidirectional. Traditionally economists have concentrated on two aspects of this relationship: savings and consumption.

The effects of income redistribution on economic growth is a classical economic subject. Most arguments rely on the assumption that the marginal propensity to save is positively correlated with income.[2] Hence

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[1] Since the variables are in current prices, it would be desirable to incorporate the effects of monetary policies on demand.

[2] The income concept use in a redistribution of income should coincide with the income concept used in the savings function to avoid confusion between permanent and current income.

a redistribution in favor of lower income groups will increase consumption, reduce savings and investment, thus retarding economic growth.[1]

Studies on income distribution and consumption usually estimate income elasticities of different commodities. From these the effects of income redistribution and sectoral demand and balance of payments (due to different import contents of different allocation consumption) can be easily derived.

To formulate income redistribution policies based on studies on the effects of income redistribution on consumption and savings is a dangerous exercise. In particular, the following feedback (positive or negative) effects and properties of income distributions, in addition to those considered above, should be given extensive considerations before the implementation of an income redistribution effort.

Savings and investments Study on the effects of income distribution should not neglect the interdependence between savings and investments decisions. This is of particular importance in developing nations where financial institutions and financial markets are rudimentary. Therefore, capital accumulation cannot be easily balanced by incurring financial liabilities. For example, in traditional agriculture, or households unfamiliar with the workings of financial markets, savings and investment decisions are made simultaneously. Redistribution of income could either further constrain or relax savings constraints of certain investors, and therefore affect the level and composition of investments.

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[1]This can be considered as a generalization of the classical assumption that all wages are consumed and all profits saved and invested.

Investments in financial assets, usually by high income groups, could be reduced significantly if income is distributed more equally, with considerable impact on the balance of payments and domestic production capacity.

Earnings Since income redistribution affects the composition of demand (i.e. sectoral distribution and level of consumption, investment, imports, etc.), it also affects derived demand for factors of production such as different types of labor, land and capital. Hence prices of factors will change, implying a different income distribution, dependent on the ownership of factors. It is clear that if income redistribution is achieved through a redistribution of ownership of the factors of production, supply schedules of such factors will also change dramatically, having an impact on income distribution.

Permanent versus current income It is well known that younger households will have lower current incomes compared to older and established households. Hence for a meaningful welfare comparison of incomes of households of different ages, the measure of permanent income must be used. Use of current income distribution can lead to considerable errors. This is best illustrated by the following example: Assume that all households in the economy have the same permanent income but with a usual profile of lifetime income stream. Then given a nontrivial distribution of households by age of heads of households, current household income will be distributed nontrivially.

It should not be interpreted that we are arguing for the analysis of permanent income distribution, and not for the analysis of current income distribution. It is desirable, if possible, to have both

distributions. Savings decisions, for example are best analyzed when data on both current and permanent incomes are available. Savings tend to occur when current income exceeds permanent income. The dissavings and low savings behavior of younger couples can be best explained by current income falling below permanent income, resulting in an intertemporal consumption reallocation decision to borrow on future income.

Demographic considerations The issue of whether income distribution should be computed on the basis of individuals or households was discussed in the previous chapter. It was concluded that from social welfare and economic behavior points of view, it is desirable to evaluate household income distribution. The problem of income comparison between households of different characteristics, especially different household sizes then arises. Usually some sort of adjustment or normalization of household income, taking into account household size is suggested. This approach raises serious theoretical objections. Any normalization procedure assumes some sort of utility comparison. The original ranking of households by income is changed by some other considerations such as demographic characteristics. How the ranking is changed (i.e. the method of normalization) involves implicit assumptions concerning interpersonal or interhousehold utility comparison.

A solution is to compute joint distribution of household income and other household characteristics. Then each household can be characterized by a vector of variables including such characteristics as household income, household size, age of head of household, etc. Instead of ranking the households based on these vectors, social welfare evaluation will be based on the weighted sum of deviations of these vectors for a socially

approved set of vectors. The indication so calculated is a generalization of the variance of distribution into multidimensional space. The method is more rigorously defined in Appendix A.

The joint distribution is also a convenient way of capturing behavior dependent on both household income and some other characteristics. This is best illustrated by an example where household savings is a function of household income and the age of the head of the household. Let

i) x = household income

y = age of head of household

ii) $f(x,y)$ is the joint density function of income and age of head of household.

i.e. $\int_0^a \int_0^b f(x,y)dx\, dy$ is the proportion of households with income less than a and age of head of household less than b years.

iii) $s(x,y)$ = savings of a household with income x and age of head of household at y years.

Then total savings of all households is:

$$HH \int_0^\infty \int_0^\infty s(x,y)\, f(x,y)\, dx\, dy$$

where HH denotes the total number of households. This example can be easily extended to include other household characteristics such as household size.

Income distribution and the consistency model

A framework that can take into account the interdependence of income distribution and economic activities is the intersectoral consistency model. By its sectoral disaggregation, the effects of income distribution on consumption patterns can be analyzed. By its input-output table, the effects of changing demand patterns on sectoral or occupational distribution of earnings can also be analyzed.

In this section, we will specify the income distribution submodel to be incorporated into the consistency model for the Philippines. Unfortunately, the relationship between income distribution and investments cannot be analyzed on an empirical level because of the lack of data. If demographic considerations are to be included, a detail demographic projection submodel will have to be included. To avoid such complications, we will neglect the impact of demographic changes on income distribution. As demographic variables will not be included, current income distribution will not be transformed into permanent income distribution.

The income distribution starts off with the computation of earnings distribution among the employed. The assumption of Cobb-Douglas sectoral production functions as shown in equation 4.10 allow us to compute labor income by sector and occupation (W_{kj}, $j = 1, \ldots, n$; $k = 1, \ldots, m$), and net return to capital by sector (NRC_j, $j = 1, \ldots, n$), given values of sectoral gross output (X_j, $j = 1, \ldots, n$). Given employment by occupation and sector (l_{kj}, $j = 1, \ldots, n, g$; $k = 1, \ldots, m$), and government wages by occupation (W_{kg}, $k = 1, \ldots, m$), a distribution of earnings among the employed can be constructed assuming some allocation of sectoral net

capital income and rents (NRC_j and $RENT_j$, $j = 1, \ldots, n$). The distribution of earnings so constructed is before corporate taxes, corporate savings, personal taxes and earnings imputed to government. A Lorenz coefficient of inequality, denoted by L_E, can then be calculated from this distribution using the usual formula.

The relationship between distribution of earnings and distribution of household income is a complex one. In the Philippines, the number of households is approximately half the number of employed persons, evidence of multiple sources of earnings within a household. It is not uncommon to find two or three persons in the labor force within a household, the median number of family members employed in 1965 being 2.3. To sidestep these problems, we will assume that the Lorenz coefficient for the distribution of family disposable income, L_{FDY}, is related to the Lorenz coefficient of earnings distribution as:

$$L_{FDY} = L_E^{\text{constant}}, \quad \text{constant} > 0. \tag{4.22}$$

Note that the above equation has the advantage that if $L_E = 1$ or 0 then $L_{FDY} = 1$ or 0 respectively. The constant in the above equation implicit assumes some sort of income tax structure. A more progressive structure of income taxes, ceterus paribus, will result in an increase in the constant in the above equation. In this sense, the constant can be regarded as a policy instrument.

We further assume that:

$$FDY \sim \Lambda(\mu_{FDY}, \sigma^2_{FDY}) \tag{4.23}$$

where FDY denotes family disposable income and Λ denotes the log-normal distribution. Variance of the log-normal distribution, σ^2_{FDY}, can be easily

calculated from the well known formula:

$$L_{FDY} = 2\ N(\frac{\sigma_{FDY}}{\sqrt{2}} \mid 0,\ 1) - 1. \tag{4.24}$$

Mean of the log-normal distribution $_{FDY}$, can be easily calculated from the formula:

$$e^{\mu_{FDY} + \frac{1}{2}\sigma^2_{FDY}} = \text{mean household income.} \tag{4.25}$$

The relationship between distribution of FDY and expenditures is best captured by a set of nonlinear household expenditure functions:

$$FC_j^* = f_j(FDY) \quad j = 0,\ 1,\ \ldots,\ n; \tag{4.26}$$

where FC_j^* denotes household expenditure, at purchasers' prices, on sector j and FC_0^* is household savings. To calculate total expenditures on a particular sector, we merely evaluate:

$$C_j^* = HH\ E(f_j(FDY));\ FDY \sim \Lambda(\mu_{FDY}, \sigma^2_{FDY}), \tag{4.27}$$

where HH is the total number of households. The functions f_j, j = 0, 1, ..., n, can be chosen such that evaluation of expected value of sectoral family consumption in the above equation does not involve too much computations.

Computation

At each point in time, sectoral capital stock and all exogenous variables (including lagged endogenous variables) are given. The Model is then computed under the following supply equals demand constraints:

$$\sum_j x_{ij} + f_i = x_i, \quad i = 1\ \ldots,\ n; \tag{4.28}$$

$$\sum_j l_{kj} + l_{kg} = l_k^s, \quad k = 1,\ \ldots,\ m; \tag{4.29}$$

where $f_i = \frac{F_i}{p_i}$, denotes real final demand in the ith sector.

The method of computation is by iteration since functions appearing in the above equations can be nonlinear. Each iteration consists of five steps which are outlined below:

Step 1: gross output

Multiplying equation 4.28 by the appropriate price p_i, we obtain:

$$\sum_j X_{ij} + F_i = X_i, \quad i = 1, \ldots, n.$$

Referring to equation 4.14, we can write the above as:

$$\sum_j \alpha_{ij}(1 - \tau_j)\, X_j + F_i = X_i$$

or

$$[I - \underline{\alpha}(I - \underline{\bar{\tau}})]\, \bar{X} = \bar{F}.$$

Solving for $\bar{X}$ we have:

$$\bar{X} = [I - \underline{\alpha}(I - \underline{\bar{\tau}})]^{-1}\, \bar{F}. \tag{4.30}$$

Hence given the final demand vector $\bar{F}$, the value of gross output needed to satisfy the final demand is given by the above equation. Note that the equation is a simple generalization of the usual Leontief equation $\bar{X} = (I - A)^{-1}\, \bar{F}$.

Using equations 4.14 and 4.15, W_{kj}, $k = 1, \ldots, m$; $j = 1, \ldots, n$; and NRC_j, $j = 1, \ldots, n$ can be calculated as constant ratios of value of sectoral gross output calculated in equation 4.30.

Step 2: employment

Multiplying equation 4.29 by the appropriate wage index z_k, we have:

$$\sum_j z_k \, l_{kj} + z_k \, l_{kg} = z_k \, l_k^s ,$$

or

$$\sum_j \frac{W_{kj}}{\theta_{kj}\eta_{kj}} + \frac{W_{kg}}{\theta_{kg}\eta_{kg}} = z_k \, l_k^s , \tag{4.31}$$

from which z_k can be solved since all other variable in the equation are known.[1] Therefore employment by occupation and sector can be derived as

$$l_{kj} = \frac{W_{kj}}{\theta_{kj}\eta_{kj}} , \qquad k = 1, \ldots, m; \quad j = 1, \ldots, n, g. \tag{4.32}$$

Step 3: real output and prices

Sectoral supply equations 4.19 can be written as:

$$\ln \bar{x}^s = \bar{\underline{\lambda}}^{-1}[(I - \bar{\underline{\lambda}} - \underline{\alpha}') \ln \bar{p} - \underline{\beta}' \ln \bar{z} + \bar{\sigma} t + \bar{\underline{\gamma}} \ln \overline{cap}] + \ln \bar{b} , \tag{4.33}$$

or

$$\ln \bar{X} = \bar{\underline{\lambda}}^{-1} [(I - \underline{\alpha}') \ln \bar{p} - \underline{\beta}' \ln \bar{z} + \bar{\sigma} t + \bar{\underline{\gamma}} \ln \overline{cap}] + \ln \bar{b} ,$$

from which we can solve for the price vector as:

$$\ln \bar{p} = (I - \underline{\alpha}')^{-1} \bar{\underline{\lambda}}(\ln \bar{X} - \ln \bar{b}) + \underline{\beta}' \ln \bar{z} - \bar{\sigma}t - \bar{\underline{\gamma}} \ln \overline{cap}] . \tag{4.34}$$

The above equation says that sectoral prices are a function of value of sectoral gross outputs (demands), rates of technical progress, capital stocks, and occupational wages.

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[1]See equationss 4.13 and 4.17.

Step 4: income distribution

We now have employment and labor income by occupation and sector, and net return to capital by sector. Hence distribution of earnings, and the associated Lorenz coefficient L_E can be calculated. Sectoral distribution of household disposable income can then be constructed using equations 4.22 to 4.25.

Step 5: final demand

Given distribution of household disposable income, the final demand vectors $\overline{F}$, $\overline{W}_g$, C_h and TM can be recomputed using the Keynesian demand model. These vectors will be used in Step 1.

The computation procedure can be started at any of the five steps mentioned above by assuming appropriate values for the necessary starting variables. The iteration procedure is cond oned on values of exogenous, policy and lagged variables. A solution of the model is reached if each successive iteration yields negligible changes in the values of all endogenous variables.

Balance of Payments Constraint

One of the most important problems faced by developing countries is the balance of payments problem. Capital goods needed for modern economic growth are, by their nature, mainly produced by industrialized countries, and therefore have to be imported. With political instability inhibiting foreign capital inflow and encouraging capital outflow, accumulation of capital is severely restricted by export generation capacity. The problem is especially severe in countries where exports are primarily agricultural

commodities, raw materials and minerals. These commodities have faced deteriorating terms of trade with respect to exports of industrialized countries until recently. Further, large fluctuation in prices of these commodities usually lead to fluctuations in export earnings, creating serious cyclical adjustment problems.

Recent price increases of primary commodities by no means alleviate balance of payments problems in developing countries. The cyclical adjustment problem still remains. Although export earnings have risen, expenditures on imports have also increased, caused in part by the high rates of price inflation of manufactured exports and capital goods from developed countries.

In any case, it is desirable to have a balance of payments constraint in our model. A foreign exchange constraint can be effectively formulated as a lower bound on the balance of trade (BOT). Recalling the savings-investments identity:

$$BOT + (\sum_i D_i - DEP) = SP + SG + SB$$

it can be seen that given the level of total savings, a lower bound on the variable BOT is essentially an upper bound on total net investments.

The permissible lower bound on the balance of trade cannot be established without taking into consideration long-term net capital inflows. For example, a chronic balance of trade deficit can be sustained now by continued long-term capital inflows provided a trade surplus can be generated in the future to service borrowed foreign capital. Given the popular development policy of encouraging foreign investments, the consideration of long-term capital movements is especially important.

The balance of trade constraint can be easily incorporated into our Keynesian demand submodel. Assuming that exports are exogenously determined, the balance of trade then becomes a function of imports. As imports are related to levels of aggregate demand, a desirable level of balance of trade can be maintained by the regulation of aggregate demand. In a Tinbergen interpretation, the variable BOT can be defined as an endogenous target variable. By adjustments of policy and exogenous variables, the balance of trade can then be maintained at the desirable level.

Dynamics

What we have described so far is a static model, where sectoral capital stocks are given at each point in time. To convert the model into a dynamic model, we specify the following dynamic equations:

$$cap_j(t+1) = (1 - \delta_j)\, cap_j(t) + inv_j(t) \qquad (4.35)$$

$$j = 1, \ldots, n;$$

where:

δ_j = depreciation rates of capital in sector j;

inv_j = real gross investment in sector j, at 1965 prices, in thousands of pesos.

Sectoral investments, inv_j, j = 1, ..., n are determined by the allocation of total available investible output d, i.e.

$$inv_g + \sum_j inv_j + inv_h = \sum_j \frac{D_j}{P_j} = \sum_j d_j = d \qquad (4.36)$$

where inv_h and inv_g denote investments in residential construction and government investments respectively, and hence are not available to be

added to sectoral capital stocks.[1] Note that we are not distinguishing between different types of capital goods. Capital goods produced by different sectors are summed into an aggregate variable d, which is allocated as a homogeneous product into different sectors. This simplifying assumption is necessary as we have not differentiated sectoral capital stock cap_j into different types of capital goods. Data needed for such a disaggregated treatment of capital do not exist.

The allocation of investible output into sectors can be policy determined, thus investigating the effects of sectoral investments allocation on income distribution, employment and growth. Alternatively, some behavioral mechanism can be assumed. We will outline one such mechanism below.

At each time period t, we will first determine desired capital stocks in the next period $cap_j^d(t+1)$, $j = 1, \ldots, n$. Desired sectoral investments $inv_j^d(t)$, $j = 1, \ldots, n$ are then calculated as:

$$inv_j^d(t) = cap_j^d(t+1) - (1 - \delta_j)\, cap_j(t)$$

$$j = 1, \ldots, n.$$ [2]

Actual investments by sector are then calculated by the following formula:

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[1]The allocation of public capital into different sectors is a difficult, if not impossible, task. To circumvent this problem, we shall assume government investment policies to affect sectoral productivities exogenously through the sectoral technical progress parameters δ_j, $j = 1, \ldots, n$.

[2]Note that if a constraint $inv_j^d \geq 0$ or equivalently $cap_j^d(t+1) \geq (1 - \delta_j)\, cap_j(t)$ is applied, rigidity of capital allocation is implied. Capital cannot be reallocated once invested in a certain sector. Removal of such a constraint would imply that cap_j can be reallocated to any other sectors.

$$inv_j = \frac{inv_j^d}{\sum_j inv_j^d} (d - inv_h - inv_g) \tag{4.37}$$

$$j = 1, \ldots, n.$$

Different hypotheses can be used in the determination of desired sectoral capital stocks in the next period. One such hypothesis assumes that entrepreneurs desire to maintain the same rate of return to capital in the next period, as in this period, and thus formulate investment decisions on this basis. The rate of return to capital in sector j, denoted by r_j, can be approximated by:

$$p_j \frac{\partial x_j}{\partial cap_j} - \delta_j p_k cap_j = r_j p_k cap_j,$$

$$j = 1, \ldots, n;$$

assuming that capital is paid its value of marginal product, and p_k denotes the price of capital. Alternatively, the above equation can be written as:

$$r_j + \delta_j = \frac{p_j x_j}{p_k cap_j^2} \gamma_j, \qquad j = 1, \ldots, n.$$

A desire to maintain the same rate of return in the next period can be written as:

$$r_j^d(t+1) + \delta_j = \frac{p_j^e(t+1) x_j^e(t+1)}{p_k^e(t+1) cap_j^d(t+1)^2} \gamma_j = r_j(t) + \delta_j,$$

$$j = 1, \ldots, n;$$

where a d or e superscript denotes desired or expected values respectively. Using the above two equations and solving for desired capital stock, we have:

$$cap_j^d(t+1)^2 = \frac{X_j^e(t+1)\ p_k(t)}{X_j(t)\ p_k^e(t+1)}\ cap_j(t)^2\ \gamma_j.$$

Approximating the expected rates of change in variables by the rates of change in the last period, the above equation can be written as a function of known variables, i.e.

$$cap_j^d(t+1)^2 = \frac{X_j(t)\ p_k(t-1)}{X_j(t-1)\ p_k(t)}\ cap_j(t)^2\ \gamma_j. \tag{4.38}$$

Conclusion

We have now completed a general description of the model. Without the dynamic equations 4.35, the model is essentially an n-sector, Walrasian type general equilibrium model, except that sectoral demand is generated by a Keynesian expenditure model. Dynamic equations are difference equations in the state variables cap_j, $j = 1, \ldots, n$. In this sense, our model is not unlike a multisector neoclassical growth model with Cobb-Douglas sectoral production functions.[1]

A serious shortcoming of input-output models, i.e. that they are demand oriented implying endless resources, is overcome by the incorporation of Cobb-Douglas production functions. This generalization does not involve too much complication in terms of computation of the model for a solution. Assuming that wages for the same occupation are distorted by a

[1]Theoretical properties of a one sector Solow growth model with Cobb-Douglas production function are well known. The system is stable with the steady state growth rate independent of initial conditions. If this property generalizes to a n-sector model, we can expect the steady state growth rates in our model to be independent of initial conditions cap_j, $j = 1, \ldots, n$.

constant ratio between sectors, complete allocation of labor into different sectors is determined. Thus sectoral labor productivities are endogenously determined. The disaggregation of employment by occupation and sector also allowed a more refined determination of income distribution. A balance of payments constraint can be easily incorporated into the Keynesian demand submodel.

A serious disadvantage of the model is the assumption of exogenous determination of underemployment rates and constant distortion of wages between sectors for each occupation. To allow for changing distortion of wages between sectors for each occupation, one would need to move in the direction of generalizing labor markets by occupation and sector. Unless labor supply by occupation and sector is correlated with each other (probably through other wages by occupation and sectors), labor supply by occupation and sector will have to be exogenously determined. Thus employment pattern by occupation and sector is predetermined.

A similar argument can be made for the endogenous determination of underemployment. Given output, employment, and potential labor productivity, the extent of underemployment can be calculated as:

$$\text{underemployment rate} = 1 - \frac{\text{Given output}}{\text{employment x potential labor productivity}} .$$

However, such calculations presume certain patterns of employment allocation and real output.

CHAPTER V. ESTIMATION OF THE MODEL

In this chapter, we will discuss quantification of the model discussed in the previous chapter, using Philippines data. Estimation of the model will not be rigorous, as data are from different sources covering different time periods and cross sections. In cases where date are not available, simplifying assumptions or guesstimates will be made. In this manner, the complete consistency model will be estimated.

In the estimation of each submodel, we shall make a partial analysis of the submodel. These partial analyses will contribute towards the understanding of the whole Philippines economy.

A Keynesian Macroeconomic Model

The model

A Keynesian type demand model is estimated for the Philippines economy, in current pesos using data presented in Appendix B. The complete model, estimated by the usual two-stage least-squares procedure, is presented as Table 5.1. The model consists of fifteen equations, of which six are national income identities.

The Keynesian model in current prices relates money flows in the economy to other money flows. To each money flow, the value of the opposite flow of goods and services depends on price variables. An increase in money flow with no corresponding increase in the opposite flow of goods and services can only occur with price inflations.

Table 5.1. A Keynesian demand model[a] for the Philippines (two-stage least-squares estimates)

Identities

5.1) $GDP = C + D + GC + E + (MP + TM) + \Delta STKS$

5.2) $YP = GDP - SB - TB - TI - DEP - GYP + TRRTP + TRGTP + NF$

5.3) $YD = YP - TP$

5.4) $SP = YP - C$

5.5) $D = CNTR + D_6^*$

5.6) $CNTR = PCNTR + GCNTR$

Behavioral Equations

5.7) $SB = \underset{(-3.233)_{**}}{-105.7} + \underset{(18.22)_{**}}{0.0324}\ GDP$ $\qquad R^2 = 0.9379$

5.8) $TB = \underset{(13.22)_{**}}{14.28} + \underset{(18.62)_{**}}{0.0109}\ GDP$ $\qquad R^2 = 0.9403$

5.9) $TP = \begin{cases} \underset{(-0.4009)}{-6.024} + \underset{(2.271)_{*}}{0.0044}\ YP & \text{if } YP \leq 10^4 \\ \underset{(-0.4009)}{-6.024} + \underset{(2.271)_{*}}{0.0044} \cdot 10^4 + \underset{(3.906)_{**}}{0.0227}(YP-10^4) & \text{if } YP \geq 10^4 \end{cases}$

$R^2 = 0.9917$

5.10) $C = \underset{(5.077)_{**}}{967.4} + \underset{(34.5)_{**}}{1.087}\ YD - \underset{(6.265)_{**}}{3.54}\ PCNTR$ $\qquad R^2 = 0.9975$

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[a]The model was estimated on the basis of annual observations expressed in current prices (in millions of pesos) from 1947 to 1970. The ratio of coefficients to their standard errors are given in parentheses under the coefficients. Interpreting these ratios as asymmetric t-values, a 5% or 1% significance level is denoted by one and two asterisks, respectively. R^2's are based on instruments.

Table 5.1. Continued

5.11) $$PCNTR = \underset{(15.13)_{**}}{103.0} + \underset{(8.105)_{**}}{0.8475}\ PCNTR(t-1) + \underset{(1.775)}{0.0493}\ [GDP(t) - GDP(t-1)] \qquad R^2 = 0.9092$$

5.12) $$D_6^* = \underset{(-4.302)_{**}}{-318.8} + \underset{(7.083)_{**}}{0.6314}\ D_6^*(t-1) + \underset{(6.466)_{**}}{0.4098}\ E \qquad R^2 = 0.9865$$

5.13) $$\Delta STKS = \underset{(8.403)_{**}}{12.12} + \underset{(8.347)_{**}}{0.6515}\ \Delta STKS(t-1) + \underset{(8.400)_{**}}{0.0730}\ [GDP(t) - GDP(t-1)] \qquad R^2 = 0.9741$$

5.14) $$MP = \underset{(2.478)_{*}}{377.2} - \underset{(-25.02)_{**}}{0.207}\ GDP \qquad R^2 = 0.9661$$

5.15) $$TM = \begin{cases} \underset{(-4.405)_{**}}{-56.71} - \underset{(-17.87)_{**}}{0.0815}\ [MP + TM] & \text{Before or in 1954} \\ \underset{(8.782)_{**}}{98.99} - \underset{(-17.87)_{**}}{0.0815}\ [MP + TM] & \text{After 1954} \end{cases} \qquad R^2 = 0.9755$$

List of variables

All variables are expressed in millions of current pesos

Endogenous variables

GDP = Gross domestic product

YP = Personal income

YD = Personal disposable income

SP = Personal savings

D = Gross investment

CNTR = Total construction

SB = Corporate savings

Table 5.1. Continued

SB	=	Corporate savings
TB	=	Corporate taxes
TP	=	Personal taxes
C	=	Personal consumption
PCNTR	=	Private construction (residential and nonresidential)
D_6^*	=	Investment in machinery and equipment (at purchasers' prices)
ΔSTKS	=	Changes in stocks or inventories
MP	=	Imports (with import taxes)
TM	=	Import taxes

Exogenous variables

GC	=	Government expenditures, procurement plus wages
E	=	Exports
TI	=	Indirect taxes
DEP	=	Depreciation
GYP	=	Government income from ownership of property
TRRTP	=	Net transfers from foreigners to the private sector
TRGTP	=	Net government transfers to private sector
NF	=	Net factor payments
GCNTR	=	Government investment in construction
GDP(t-1)	=	Lagged gross domestic product
$D_6^*(t-1)$	=	Lagged investments in machinery, at purchasers' prices
PCNTR(t-1)	=	Lagged private construction
ΔSTKS(t-1)	=	Lagged changes in inventories

The relationship between demand and money supply is well known in both classical and neoclassical economic theories. Most economists strongly believe that an increase in the growth rate of money supply will result in an increase in the money flow of various demands, resulting in price inflations and/or production increases, depending on the extent of unemployment of resources. However, in our model presented in Table 5.1, the variable money supply appears nowhere, hence making all money flows independent of the level or growth rate of money supply.

The absence of a money supply variable in our model is due to statistical estimation problems. In a growing economy like that of the Philippines, the variable money supply has grown steadily over the years, and hence is highly correlated with other variables. Estimation of equations including a money supply variable has lead to extensive multicolinearity problems. Hence it was decided to drop the money supply variable and make the assumption of passive monetary policy, i.e. money supply will behave in such a manner as to make any projected values of income and prices feasible.

Equation 5.7 and 5.8 relates corporate savings and taxes to the level of gross domestic product. In equation 5.9, personal taxes are explained by the level of personal income in a nonlinear fashion. The equation is presented in graphical form as figure 5.1. If equation 5.9 is replaced by a linear function, problems of autocorrelation will occur as the data are related nonlinearly. Incorporation of a nonlinear behavioral equation in a simultaneous model will cause complications in estimation procedures, and computation of the reduced form later. A

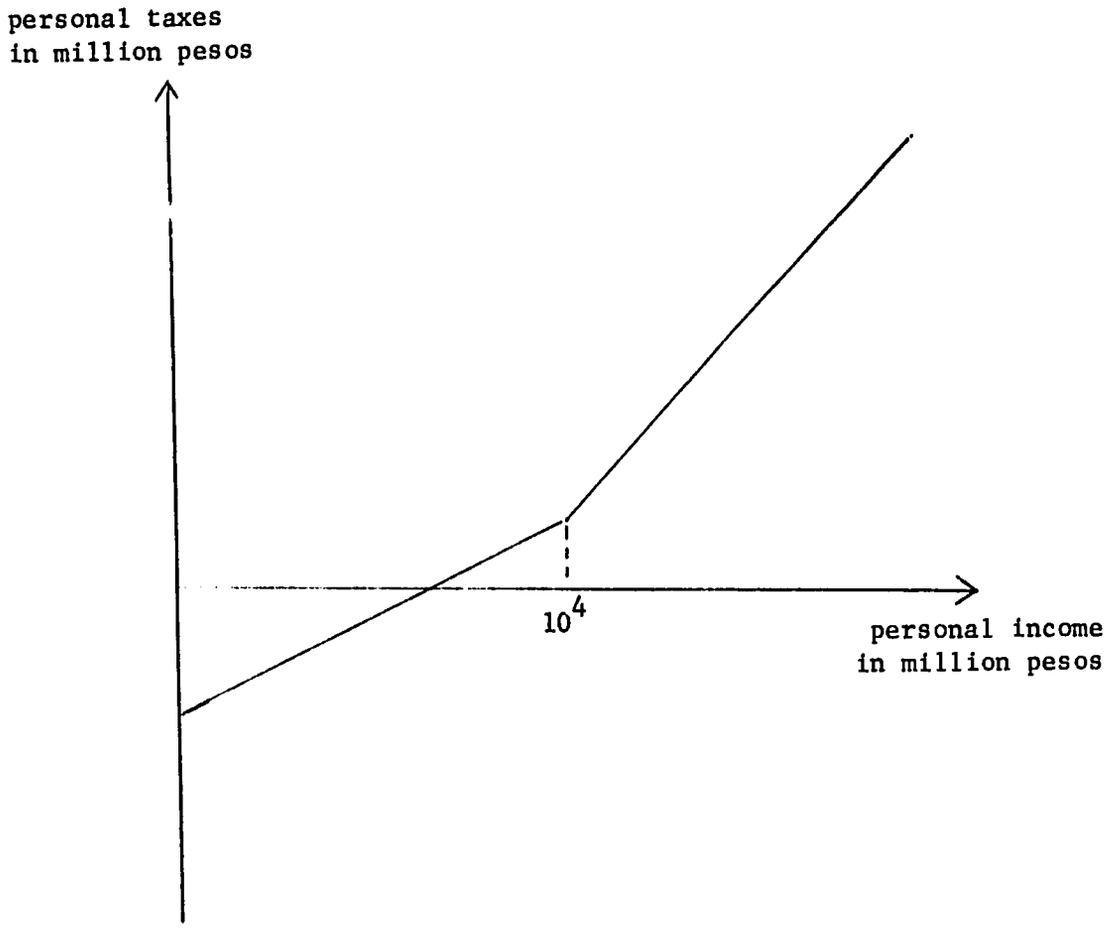

Figure 5.1. Personal taxes as a function of personal income

compromise is to use grafted linear segments as shown in Figure 5.1. Such an equation can be easily estimated by the usual two-stage least squares procedure, and the reduced form derived by simple inversion and multiplication of matrices.

Equation 5.10 is the consumption function, relating personal consumption expenditures to personal disposable income and private construction. The inclusion of private construction emphasizes the simultaneous nature of investments and savings decisions. Given a level of disposable income, an increase in the level of private construction, of which residential construction is a large part, will lead to an increase in savings or a reduction in consumption. A greater than one marginal propensity to consume, as shown in equation 5.10, should not be interpreted as instability of the model. Equation 5.10 is merely a small part of a larger model. An increase in personal disposable income, will result in an increase in private construction due to behavioral equations elsewhere in the model. Thus consumption will rise less than the initial increase in disposable income. Stability of the entire model will be demonstrated later in the chapter.

Equations 5.11 and 5.13 hypothesize a lagged plus accelerator structure for the determination of private construction and changes in inventories. The lagged term in the equation for private construction recognizes the fact that construction projects have a gestation period of longer than one year. In the absence of GDP growth, private construction is given by:

$$PCNTR(t) = 103.0 + 0.8475\ PCNTR(t-1),$$

or equivalently as:

$$PCNTR(t) = (PCNTR(0) - 675.4)\ (0.8475)^t + 675.4$$

which says that private construction will decline geometrically to a value of 675.4 as time proceeds. This is in contrast to a pure accelerator relationship where private construction will gravitate immediately to the intercept value whenever there is no GDP growth. A similar interpretation can be given to equation 5.13 explaining changes in inventories. A positive coefficient on the lagged variable implies that changes in inventories in this period is highly correlated with changes in inventories in the last period.

Equation 5.12 explains investment in machinery using the lagged variable and exports. The appearance of exports in this equation emphasizes the fact that machineries and equipments for investment purposes are usually imported in the Philippines. An increase in exports stimulates investments. At the same time, exports relax the foreign exchange constraint, thus allowing for increased imports of machineries and equipments. A significant lagged relationship implies that investments in machineries is highly correlated over time.

Equation 5.14 relates imports to GDP. Theoretically, different components of GDP, such as consumption, investments, etc., have different import contents. Therefore, imports should be explained as a linear combination of different components of GDP. However, because of multicolinearity problems, we have adopted a second best solution by merely regressing total imports on GDP.

Finally, import taxes are explained as a linear function of imports without taxes, allowing for a discontinuity in this relationship at the year 1954. The discontinuity can be easily observed by plotting import taxes against time.

Note that the model does not impose any constraints on balance of payments and government budgets. If desired, these constraints can be incorporated by converting the model into a Tinbergen type policy model and placing constraints on exogenous variables and policy instruments.

Reduced form

Given the model as presented in Table 5.1, impact multipliers of endogenous variables with respect to exogenous variables can be computed by the inversion and multiplication of certain matrices. The table of impact multipliers, computed for the case YP $\geq$ 10 billion pesos and YEAR > 1954 is presented in Table 5.2.

The GDP multiplier for injection of government expenditures and construction is in the order of 4.3. This does not imply that the economic impacts of government current expenditures and investment are similar, since government investments result in an increase in the stock of social overhead capital and hence future welfare. The GDP impact multiplier resulting from say an increase in exports is higher, being in the neighborhood of 6.1. Our model included the expansionary effects of exports on investments in machineries. Therefore exports not only affect GDP directly, but also indirectly through increases in investments.

Since the model is recursive in nature, it is desirable to have the property of stability, i.e. fixing all exogenous variables, not including

Table 5.2. Impact multipliers of macro model for the case YP ≥ 10 billion pesos and YEAR > 1954

Endogenous Variables	GC	E	GCNTR	TI+DEP-NF +GYP-TRRTP -TRGTP	GDP(t-1)	PCNTR(t-1)	D_6^*(t-1)	ΔSTKS(t-1)	Constant
GDP	4.3102	6.0766	4.3102	-4.5789	0.2508	-9.2785	2.7215	2.5792[a]	4941.06
SB	0.1396	0.1968	0.1396	-0.1483	0.0081	-0.3004	0.0881	0.0835	54.29
TB	0.0471	0.0664	0.0471	-0.0500	0.0027	-0.1014	0.0297	0.0282	68.29
YP	4.1236	5.8134	4.1236	-5.3806	0.2400	-8.8877	2.6036	2.4675	4818.49
TP	0.0936	0.1320	0.0936	-0.1221	0.0054	-0.2015	0.0591	0.0560	-79.83
YD	4.0300	5.6815	4.0300	-5.2584	0.2345	-8.6751	2.5445	2.4115	4898.32
SP	0.4015	0.5660	0.4015	-0.3415	-0.1511	2.1359	0.2535	0.2402	-166.78
C	3.6285	5.1155	3.6285	-4.9170	0.3856	-10.8111	2.2910	2.1713	5065.11
D	0.2125	0.7093	1.2125	-0.2257	-0.0369	0.3901	0.7655	0.1271	27.74
CNTR	0.2125	0.2995	1.2125	-0.2257	-0.0369	0.3901	0.1341	0.1271	346.54
PCNTR	0.2125	0.2995	0.2125	-0.2257	-0.0369	0.3901	0.1341	0.1271[a]	346.54
D_6^*	0.	0.4098	0.	0.	0.	0.	0.6314	0.	-318.80
ΔSTKS	0.3144	0.4433	0.3144	-0.3340	-0.0547	-0.6769	0.1985	0.8397	372.57
MP	-0.8922	-1.2579	-0.8922	0.9478	-0.0519	1.9206	-0.5634	-0.5339	367.75
TM	0.0471	0.0664	0.0471	-0.0500	0.0087	-0.1014	-0.0297	-0.0249	121.24

[a]The matrix enclosed in bold lines is the matrix of impact multipliers of lagged endogenous variables on endogenous variables appearing as lags.

lagged endogenous variables, successive computation of the model using this period's endogenous variables as next period's lagged endogenous variables, will result in convergence of all endogenous variables. By the theory of difference equations, our model is stable if the matrix enclosed in bold lines in Table 5.2 has all eigenvalues with absolute values less than one.[1] Calculation of eigenvalues for the matrix yields values of 0.9065, 0.6314, -0.11×10^4, and 0.5741, hence proving the model is stable. Further, a small and negative value of one of the eigenvalues suggests the existence of an oscillatory behavior in most solutions. Investigation of the impact multipliers associated with the case YP $\leq$ 10 billion pesos will yield similar results, i.e. stability and oscillation.

The reduced form of the model can be used to test the model over the sample period, 1947-1970. The test consists of examining the predictive ability, or the ability to track, over the sample period. As the model is recursive, two methods of testing are available. Firstly, actual values of exogenous and lagged endogenous variables can be used with the reduced form matrix. Secondly, actual values of exogenous variables, and predicted values of lagged endogenous variables, can be used with the reduced form matrix. The first method is more relevant to using the model for one

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[1] A system of difference equations can be written as:

$$\bar{x}_t = \underline{A}\, \bar{x}_{t-1} + \bar{g}$$

where $\bar{x}_t$, $\bar{x}_{t-1}$, and $\bar{g}$ are nx1 vectors and $\underline{A}$ is a nxn matrix. A solution $\bar{x}_t = \bar{f}(t)$ to this system is stable, i.e. $\lim_{t \to \infty} \bar{f}(t)$ exist and is finite, if the matrix $\underline{A}$ has all eigenvalues with absolute values less than 1.

period projections, where actual values of lagged endogenous variables are known. However, for long or medium term projections where values of lagged endogenous variables are unknown, the second method of testing is more relevant.

Results from both methods are presented as graphs in Appendix C. The tests show that predicted values of most variables oscillate around the actual values throughout the sample period, thus having fairly good agreement with actual growth paths. As all exogenous variables have a fairly smooth growth path, these oscillations are induced by the recursive nature of the model. In projecting into the future, assuming certain growth rates of exogenous variables, these oscillations will dampen with all variables converging to their equilibrium growth paths, as the model is stable as demonstrated earlier. Therefore, oscillations above and below actual values as shown in diagrams in Appendix C should cause no excessive inaccuracies in any medium or long-term projections.

Sectoral Information

The input-output table

Table 5.3 is the 1965 input-output table used in this study. It was derived from a more basic table reported in (34). Adjustments made in order to achieve compatibility of the input-output accounts with national accounts, as presented in Appendix B, are described below.

The government sector was disaggregated from the service sector. Government wages, amounting to 1,559,502 thousands pesos, were removed from government demand in the service sector and entered as government demand for labor in the fourth quadrant of the table. The housing sector

Table 5.3. 1965 input-output accounts of the Philippines at producers' prices, in thousands of pesos[a]

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.	Construc-tion	Utilities
Agriculture	207,395	1,624	--	1	2,284,572	485,632	239	--
Fisheries	865	10,770	--	--	119,115	820	--	--
Forestry	2,140	6,544	2,287	6,309	4,518	127,403	6,733	308
Mining	264	642	--	2,251	5,595	321,604	23,222	--
Food Mfg.	94,838	30,062	--	--	361,814	49,385	--	--
Other Mfg.	165,300	92,567	65,719	93,414	223,699	1,830,731	631,921	63,536
Construction	--	--	--	283	803	2,592	23,320	749
Utilities	3,285	973	817	3,316	12,876	54,353	2,646	20,856
Transportation, Communications, etc.	19,832	6,891	4,770	10,249	86,876	144,813	24,402	7,290
Trade	63,720	27,229	13,736	15,185	377,865	410,232	109,718	13,307
Finance	73,627	5,206	6,331	10,263	56,475	123,043	21,878	7,118
Services	19,022	11,391	20,514	17,352	59,868	285,588	70,880	12,218
Total intermediate inputs	650,289	193,898	114,175	158,624	3,594,076	3,836,198	914,959	125,382

[a]Source: See text.

Table 5.3. Continued

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.	Construction	Utilities
Labor income: professionals	13,248	14,505	3,076	6,294	40,153	164,833	57,979	11,220
Labor income: sales and clerical workers	18,623	--	1,736	5,434	41,838	129,001	31,007	14,897
Labor income: farmers, fishermen, farm workers, etc.	1,238,441	125,836	42,141	--	--	2,834	625	210
Labor income: skilled and semiskilled workers	14,345	2,703	21,407	25,623	112,965	958,762	257,391	19,055
Labor income: manual workers	1,355	--	488	26,787	5,033	6,350	72,699	1,049
Labor income: service workers	11,824	--	8,489	1,819	2,528	22,272	6,381	6,360
Total labor income	1,297,837	143,043	77,337	65,957	202,517	1,284,052	426,082	52,791
Net return to capital	2,471,883	400,822	479,372	182,526	917,184	670,714	280,437	76,444
Rents	414,492	--	--	82	--	--	--	--

Table 5.3. Continued

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.	Construc-tion	Utilities
Depreciation	131,436	219,045	74,708	43,983	133,643	326,676	57,730	47,413
Indirect taxes	-38,313	3,008	24,746	-16,748	73,240	663,920	22,491	24,514
Total value added	4,277,335	765,917	656,163	275,800	1,326,583	2,945,362	786,741	201,161
Gross Output	4,927,625	959,815	770,338	434,424	4,920,659	6,781,559	1,701,700	326,543

Table 5.3. Continued

	Transportation	Trade	Finance	Services	Total intermediate sales
Agriculture	5,136	--	--	118,957	3,103,556
Fisheries	3,572	--	--	40,872	176,014
Forestry	--	--	--	271	156,513
Mining	101	--	823	719	355,222
Food Mfg.	27,734	41	--	266,165	830,040
Other Mfg.	269,522	92,879	90,055	288,055	3,907,398
Construction	952	3,096	36,603	3,505	71,904
Utilities	7,311	27,429	16,803	34,500	185,166
Transportation, Communications, etc.	75,991	91,956	22,616	55,804	551,489
Trade	57,184	18,062	17,076	140,382	1,263,696
Finance	38,712	298,136	93,841	106,540	841,171
Services	61,295	224,160	148,280	265,213	1,195,781
Total intermediate inputs	547,511	755,759	426,097	1,320,983	12,637,951

Table 5.3. Continued

	Transportation	Trade	Finance	Services	Total intermediate sales
Labor income: professionals	71,245	58,984	42,457	488,482	972,476
Labor income: sales and clerical workers	45,429	1,140,327	139,809	139,544	1,707,644
Labor income: farmers, fishermen, farm workers, etc.	--	1,103	2,573	--	1,413,763
Labor income: skilled and semiskilled workers	255,504	22,282	2,568	21,315	1,713,920
Labor income: manual workers	30,795	15,100	123	15,491	175,271
Labor income: service workers	14,213	7,839	8,365	489,350	579,440
Total labor income	417,185	1,245,635	195,895	1,154,183	6,562,513
Net return to capital	173,799	1,435,504	1,044,210	1,250,737	9,383,633
Rents					414,574

Table 5.3. Continued

	Transporta-tion	Trade	Finance	Services	Total intermedi-ate sales
Depreciation	141,133	137,948	337,300	147,986	1,799,001
Indirect taxes	55,402	101,139	169,221	40,380	1,123,000
Total value added	787,518	2,920,226	1,746,626	2,593,286	19,282,719
Gross Output	1,335,029	3,675,985	2,172,723	3,914,269	31,920,670

Table 5.3. Continued

	Personal Consumption	Investments	Government Consumption	Exports	Imports	Changes in Stocks	Total final Demand	Gross Output
Agriculture	1,225,815	--	3,293	546,444	-230,735	279,252	1,824,069	4,927,625
Fisheries	780,626	--	2,170	1,072	-67	--	783,801	959,815
Forestry	181,445	--	1	435,438	-3,059	--	613,825	770,338
Mining	12,751	--	5,528	292,029	-240,474	9,368	79,202	434,424
Food Mfg.	4,033,635	--	13,150	493,849	-503,644	53,629	4,090,619	4,920,659
Other Mfg.	2,850,835	1,998,350	162,882	520,088	-2,803,021	145,027	2,874,161	6,781,559
Construction	3,413	1,592,063	34,320	--	--	--	1,629,796	1,701,700
Utilities	114,077	--	21,809	7,121	-1,630	--	141,377	326,543
Transportation, Communications, etc.	541,245	51,327	39,312	172,861	-21,205	--	783,540	1,335,029
Trade	1,773,918	286,323	32,850	319,198	--	--	2,412,289	3,675,985
Finance	595,315	418,937	87,685	304,918	-75,303	--	1,331,552	2,172,723
Services	2,259,146	--	67,498	789,982	-407,862	9,724	2,718,488	3,914,269
Total intermediate inputs	14,372,221	4,347,000	470,498	3,883,000	-4,287,000	497,000	19,282,719	31,920,670

Table 5.3. Continued

	Personal Consumption	Investments	Government Consumption	Exports	Imports	Changes in Stocks	Total final Demand	Gross Output
Labor income: professionals	--	--	1,095,862	--	--	--	1,095,862	2,068,338
Labor income: sales and clerical workers	--	--	253,609	--	--	--	253,609	1,961,253
Labor income: farmers, fishermen, farm workers, etc.	--	--	1,146	--	--	--	1,146	1,414,909
Labor income: skilled and semiskilled workers	--	--	36,776	--	--	--	36,776	1,750,695
Labor income: manual workers	--	--	4,750	--	--	--	4,750	180,021
Labor income: service workers	--	--	167,359	--	--	--	167,359	746,799
Total labor income	--	--	1,559,502	--	--	--	1,559,502	8,122,015
Net return to capital	--	--	--	--	--	--	--	9,383,633
Rents	1,081,779	--	--	--	--	--	1,081,779	1,496,353

Table 5.3. Continued

	Personal Consumption	Investments	Government Consumption	Exports	Imports	Changes in Stocks	Total final Demand	Gross Output
Depreciation	--	--	--	--	--	--	--	1,799,001
Indirect taxes	--	--	--	--	368,000	--	368,000	1,491,000
Total value added	1,081,779	--	1,559,502	--	368,000	--	3,009,281	22,292,000
Gross Output	15,454,000	4,347,000	2,030,000	3,883,000	-3,919,000	497,000	22,292,000	54,212,670

was disaggregated from sector eleven: finance. Therefore, rents amounting to 1,081,779 thousands pesos were removed from final demand in that sector and entered in the fourth quadrant as rents. Import taxes of 368,000 thousands pesos, not reported in the original table were added as indirect taxes in the fourth quadrant.

The consumption vector (with rents deducted), at purchasers' prices, originally reported in (34), was multiplied by a constant such that total consumption (with rents) agrees with total private consumption reported in the national accounts. This adjusted vector is reported as the first column of Table 5.4a. Multiplication of this vector by trade and transport margins associated with the original vector, gave us trade and transport margins associated with the new vector. These are reported as columns two and three in Table 5.4a. From these vectors, the consumption vector at producers' prices can be derived.

In a similar manner, adjusted final demand vectors for investments, government consumption, and exports, at producers' and purchasers' prices were derived. These are reported in Tables 5.4b to 5.4d. Adjusted imports and changes in inventories vectors, valued only at producers' prices, were also obtained in a similar manner. These are as reported in Table 5.3.

The final demand vector consistent with the national accounts was derived by summation of all demand vectors, i.e.

$$\overline{F} = \overline{C} + \overline{D} + \overline{GC} + \overline{E} + \overline{MP} + \overline{STKS}.$$

Sectoral gross outputs necessary to satisfy this final demand vector was calculated by the usual Leontief equation:

Table 5.4a. Private consumption vector associated with Table 5.3

	At producers' prices	Trade margins	Transport margins	At purchasers' prices
Agriculture	1,225,815	163,589	19,140	1,408,544
Fisheries	780,626	152,038	35,561	968,225
Forestry	181,445	31,355	6,993	219,793
Mining	12,751	5,778	1,094	19,623
Food Mfg.	4,033,635	756,226	35,040	4,824,901
Other Mfg.	2,850,835	649,376	46,001	3,546,212
Construction	3,413	--	--	3,413
Utilities	114,077	--	--	114,077
Transportation	541,245	--	--	397,416
Trade	1,773,918	--	--	15,556
Finance	595,315	--	--	595,315
Services	2,259,146	--	--	2,259,146
Total	14,372,221	1,758,362	143,829	14,372,221

Table 5.4b. Investments vector associated with Table 5.3

	At producers' prices	Trade margins	Transport margins	At purchasers' prices
Agriculture	--	--	--	--
Fisheries	--	--	--	--
Forestry	--	--	--	--
Mining	--	--	---	--
Food Mfg.	--	--	--	--
Other Mfg.	1,998,350	286,323	51,327	2,336,000
Construction	1,592,063	--	--	1,592,063
Utilities	--	--	--	--
Transportation	51,327	--	--	--
Trade	286,323	--	--	--
Finance	418,937	--	--	418,937
Services	--	--	--	--
Total	4,347,000	286,323	51,327	4,347,000

Table 5.4c. Government consumption vector associated with Table 5.3

	At producers' prices	Trade margins	Transport margins	At purchasers' prices
Agriculture	3,293	454	65	3,812
Fisheries	2,170	573	121	2,864
Forestry	1	--	--	1
Mining	5,528	1,510	365	7,403
Food Mfg.	13,150	2,431	127	15,708
Other Mfg.	162,882	27,882	4,424	195,188
Construction	34,320	--	--	34,320
Utilities	21,809	--	--	21,809
Transportation	39,312	--	--	34,210
Trade	32,850	--	--	--
Finance	87,685	--	--	87,685
Services	67,498	--	--	67,498
Total	470,498	32,850	5,102	470,498

Table 5.4d. Exports vector associated with Table 5.3

	At producers' prices	Trade margins	Transport margins	At purchasers' prices
Agriculture	546,444	67,027	33,028	646,499
Fisheries	1,072	185	45	1,302
Forestry	435,438	57,302	26,380	519,120
Mining	292,029	1,981	12,098	306,108
Food Mfg.	493,849	113,310	9,312	616,471
Other Mfg.	520,088	79,393	8,022	607,503
Construction	--	--	--	--
Utilities	7,121	--	--	7,121
Transportation	172,861	--	--	83,976
Trade	319,198	--	--	--
Finance	304,918	--	--	304,918
Services	789,982	--	--	789,982
Total	3,883,000	319,198	88,885	3,883,000

$$\bar{X} = (I - A)^{-1} \bar{F} ,$$

where A is the matrix of technical coefficients. The Leontief inverse is reported in Table 5.5. The values of sectoral gross outputs so calculated are reported in Table 5.3. The values of intermediate inputs, X_{ij}'s, were then calculated using these values of sectoral gross outputs, maintaining the original technical coefficients.

The original row of sectoral depreciations was adjusted by a constant ratio such that total depreciation agrees with that reported in the national accounts. A similar adjustment was made on the row of indirect taxes until total indirect taxes, including import taxes of 368,000 thousands pesos, agreed with the national accounts. The row of rents as shown in Table 5.3 was taken from (27).

We now have computed gross output, intermediate inputs, rents, depreciation and indirect taxes for each sector. Sectoral gross output less intermediate inputs, rents, depreciation and indirect taxes is sectoral net domestic product (less rents) at factor costs. This had to be allocated into net capital income and labor income for different occupations. We determined labor income for different occupations, leaving net capital income to be calculated as a residual.

Total sectoral wages and salaries, reported in the original table were described as:

> Wages and salaries cover all compensation to wage earners and salary employees, including living allowances, bonuses, commissions, employers' contribution to life and retirement plans, payments in kinds and other fringe benefits. In general, this item was estimated directly from production cost data by industry (34).

It is difficult to judge whether wages and salaries contain imputed wages

Table 5.5. The Leontief inverse, i.e. $[I - \underline{\alpha}(I-\underline{T})]^{-1}$

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.	Construc-tion	Utilities	Transpor-tation	Trade	Finance	Services
Agriculture	1.0599	0.0325	0.0132	0.0316	0.5411	0.1197	0.0509	0.0303	0.0472	0.0108	0.0131	0.0857
Fisheries	0.0009	1.0126	0.0006	0.0011	0.0274	0.0017	0.0014	0.0011	0.0046	0.0011	0.0011	0.0137
Forestry	0.0016	0.0100	1.0055	0.0218	0.0038	0.0281	0.0152	0.0073	0.0064	0.0013	0.0018	0.0030
Mining	0.0028	0.0079	0.0062	1.0211	0.0070	0.0682	0.0407	0.0152	0.0156	0.0031	0.0049	0.0070
Food Mfg.	0.0234	0.0383	0.0044	0.0091	1.0956	0.0207	0.0125	0.0090	0.0335	0.0072	0.0076	0.0838
Other Mfg.	0.0569	0.1511	0.1303	0.3314	0.1185	1.4301	0.5599	0.3168	0.3240	0.0630	0.0884	0.1387
Construction	0.0004	0.0004	0.0004	0.0017	0.0010	0.0016	1.0150	0.0035	0.0020	0.0026	0.0181	0.0019
Utilities	0.0018	0.0034	0.0031	0.0129	0.0062	0.0151	0.0091	1.0729	0.0110	0.0104	0.0106	0.0128
Transporta-tion	0.0073	0.0140	0.0115	0.0370	0.0297	0.0399	0.0345	0.0367	1.0730	0.0311	0.0163	0.0242
Trade	0.0202	0.0437	0.0288	0.0626	0.1030	0.0988	0.1084	0.0696	0.0736	1.0151	0.0200	0.0580
Finance	0.0203	0.0148	0.0155	0.0410	0.0349	0.0434	0.0392	0.0405	0.0490	0.0910	1.0523	0.0422
Services	0.0107	0.0258	0.0387	0.0691	0.0337	0.0814	0.0852	0.0680	0.0780	0.0783	0.0848	1.0896

of self-employed and unpaid family workers; since data were obtained from production cost data. The description above certainly implies that they have been left out. However, production cost data in farming activities inevitably include the opportunity costs of farmer-operators. This is clearly the case since wages and salaries in the agriculture sector, as reported in the original table, amounted to approximately half of GDP in agriculture. Therefore, to avoid the problem of deciding whether wages of self-employed and unpaid family workers have been imputed in each sector, independent estimates of labor income by the six occupations indicated in Table 5.3 were obtained by the following method.

During recent labor force surveys, data on sectoral employment by a two-digit occupational classification were collected by the Bureau of the Census and Statistics (BCS) in the Philippines. Such data are available from the BCS in the form of unpublished tables. The two-digit occupational classification resulted in 72 occupational subclasses. The sectoral classification system (of 57 sectors) can be aggregated into sectors consistent with classification in our input-output table. Earnings data for the March 1971 survey, in terms of average weekly earnings of wage and salary workers by the same two-digit occupational classification, (i.e. by 72 occupational subclasses), are available in (5).

Yearly labor income by the 72 suboccupations and by the thirteen sectors, was approximated by the formula:

$$W_{k'j} = w_{k'} \eta_{k'} l_{k'j} \cdot 52$$

$$k' = 1, \ldots, 72;$$

$$j = 1, \ldots, 12, \quad ;$$

where:

$W_{k'j}$ = yearly labor income in thousands of pesos, of sub-occupation k' in sector j;

$w_{k'}$ = average weekly wages and salaries, in pesos, of sub-occupation k';

$\eta_{k'}$ = extent of full employment, i.e. one minus the extent of underemployment, of suboccupation k';

$l_{k'j}$ = employment in thousands, of suboccupation k' in sector j.

Implicit in the above calculation is the assumption that wages and the extent of underemployment are equal for the same suboccupation (in a two-digit classification) across all sectors. This is not particularly severe, given the fine suboccupational classification scheme.

Using assumed extent of underemployment, yearly wages for 1971, in terms of seventy-two suboccupations and thirteen sectors, were calculated. These were aggregated into labor income by six occupations (as indicated in Table 5.3) and thirteen sectors, i.e. W_{kj} (6), k = 1, ..., 6; j = 1, ..., 12, g; (t=6 for 1971). Underemployment of these six occupations and thirteen sectors were calculated by the method of weighted average, and are reported in Table 5.6. Note that the variable $\theta_{kj} z_k(6)$ (t=6 for 1971), can be calculated as:

$$\theta_{kj}\, z_k(6) = \frac{W_{kj}(6)}{l_{kj}(6)\, \eta_{kj}}, \qquad k = 1, \ldots, 6; \quad j = 1, \ldots, 12, g.$$

Table 5.6. Labor efficiency rates by occupation and sector, i.e., the Π matrix

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.
Professionals	0.91	1.00	1.00	1.00	1.00	0.98
Sales and clerical workers	0.80	1.00	0.80	0.80	0.76	0.79
Farmers, fishermen, etc.	0.50	0.50	0.80	1.00	1.00	0.64
Skilled and semiskilled workers	0.72	0.93	0.76	0.88	0.89	0.89
Manual workers	0.70	1.00	0.70	0.70	0.70	0.70
Service workers	1.00	1.00	1.00	1.00	0.86	0.88

Construc-tion	Utilities	Transporta-tion	Trade	Finance	Services	Total intermedi-ate inputs
1.00	1.00	0.99	1.00	0.99	0.97	0.95
0.80	0.80	0.80	0.73	0.85	0.79	0.80
0.50	0.50	1.00	0.60	0.90	1.00	0.58
0.89	0.88	0.68	0.76	0.93	0.73	0.81
0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.80	0.61	0.79	0.77	0.93	0.72	0.90

We have yet to compute labor income and employment for the base year 1965. To do this, we note that:

$$\frac{W_{kj}(6)}{X_j(6)} = \beta_{kj}(1 - \tau_j) = \frac{W_{kj}(0)}{X_j(0)},$$

$$k = 1, \ldots, 6;$$

$$j = 1, \ldots, 12;$$

under our assumption of Cobb-Douglas sectoral production functions. Since $X_j(0)$ and $X_j(6)$, $j = 1, \ldots, 12$; are available from the national accounts, $W_{kj}(0)$, $k = 1, \ldots, 6$; $j = 1, \ldots, 12$; can be easily calculated. For government wages, we assumed a constant proportional allocation of total government wages into different occupations, and hence derived $W_{kg}(0)$, $k = 1, \ldots, 6$. Wages computed in this manner are as reported in Table 5.3.

To calculate the distribution of employment by occupation and sector we note that:

$$\sum_j \frac{W_{kj}(0)}{\theta_{kj}\ \eta_{kj}\ z_k(6)} + \frac{W_{kg}(0)}{\theta_{kg}\ \eta_{kg}\ z_k(6)}$$

$$= \frac{1}{z_k(6)} \left[\sum_j l_{kj}(0) + l_{kg}(0) \right]$$

$$= \frac{1}{z_k(6)} \quad l_k^s(0), \qquad k = 1, \ldots, 6.$$

As $l_k^s(0)$, $k = 1, \ldots, 6$, can be obtained from (5), we calculated $z_k(6)$, $k = 1, \ldots, 6$ from the above equation. Since $\theta_{kj} z_k(6)$ $k = 1, \ldots, 6$; $j = 1, \ldots, 12, g$; were known, we can derive θ_{kj}, thus deriving:

$$l_{kj} = \frac{W_{kj}(0)}{\eta_{kj}\ \theta_{kj}}$$

$$k = 1, \ldots, 6;$$

$$j = 1, \ldots, 12, g.$$

Employment by occupation and sector derived in this manner as presented in Table 5.7. As some scanty information on employment by occupation and sector are available from other sources, minor adjustments are made to this table. Adjustments made are documented as footnotes in Table 5.7. The recomputed matrix, using Table 5.7, is presented as Table 5.8.

Employment impact of increases in final demand

The sectoral and occupational information we have so far allow us to compute the employment effects of increases in final demand by sector. Note that:

$$\frac{\partial \sum_{j=1}^{12} z_k\ l_{kj}}{F_i} = \sum_{j=1}^{12} \frac{\partial z_k\ l_{kj}}{\partial W_{kj}} \frac{\partial W_{kj}}{\partial X_j} \frac{\partial X_j}{\partial F_i}$$

$$= \sum_{j=1}^{12} \frac{\beta_{kj}(1 - \tau_j)}{\theta_{kj}\ \eta_{kj}} \frac{\partial X_j}{\partial F_i} .$$

The expression $\frac{\partial \sum_{j=1}^{12} z_k\ l_{kj}}{\partial F_i}$ is the increase in employment in occupation k due to increase in one peso of final demand in sector i, assuming that the wage rate z_k remain unchanged. The constant wage rate assumption is equivalent to surplus or unemployment of labor in occupation k. The

Table 5.7. Employment (in thousands) by occupation and sector in the Philippines, 1965

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.
Professionals	2.9[a]	3.0[a]	0.5[a]	1.1[a]	7.1[b]	30.0[c]
Sales and clerical workers	5.5[a]	--	0.5[a]	1.7[a]	23.8[b]	49.2[d]
Farmers, fisherman, etc.	5210.1[d]	400.0[d]	50.1[a]	--	--	5.5[a]
Skilled and semiskilled workers	12.1[a]	1.0[a]	12.6[d]	19.1[d]	110.0[b]	835.5[d]
Manual workers	1.3[a]	--	9,5[a]	2.5[a]	5.6[b]	7.0[d]
Service workers	3.9[a]	--	2.8[a]	0.6[a]	1.5[b]	8.6[d]
Total	5236.0[d]	404.0[f]	67.0[g]	25.0[e]	148.0[h]	936.0[d]

[a]See text.

[b]Proportional to sectoral employment, whose proportion is sectoral total in above table to projected sectoral total (see text).

[c]Assumed.

[d]As a residual.

[e]Average of May and October, 1965, figures.

[f]May, 1965 figure.

[g]Average of projected figure (see text) and May, 1965 figure.

[h]From (21).

[i]Projected (see text) figure but close to May, 1965 figure.

Construction	Utilities	Transportation	Trade	Finance	Services	Government	Total
11.4[a]	2.0[b]	12.1[a]	10.4[a]	7.2[a]	110.0[c]	353.3[d]	551.0[e]
9.1[a]	4.8[b]	14.8[a]	1005.0[a]	42.3[a]	57.5[d]	110.8[a]	1325.0[e]
2.0[a]	0.9[b]	--	2.5[a]	2.1[a]	--	3.8[a]	5677.0[e]
199.4[d]	10.3[b]	279.9[d]	20.1[a]	1.5[a]	20.0[c]	34.5[a]	1556.0[e]
60.3[a]	0.9[b]	34.1[a]	16.0[a]	0.1[a]	16.4[b]	6.3[a]	151.0[e]
2.8[a]	3.1[b]	7.1[a]	3.3[a]	2.9[a]	718.1[a]	85.3[a]	840.0[e]
285.0[e]	22.0[e]	348.0[e]	1057.0[i]	56.0[i]	922.0[c]	594.0	10,000.0[e]

Table 5.8. Average labor income by occupation and sector in pesos for 1965, i.e., the matrix θ

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.
Professionals	5020.25	4834.93	6151.31	5721.95	5655.30	5606.57
Sales and clerical workers	4232.61	--	4340.26	3995.28	2313.05	3318.94
Farmers, fishermen, etc.	475.40	629.18	1051.42	--	--	805.22
Skilled and semiskilled workers	1646.55	2905.98	2235.46	1524.48	1153.88	1289.36
Manual workers	1489.27	--	1394.41	1530.67	1284.02	1295.96
Service workers	3031.80	--	3031.80	3031.80	1959.56	2942.87

Construc-tion	Utilities	Transpor-tation	Trade	Finance	Services	Government
5085.86	5609.79	5947.50	5671.51	5956.42	4578.09	4522.03
4259.18	3879.38	3836.87	1554.32	3888.43	3071.96	3962.59
625.21	467.48	--	735.13	1361.15	--	719.97
1450.37	2102.31	1324.41	1458.65	1840.77	1459.96	1822.65
1722.32	1665.25	1290.10	1348.21	1763.39	1349.42	1490.92
2848.52	3363.44	2533.97	3085.02	3101.52	946.46	3019.26

expression $\frac{\partial x_j}{\partial F_i}$ is merely the $(j, i)^{th}$ element of the Leontief inverse. Therefore, the complete expression in the above equation can be easily evaluated given the information we now know.

Such a computation was carried out and the result reported in Table 5.9, for one million pesos increases in final demand. A similar calculation was carried out by the ILO (21), although employment impacts were not broken down into occupational categories. An occupational breakdown allows for finer analysis of employment effects. For example, although employment content of final demand in agriculture is high, employment tends to be generated in the low income occupation as farmers, farmworkers, etc. This is also true for the food manufacturing sector.

The figures reported in Table 5.9 can also be interpreted as labor productivities with respect to final demand. In this manner, the pattern of productivities follow closely to what one would expect for a developing country. Demand in the agriculture, food manufacturing, fisheries, transportation and services sectors generate high employment, or have low labor productivities. Demand in the mining, utilities, forestry and finance sectors generate low employment or have high productivities. Intermediate sectors are manufacturing, construction and trade.

Table 5.9. Employment effects by occupation of a 1 million pesos increase in final demand by sector[a]

	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg.	Construction	Utilities	Transportation	Trade	Finance	Services
Professionals	1.4	4.9	2.6	6.7	4.1	9.7	12.6	10.6	13.9	6.0	6.6	32.0
Sales and clerical workers	7.8	14.1	10.5	26.0	36.5	40.6	41.9	39.4	36.9	281.4	28.3	34.6
Farmers, fisherman, etc.	1121.2	457.2	79.6	35.6	584.0	130.3	57.1	36.3	52.7	12.8	15.5	96.7
Skilled and semiskilled workers	12.1	24.6	35.8	95.4	48.1	190.4	198.9	82.8	267.9	21.3	18.5	31.1
Manual workers	0.9	1.4	1.8	60.7	3.3	7.4	40.7	5.8	29.4	5.9	2.0	6.2
Service workers	3.0	5.1	11.1	15.0	7.5	17.5	18.6	23.4	20.8	15.8	17.3	200.5
Total	1146.5	507.5	141.5	239.6	683.6	396.1	370.0	198.4	421.7	343.3	88.4	401.4
Rank	1	3	11	9	2	6	7	10	4	8	12	5

[a]Under assumption of constant wages, or unlimited supply of labor for all occupations.

Sectoral Consumption

Cross section data on household expenditures were collected during the household expenditure survey of 1971. Tabulations of this survey, yet to be published, can be obtained from the BCS in the Philippines. Commodity classification in the survey was in terms of approximately four hundred items. These were allocated to the twelve sectors in our input-output table, with rents for housing being allocated into the finance sector. A similar allocation was performed on the 1965 household expenditure survey, and the result compared with the 1965 consumption vector at purchasers' prices reported in Table 5.4a.[1] For each sector, the ratio of reported to allocated consumption was used to adjust the allocated consumption in 1971 in order to achieve consistency of our allocation with the input-output accounts.

An examination of savings data in the 1971 household expenditure survey revealed that out of fourteen income classes reporting, only the three top income classes were net savers. Further, overall savings of all families was negative, while total personal savings reported in the national accounts for 1971 was 2674 million pesos. However, total consumption of 28,430 million pesos reported in the household expenditure survey compare more favorably with a figure of 35,628 million pesos reported in the national accounts; if we note that the latter figure contains consumption expenditures of all nonprofit organizations.[2] Therefore,

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[1]Data available from the 1965 household expenditure survey were insufficient to estimate cross section consumption functions.

[2]This discrepancy will not introduce excessive errors into our model as total consumption is as projected by the macroeconomic model estimated from national accounts.

there was extensive underreporting of income in the 1971 household expenditure survey.

Such underreporting of income is common in almost all household budget surveys. The usual explanation is that production for self-consumption and barter transactions of goods and services are not included in the computation of income, but are included in computation of consumption. Given the widespread phenomenon of production for self-consumption in a largely agrarian economy, the extent of income underestimation in low income families can be considerable.

Given the unreliability of income data, we have decided to explain sectoral consumption expenditures by total consumption instead of income. The determination of savings and total consumption will be left to the Keynesian model described earlier. Hence, it will not be possible to capture the effects of income distribution on savings.

The modified household expenditure system can now be written as:

$$FC_i^* = \phi_{0i} + \phi_{1i}\, t + \phi_{2i}\, FC + \phi_{3i} \ln FC,$$

$$i = 1, \ldots, 10, 11+h, 12;$$

where:

FC_i^* = household consumption expenditures, in pesos, at purchasers' prices, on sector i; and i = 11+h indicates that rents on housing has been included in sector 11;

FC = total household consumption expenditures.

Theoretically, it is easy to see that household consumption behavior will depend heavily on household characteristics such as household size and ages of members. As an examination of Table 5.10 will reveal, median

Table 5.10. Media family size of different income groups in the 1971 household expenditure survey, Philippines[a]

Income Class (pesos)	Urban	Rural	Total
0- 500	3.4	4.2	4.1
500- 1,000	4.2	4.7	4.7
1,000- 1,500	4.7	5.1	5.0
1,500- 2,000	5.4	3.4	5.4
2,000- 2,500	4.9	5.3	5.2
2,500- 3,000	5.3	5.9	5.6
3,000- 4,000	5.2	6.1	5.8
4,000- 5,000	5.8	6.4	6.1
5,000- 6,000	6.6	6.9	6.8
6,000- 8,000	6.1	6.6	6.3
8,000-10,000	6.2	6.6	6.4
10,000-15,000	6.2	7.1	6.5
15,000-20,000	6.5	7.1	6.7
Over 20,000	6.7	6.4	6.6
Total	5.6	5.5	5.5

[a]Source: Unpublished BCS data

family size is highly correlated with family income. Inclusion of household size in household expenditure equations gave rise to multicolinearity problems. It was therefore decided not to include the variable household size. No serious projection problems will arise if the two variables, household income and household size, remain correlated during the projection period.

Using cross section data in 1971 (t=6) described earlier, certain parameters in the above equation were estimated. These are reported in Table 5.11. Note that $\phi_{0i} + \phi_{1i} \cdot 6$ was estimated as a single variable. To estimate ϕ_{1i}, note that:

$$\phi_{1i} \approx \frac{1}{6} \; [(\phi_{0i} + \phi_{1i} \cdot 6) + \phi_{2i} \; FC(0) + \phi_{3i} \; \ln FC(0) - FC_i^*(0)].$$

As $FC_i^*(0)$, i = 1, ..., 10, 11+h, 12, are known, the above formula was used to approximate ϕ_{1i}, i = 1, ..., 10, 11+h, 12. These are reported in the last column of Table 5.12.

To estimate the consumption vector at producers' prices, we first compute:

$$C_i^* = HH \cdot FC_i^*, \; i = 1, \ldots, 10, 11+h, 12;$$

$$C_h^* = C_{11+h}^* \cdot \frac{C_h^*(0)}{C_{11+h}^*(0)}, \quad C_{11}^* = C_{11+h}^* - C_h^*,$$

where HH is the number of households in thousands. To convert the consumption vector at purchasers' prices to consumption at producers' prices, the same proportion of trade and transport margins as the base year 1965 are assumed for each sector.

To examine the effects of income redistribution on sectoral consumption, we appeal to the identity:

Table 5.11. OLS regression results of household consumption expenditure equations using unpublished data from 1971 household expenditure survey, Philippines[a]

Sector	ϕ_{0i}	ϕ_{2i}	ϕ_{3i}	R^2	ϕ_{1i}[b]
Agriculture	166.57 (1.0041)	0.0379 (10.3845)	12.0959 (0.5652)	0.9879	17.8549
Fisheries	-1097.25 (-8.3699)	0.0171 (5.8726)	100.3694 (9.2321)	0.9934	3.2302
Forestry	7.23 (0.0794)	0.0013 (0.6307)	6.5552 (0.5429)	0.4771	3.4952
Mining	90.46 (1.9075)	0.0061 (5.7487)	-12.8802 (-2.6497)	0.9130	0.6927
Food Mfg.	-4267.05 (-12.6115)	0.0919 (12.2260)	632.8916 (14.1166)	0.9978	3.7929
Other Mfg.	-256.85 (-0.8817)	0.2595 (40.0866)	24.1711 (0.6262)	0.9991	2.9786
Construction	15.74 (1.9240)	0.0011 (5.7909)	-2.2403 (-2.0670	0.9141	0.1402
Utilities	180.83 (4.1729)	0.0195 (20.2808)	-28.7301 (-5.0035)	0.9941	-1.2998
Transportation	-78.70 (-0.4291)	0.0387 (9.4983)	4.2791 (0.1761)	0.9846	-1.3250
Trade	-24.02 (-3.4104)	0.0002 (1.0738)	3.2698 (3.5040)	0.9335	-0.1501
Finance and housing	2679.68 (4.1503)	0.2259 (15.7451)	-394.2949 (-4.6088)	0.9892	-8.3701
Services	2583.36 (9.1988)	0.3008 (48.1895)	-405.4866 (-10.8966)	0.9990	-21.0397

[a]See text for notation.

[b]See text for the estimation of this parameter.

$$\frac{\partial^2 FC_i^*}{\partial FDY^2} = \frac{\partial^2 FC_i^*}{\partial FC^2}\left[\frac{\partial FC}{\partial FDY}\right]^2 + \frac{\partial FC_i^*}{\partial FC}\ \frac{\partial^2 FC}{\partial FDY^2}$$

$$i = 1, \ldots, 10, 11+h, 12.$$

Assuming that:

$$FC = a\ FDY^b\ ,\quad b < 1,$$

the above can be written as:

$$\frac{\partial^2 FC_i^*}{\partial FDY^2} = [-b\ \phi_{3i} + \phi_{2i}\ ab(b-1)\ FDY^b]\ \frac{1}{FDY^2}$$

Therefore:

$$\text{sign}\left[\frac{\partial^2 FC_i^*}{\partial FDY^2}\right] = \text{sign}\ [-b\ \phi_{3i} + \phi_{2i}\ ab(b-1)\ FDY^b]$$

Before proceeding further, it should be noted that if $b < 1$, then the sectoral consumption functions as a function of income, will be concave as we proceed to high income levels. The reason for this phenomenon is that a constant elasticity aggregate consumption function with elasticity less than one will imply an increasing proportion of savings, with an upper limit of one that will be reached at infinitely large income. Hence at high incomes, the depressing effect of increasing savings is so great as to cause all sectoral consumptions to be concave.

If $\phi_{3i} < 0$, then the sectoral consumption function will initially be convex before turning concave at some high level of income. For each sector, the level of income for which transition from convexity to concavity takes place can be calculated from the formula:

$$e^{\frac{1}{b} \ln \left[\frac{b\ \phi_{3i}}{\phi_{2i}\ ab(b-1)}\right]}, \quad \phi_{3i} < 0.$$

If $\phi_{3i} > 0$, then the consumption function is unambiguously concave, i.e.

$$\frac{\partial^2 FC_i^*}{\partial FDY^2} < 0.$$

Sectors for which this is true (with statistical significance) are the sectors: fisheries, food manufacturing, and trade. The first two are food oriented sectors, strongly indicating that the marginal propensity of consumption for food is less than one.[1] Sectors for which $\phi_{3i} > 0$, but without statistical significance are the sectors agriculture, forestry, other manufacturing, and transportation.

Sectors which show convexity of sectoral consumption functions, at least for low levels of income, are all statistically significant in this property. The sectors are: mining, construction, utilities, finance and housing, and services. Except for the service sector, all the above sectors are highly related to housing or accommodation. Consumer demand in the mining sector consists mainly of materials for house repairs. Consumer demand in the construction sector consists mainly of labor for home repairs or improvements. Consumption of utilities is highly correlated with quality of homes. Consumption in the finance and housing sector consists mainly of rents. Therefore, better housing is unambiguously a commodity with income elasticity of demand larger than one in

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[1]This of course assumes that the household consumption function as $FC = a\ FDY^b$, $b < 1$.

the Philippines' economy. Convexity of the consumption function of services is a well-known fact.

Other Final Demands

Investments

The Keynesian macroeconomic model projects:

i) $CNTR = D_7 + D_{11}$ = total construction;

ii) D_6^* = investments in machineries at purchasers' prices.

The proportional allocation of total construction between the construction and the finance (which contains the real estate subsector) sectors is assumed to be constant as in the base year 1965. Given this assumption, the complete vector of gross investments demand at purchasers' prices is determined; since the only three nonzero entries of this vector are: $D_7^* = D_7$, $D_{11}^* = D_{11}$ and D_6^*. Conversion of the gross investments vector at purchasers' prices to valuation at producers' prices is achieved by the use of constant ratios.[1]

Imports

Time series of merchandise imports by commodities (f.o.b. in U.S. dollars, excluding import taxes and smuggled merchandise) are available from the Central Bank of the Philippines (7). Allocating these to the six merchandise importing sectors (the first six sectors in the input-output table), and using the exchange rates reported in (19), sectoral imports for the merchandise importing sectors (in pesos, f.o.b., excluding import taxes and smuggled merchandise) were derived. Since these

[1]See page 134 for the conversion of the consumption vector.

figures were recorded at border points, they were valued at producers' prices. They relate most closely to the variables MP_i, i = 1, ..., 6: c.i.f. imports at producers' prices, with import taxes; in our model.

Total merchandise imports (in pesos, f.o.b. excluding import taxes and smuggled merchandise) calculated in this manner exceeds total merchandise imports (c.i.f.) reported in the national accounts. The discrepancy is probably due to our use of the wrong exchange rates. To correct for these errors, constant ratios were used. Each year, sectoral imports for the merchandise importing sectors (in pesos, f.o.b., excluding import taxes and smuggled merchandise) were inflated or deflated by a constant ratio until their total agreed with total merchandise imports plus import taxes in the national accounts. The adjusted figures will be our guesstimates for MP_i, i = 1, ..., 6, over time.

In the input-output table, nonmerchandise imports at producers' prices consist of invisible imports but exclude freight and insurance on merchandise imports; since merchandise imports in the table were valued at c.i.f.. Trade and transport margins on the sale of imported merchandise were also excluded; since they do not represent leakages of expenditures. Total nonmerchandise imports, denoted as:

$$\sum_{i=7}^{12} MP_i,$$

is reported in the national accounts.

Using these data, sectoral import equations as a function of GDP were estimated by ordinary least-squares and estimates of parameters presented in Table 5.12. To project the import vector, gross domestic product as projected by the Keynesian model is used to project total

Table 5.12. OLS estimate of sectoral import equations using data in Appendix B[a]

Sector	Intercept	Coefficients in GDP	R^2	DW
Agriculture	11.3633 (0.5126)	0.4975×10^{-2} (4.5875)**	0.5532	0.7781
Fisheries	0.0106 (1.6033)	0.2468×10^{-5} (7.6094)**	0.7730	1.2755
Forestry	0.8412 (1.8053)*	0.4115×10^{-4} (1.8051)*	0.1608	0.5463
Mining	-6.7014 (-0.5903)	0.1053×10^{-1} (18.9546)**	0.9548	1.0441
Food Mfg.	100.3655 (2.6675)**	0.1386×10^{-1} (7.5292)**	0.7693	0.8159
Other Mfg.	-667.9775 (-4.8574)**	0.1637 (24.3302)**	0.9721	2.0426
Nonmerchandise	-173.6272 (-5.0369)**	0.2794×10^{-1} (16.5657)**	0.9417	1.3568

[a] t-values in parentheses; n = 19 for 1952-1970.

* Significant at 5%.

** Significant at 1%.

nonmerchandise imports and sectoral merchandise imports, using equations presented in Table 5.12. Total imports as projected by the Keynesian model is then allocated between total nonmerchandise imports and sectoral merchandise imports, using proportions implied by these sectoral projections. Total nonmerchandise imports are further allocated into the appropriate sectors using proportions implied in the 1965 input-output table.

Changes in inventories

Total inventory changes (ΔSTKS) as projected by the Keynesian model is allocated into different components of the demand vector of inventory changes; using proportions implied by the input-output table in 1965.

Government expenditures and exports

As mentioned earlier, the vector of government expenditures (including $\overline{W}_g$), and the vector of exports, both at purchasers' prices, are assumed to be exogenously or policy determined. Conversion of both vectors to valuation at producers' prices will be achieved by the use of ratios implied in Tables 5.4c and 5.4d.

Assuming demand vectors at purchasers' prices, rather than at producers' prices, to be exogenously determined provide some constraints on the separate movements of different components in the vector at producers' prices. This is best illustrated by an example. An increase in exports (at producers' prices) from the trade or transportation sector, in terms of domestically produced trade margins, cannot be achieved independently of increases in commodity or merchandise exports.

Supply of Labor

As mentioned in the previous chapter, employment by occupation in the model will be linked to employment by educational attainment. The October 1965 labor force survey conducted by the BCS in the Philippines included information on the educational composition of the labor force. Tabulations are available in (5). Employment by occupation and education attainment is reported in Table 4.3. Table 5.13 shows the ratios of employment by education attainment and occupation to total employment by occupation, calculated from Table 4.3. These ratios indicate a positive correlation between education attainment and skill level of occupation.

The educational composition of skilled and semiskilled workers, manual workers, and service workers are very similar. Therefore, projection of employment of these occupations for employment by educational attainment might lead to difficulties. The problem is overcome to some extent by projecting manual workers exogenously (see next page). Differentiation of skilled and semiskilled workers, and service workers can be based largely on sex, with service workers dominated by females. Therefore the allocation procedure described below will not introduce serious errors.

Employment by educational attainment will be determined exogenously in the model, with total employment being constrained by population growth and labor force participation rate. This can be achieved by allowing employment with no education or schooling to be determined as a residual.

Table 5.13. Education composition of employment by occupation: proportion of employment in different education attainment classes, Philippines, 1965

Occupation	Education attainment				
	No Schooling	Primary or less	Secondary or less	College or less	Total
Professionals	.0055	.0716	.1826	.7403	1.000
Sales and clerical workers	.0797	.4944	.2337	.1922	1.000
Farmers	.1980	.7120	.0810	.0090	1.000
Skilled and semi-skilled workers	.1085	.5905	.2600	.0410	1.000
Manual workers	.0710	.6083	.2869	.0338	1.000
Service workers	.0810	.6490	.2120	.0580	1.000

Table 5.14. Allocation of employment by education attainment into occupation[a]

Occupation	No education	Primary or less	Secondary or less	College or less
Professionals	.0090	.0182	.1013	.5262
Sales and clerical workers	.3057	.3036	.3121	.3287
Skilled and semiskilled workers	.4887	.4255	.4072	.0822
Service workers	.1969	.2527	.1974	.0629
Total	1.0000	1.0000	1.0000	1.0000

[a]Source: Calculated from Table 4.3.

To convert employment by educational attainment to employment by occupation, we make two simplifying assumptions. First, we assume that employment in occupation three: farmers, farm workers, fishermen etc., to be determined exogenously. Supply of farmers, farm workers etc., depends heavily on the growth of rural population, which in turn depends on the flow of rural-urban migration. However, quantification of rural-urban migration, given the limited data in the Philippines, is impossible. Therefore, employment in occupation three is left as an exogenous policy variable.

Secondly, employment of manual workers is assumed to be also exogenously determined. Time series of employment of manual workers show a rather erratic behavior of this variable. As the ratio of manual workers to total employment is small, errors introduced by our assumption will be small.

Given total employment in occupation three (farmers etc.) and five (manual workers), education composition of these workers can be computed using ratios in Table 5.13. Therefore, reduction in employment by educational attainment available to be allocated to other occupations can be calculated. Employment by educational attainment, less requirements by occupation five and three, are then allocated to employment by occupation using ratios indicated in Table 5.14.

Noting that all occupations, except occupation three, are mainly urban oriented, and occupation three is rural oriented, our classification of occupations provide an approximate rural-urban disaggregation of employment. We can now easily rationalize the employment allocation

procedure described earlier. Given the overall national education policy, which determine employment by educational attainment, educational requirements of rural employment or occupation three are deducted to yield employment by educational attainment in urban areas. For each educational attainment, total employment in urban areas is allocated into different urban occupations using proportions indicated in Table 5.14. For the projection of manual workers, a procedure similar to that for occupation three is followed because of past erratic behavior of that variable.

Distribution of Earnings, Income and Consumption

The income distribution submodel involves first the computation of the Lorenz coefficient of earnings distribution among the employed. This is achieved under the following assumptions concerning the distribution of net return to capital and rents:

i) A new class of income earners is formed using 5 percent of total employment in occupation one: professionals, proprietors, administrators, etc.

ii) The proportions of net returns to capital in each sector, allocated to employment by occupation in that sector, are as shown in Table 5.15.

iii) The remainder of all net returns to capital and rents in all sectors is allocated to the new class of income earners, as computed in i).[1]

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[1]The new class of income earners, computed under assumption i) is to represent the rich families in the Philippines. It is widely believed, but not documented rigorously, that approximately 100 families in the Philippines control a large segment of the economy. The political influence of these families are considerable.

Table 5.15. Assumed proportional allocation of sectoral net returns to capital to employment by occupation

Occupation	Sector											
	Agriculture	Fisheries	Forestry	Mining	Food Mfg.	Other Mfg	Construc-tion	Utilities	Transpor-tation	Trade	Finance	Services
Professional	.0	.1	.6	.6	.6	.6	.6	.6	.3	.3	.6	.6
Sales and clerical workers	.0	--	--	--	--	--	--	--	--	.5	--	--
Farmers, etc.	.5	--	--	--	--	--	--	--	--	--	--	--
Skilled and semiskilled workers	--	--	--	--	--	--	--	--	.5	--	--	--
Manual workers	--	--	--	--	--	--	--	--	--	--	--	--
Service workers	--	--	--	--	--	--	--	--	--	--	--	--

In the allocation of net returns to capital, it is generally assumed that 40 percent of net returns to capital accrue to the new class of income earners, as calculated under assumption i). However, exceptions are made in the following cases. In the agricultural sector, 50 percent of net returns to capital in the agricultural sector is allocated to occupation three: farmers, fishermen, etc. This represents return to land and capital owned by farmer-operators, although the figure used is merely a guesstimate. In the trade sector, a similar allocation is made to sales workers because proprietors and owners of small general stores (sari-sari stores) are classified as sales workers, with their labor income imputed at wages of sales workers. In the transportation sector, a similar proportion (50 percent) of net return to capital is allocated to occupation four: skilled and semiskilled workers, which in this sector is composed mainly of taxi and jeepney drivers. This allocation is to represent returns to ownership of transportation vehicles by the drivers themselves. It is probably true that similar allocation of net return to capital to workers has to be made in other sectors to approach the true distribution of earnings. However, it is assumed that only the three adjustments mentioned above, if neglected, will cause any serious problem.

Only 10 percent of net returns to capital in the forestry sector is allocated to occupation one, as a 60 percent allocation has caused unreasonably high income levels for occupation one in the forestry sector.

The ratios presented in Table 5.15 are arbitrary, but necessary to derive the distribution of earnings among the employed. Given these ratios, the Lorenz coefficient of earnings distribution computed for 1965

data is 0.64. The Lorenz coefficient of household income distribution, computed from the 1965 household expenditure survey, is 0.5056. From these two figures, we solved for the exponent in the following equation:

$$L_{FDY} = L_E^{1.5330} \quad .$$

Sectoral consumption functions, derived earlier in the chapter, are dependent on total household consumption because of our inability to link savings and income distribution. Unfortunately, this inability also implies that distribution of total household consumption cannot be derived directly from distribution of household income. We therefore resort to the procedure used above in the derivation of household income distribution from distribution of earnings. The Lorenz coefficient of consumption distribution, calculated from the 1965 household expenditure survey, is 0.334. Recalling that L_{FDY} for 1965 is 0.5056, we arrived at the following formula:

$$L_{FC} = L_{FDY}^{1.6079}$$

It is well-known that the log-normal distribution provides a reasonable fit to income distribution in most countries. We therefore assume:

$$FDY \sim \Lambda(\mu_{FDY}, \sigma^2_{FDY}) \ .$$

Note that if we assume a constant elasticity aggregate household consumption function, i.e.

$$FC = a\ FDY^b, \quad b < 1,$$

then:

$$FC \sim \Lambda(\ln a + \mu_{FDY}, b^2 \sigma^2_{FDY}) \ .$$

Therefore,

$$L_{FC} = 2\ N(\frac{b\sigma_{FDY}}{\sqrt{2}} \mid 0,\ 1) - 1,$$

which implies that $b\sigma_{FDY}$ can be calculated since L_{FC} is known. Noting that:

$$E(FC) = e^{\ln a + b\mu_{FDY} + \frac{1}{2} b^2 \sigma^2_{FDY}}$$

where E(FC) denotes average household consumption or total consumption divided by the number of households, the expression $\ln a + b\mu_{FDY}$ can be easily computed.

To calculate total sectoral consumption is now an easy matter, since:

$$\begin{aligned} C_i^* &= HH\ E(FC_i^*) \\ &= HH\ E(\phi_{0i} + \phi_{1i}\ t + \phi_{2i}\ FC + \phi_{3i}\ \ln FC) \\ &= HH\ [\phi_{0i} + \phi_{1i}\ t + \phi_{2i}\ E(FC) + \phi_{3i}\ E(\ln FC)] \\ &= HH\ [\phi_{0i} + \phi_{1i}\ t + \phi_{2i}\ E(FC) + \phi_{3i}\ (\ln a + b\mu_{FDY})]. \end{aligned}$$

The link between distribution of earnings and sectoral pattern of consumption is now complete.

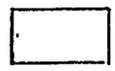
The Complete Model and a Test Simulation

The entire consistency model is now almost completely specified. To clarify the interrelationships in the model for the reader, a flow diagram depicting main causal relationships in the model is presented as Figure 5.2. Note that the two variables indirect taxes (TI) and depreciation (DEP), exogenous to the Keynesian model, are determined endogenously by the input-output model at:

$$TI = \sum_j \tau_j X_j + TM,$$

Figure 5.2. Causal flow diagram of the model

Legend:

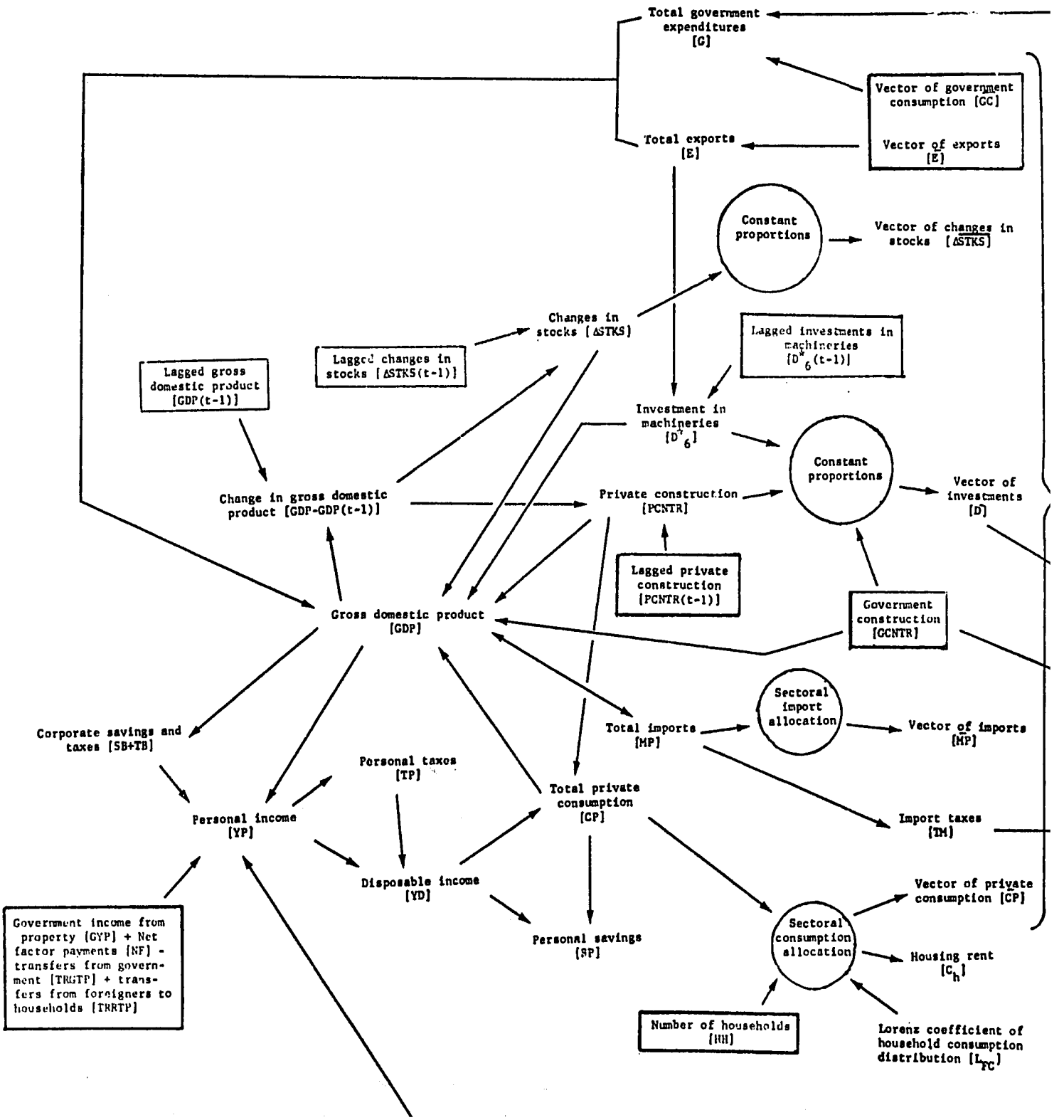


lagged endogenous variable, exogenous or policy variable

a mechanism

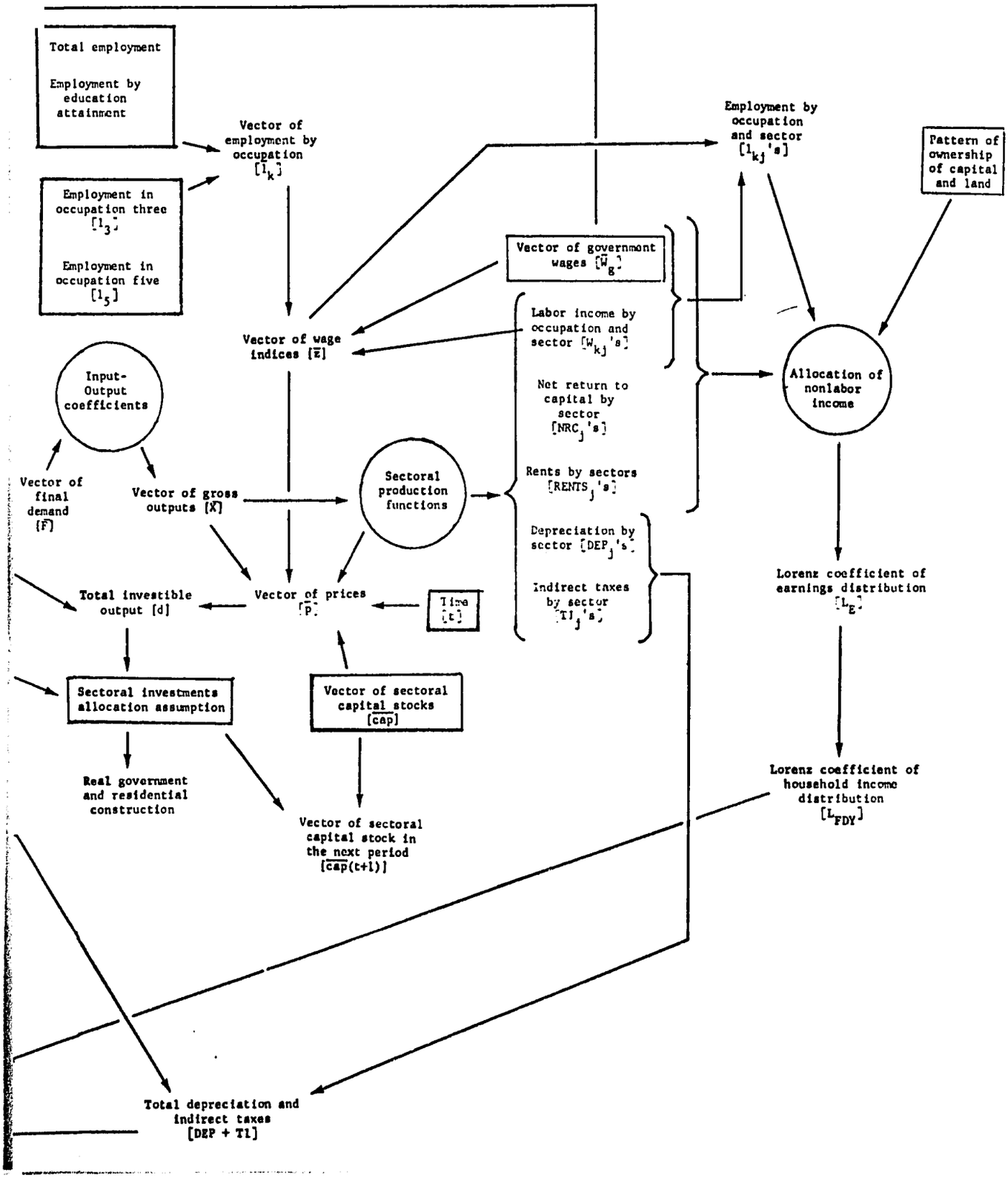
Macroeconomic Subsystem

Demand Subsystem



I-O, Supply, Employment and Price Subsystem

Income Distribution Subsystem



$$DEP = \sum_j DEP_j = \sum_j \varphi_j X_j ,$$

where φ_j is the depreciation coefficient in sector j implied by the input-output table.

Theoretically speaking, depreciation in the economy should be determined by multiplication of depreciation rates (δ_j, j = 1, ..., n) by value of sectoral capital stocks. However, in order to achieve total depreciation reported in the national accounts (with capital stock as calculated in Table 5.16), sectoral depreciation rates will have to be in the order of approximately 25 percent, a highly unrealistic figure. We therefore assume that depreciation as reported in the national accounts is merely the total of depreciation deducted as costs by firms. Such depreciations deducted have no relevance to the wear and tear of capital, or the rate of decline in productivity of a given capital stock.

To approximate total depreciation (DEP), an amount to be deduced from gross domestic product (or retained by businesses) in order to derive personal income, we rely on depreciation coefficients φ_j, j = 1, ..., n, and the above equation. To approximate the decline in sectoral capital stocks due to wear, tear and obsolesce, we shall rely on sectoral depreciation rate ρ_j, j = 1, ..., 12 and equation 4.35.

The list of exogenous variables, policy variables and simulation parameters is presented in Table 5.16. Exogeneity of most variables in this list is self evident, or has been assumed in earlier discussions. However, the nature of the simulation parameters, and policy variables o_j, j = 1, ..., 12, needs elaboration.

No estimates for δ_j or σ_j are available for the Philippines. They are therefore assumed to be simulation parameters. Reasonable guesstimates of these parameters will be made during simulation of the complete model. A given set of guesstimates for δ_j and σ_j, $j = 1, \ldots, 12$, will be accepted as reasonable if, given these guesstimates, the model is able to track accurately over the sample period.

Because of lack of data, initial conditions of the model: cap_j, $j = 1, \ldots, 12$, will be estimated by the equation:

$$cap_j(0) = \frac{DEP_j(0)}{\delta_j}, \quad j = 1, \ldots, 12.$$

Recall that in a one sector neoclassical growth model with Cobb-Douglas prcduction function, the equilibrium growth rate is independent of initial conditions. It can easily be seen that our model is essentially a discrete time multisector neoclassical growth model with Cobb-Douglas sectoral production functions. If the equilibrium property of the one sector model generalizes to the multisector model, equilibrium conditions in our model will be independent of initial conditions. Growth path of the model is therefore insensitive to small changes in initial conditions Hence, our method of calculating initial sectoral capital stocks should not introduce serious complications, especially given that δ_j, $j = 1, \ldots, 12$ are chosen so as to obtain reasonable tracking of the model over the sample period.

Sectoral allocation of investments will be determined by the policy variables ρ_i, $i = 1, \ldots, 12$. Available real investments (real gross investments less government investments and housing construction, which

Table 5.16. List of exogenous variables, instrument variables and simulation parameters

Exogenous or policy variables

1) E_i^*: export demand on sector i, in 10^3 current pesos, at purchasers' prices, i = 1, ..., 12.

2) GC_i^*: government demand on sector i, in 10^3 current pesos, at purchasers' prices, i = 1, ..., 12.

3) W_{kg}: government wage bill, for occupation, in 10^3 current pesos, k = 1, ..., 6.

4) GYP: government income from ownership of property, in 10^3 current pesos.

5) TRRTP: net transfers from foreigners to the private sector, in 10^3 current pesos.

6) TRGTP: net government transfer to private sector, in 10^3 current pesos.

7) TRRTG: net foreign transfers to government, in 10^3 current pesos.

8) GCNTR: government construction expenditure in 10^3 current pesos.

9) NF: net factor payments from abroad, in 10^3 current pesos.

10) 1^s: total employment in thousands.

11) $EDUC_q$: employment by education attainment q, q = 1, ..., 4.

12) 1_3^s: employment in occupation three (farmers) in thousands.

13) 1_5^s: employment in occupation five (manual workers) in thousands.

14) HH: number of households in thousands.

15) ρ_i: proportion of total available investments allocated to section i,

$$\sum_{i=1}^{12} \rho_i = 1.$$

Table 5.16. Continued

Simulation parameters

1) δ_j: depreciation rate of capital in sector j, which also determines initial capital stock by

$$cap_j(0) = DEP_j(0)/\delta_j \qquad j = 1, \ldots, 12.$$

2) σ_j: rate of Hick's neutral technical progress in sector j, j = 1, ..., 12.

is approximately 50 percent of private construction), will be allocated to sector i in the proportion ρ_i.[1]

The complete model can now be tested over the sample period: 1965 to 1971. Actual values of exogenous variables and simulation parameters used are shown in Table 5.17. Note that actual values of exogenous variables were used whenever possible. If only two observations of a variable were available, a constant growth rate was assumed. If no data were available, as in the case of employment by educational attainment, depreciation rates, sectoral investment allocations, and rates of technical progress, estimates were chosen based on their ability to predict accurately. In the case of employment by education attainment, reasonable growth rates were obtained. Ranking of growth rates agree with ranking of educational attainment. The assumption of 9 percent depreciation rate of capital across all sectors gave reasonable capital-output ratios, as shown in Table 5.17. Traditional sectors such as agriculture, construction, trade and services have low capital-output ratios. The average, economy wide, capital-output ratio is 0.9 which compares favorably with an incremental capital-output ratio of 1.26 reported by G. Myrdal (32). Myrdal's ratio was probably calculated with net public and private investments. Our ratio is based on private capital, not including dwellings. Hence, a lower ratio can be expected.

Projection of the model using assumptions in Table 5.17 gave severe underestimates of indirect taxes and depreciation. Consequently, indirect tax rates and depreciation coefficients (not depreciation rates

[1]See page 92, especially footnote, on the treatment of government investments.

Table 5.17. Values of exogenous variables, policy instruments and simulation parameters in test simulations, 1965 to 1972

Exogenous variables

1)	E_i^*, i=1...12:	Total exports was as given in the national accounts. Total nonmerchandise exports was as given in national accounts, with allocation among nonmerchandise exporting sectors (8 to 12) in the same proportion as in 1965. Total merchandise exports was allocated among merchandise exporting sectors (1 to 7) using ratios implied by Central Bank Statistics.
2)	GC_i^*, i=1...n:	Total government expenditures was as given in the national accounts. Total government wages (value added by government) also was as given in the national accounts. The difference of the these two figures is government procurement. Total government procurement was then allocated into GC_i^*, i=1...12 is the same proportion as in 1965. Similarly, total government wages was allocated into W_{kg}, k=1...n.
3)	W_{kg}, k=1...6:	
4)	GYP:	Values as given in the national accounts.
5)	TRRTP:	
6)	TRGTP:	
7)	TRRTG:	
8)	GCNTR:	
9)	NF:	
10)	1^s:	Determined by a historical growth rate (1957 to 1971) of 2.97%.
11)	$EDUC_q$, q=1...4:	In q = 2, 3, 4, growth rates of 2.5, 4.1, and 5.1 percent respectively were assumed. $EDUC_1$ was determined as a residual, implying a growth rate of 1.9%. These growth rates were calculated so as to project employment by occupation accurately over the sample period (1965 to 1971).

Table 5,17. Continued

12) l_3^s: Determined by a historical growth rate (1965 to 1971) of 0.8%.

13) l_5^s: Determined by a historical growth rate (1965 to 1971) of 9.0%.

14) HH: Determined by a historical growth rate (1965 to 1971) of 2.86%.

15) ρ_i: Investments were allocated into sectors in the same proportion as initial capital stock.

Simulation parameters

i) $\delta_j = 0.09$ for $j = 1...12$. Capital output ratios implied by these depreciation rates are:

Sector	Capital/GDP ratio
Agriculture	0.34
Fishing	3.18
Forestry	1.27
Mining	1.77
Food Manufacturing	1.12
Other Manufacturing	3.76
Construction	0.82
Utilities	2.62
Transportation	1.99
Trade	0.52
Finance	2.15
Services	0.63
Average	0.90

ii) $\sigma_j = 0$ for $j = 1...12$ because of lack of data.

δ_j, j = 1, ..., 12) τ_j and φ_j, j = 1, ..., 12, were adjusted yearly by multiplication with constant factors of 1.05 and 1.0475 respectively to increase estimated indirect taxes and depreciation. The original and 1972 values of these coefficients are presented in Table 5.18.

Simulation of the model using the matrix $\underline{\theta}$ reported in Table 5.8 ga' severe underestimation of employment in the construction and government sectors, and overestimation of employment in the mining sector. Underestimation was the result of not taking into account the ability of a sector to absorb labor by paying lower relative wages for certain occupa tions. Given the high unemployment rate in the Philippines, the government can be easily under political pressure to hire more workers by lowering, or not raising wages. In this sense, the government sector, consisting of large, modern and monopolistic firms, absorbed less labor than what calculations under constant wage distortions indicated. The traditional nature of labor absorption in the construction sector was documented in Chapter II.

To correct for these discrepancies, the matrix $\underline{\theta}$ was corrected during the course of the test simulation. The columns of $\underline{\theta}$ associated with the government and construction sectors were adjusted downward by multiplication with a factor of 0.9 yearly. No adjustments were made fc the mining sector as employment in that sector accounted for less than 1 percent of total employment. The adjusted parameters, or columns of the atrix $\underline{\theta}$ are reported in Table 5.19.

A similar adjustment can be achieved by increasing underemployment in the construction and government sector. Given total labor income by

Table 5.18. Original and revised values of indirect tax rates and depreciation coefficients[a]

Sector	Indirect tax rates		Depreciation coefficients	
	1965 (original)	1972 (revised)	1965 (original)	1972 (revised)
Agriculture	-0.0078	-0.0109	0.0267	0.0369
Fisheries	0.0031	0.0044	0.2282	0.3158
Forestry	0.0321	0.0452	0.0969	0.1342
Mining	-0.0386	-0.0542	0.1012	0.1401
Food Manufacturing	0.0149	0.0209	0.0272	0.0376
Other Manufacturing	0.0979	0.1378	0.0482	0.0667
Construction	0.0132	0.0186	0.0339	0.0469
Utilities	0.0751	0.1056	0.1452	0.2009
Transportation	0.0415	0.0584	0.1057	0.1463
Trade	0.0275	0.0387	0.0375	0.0519
Finance	0.0779	0.1096	0.1552	0.2148
Services	0.0103	0.0145	0.0378	0.0523

[a]Source: See text.

Table 5.19. Original and revised values of θ_{kj} at 1972, associated with construction and government (in pesos)

Occupation	Construction		Government	
	1965 (Original)	1972 (Revised)	1965 (Original)	1972 (Revised)
Professional	5085.86	2432.55	4522.03	2162.87
Sales and clerical workers	4259.18	2037.15	3962.59	1895.29
Farmers, etc.	625.21	299.04	719.97	344.36
Skilled and semiskilled workers	1450.37	693.71	1822.65	871.77
Manual workers	1722.32	823.78	1490.92	713.10
Service workers	2848.52	1362.44	3019.26	1444.10

occupation and sector, W_{kj}, recall that

$$l_{kj} = \frac{W_{kj}}{z_k \, \theta_{kj} \eta_{kj}} \qquad \begin{array}{l} k = 1, \ldots, 5 \\ j = 1, \ldots, 12, g. \end{array}$$

Therefore, adjustment of θ_{kj} by a factor of x is equivalent to an adjustment of η_{kj} by a factor of x, or adjustment of both θ_{kj} and η_{kj} by factors of y and v respectively such that yv = X. Alternatively speaking, given total labor income, more workers can be absorbed by lowering wages relative to other sectors, or increasing underemployment, or both. In the real world, labor absorption under output constraint probably results in both a reduction of relative wages and increasing underemployment. Our reliance on one method of adjustment (relative wage reduction) should not be interpreted as complete neglect of the other method. The two methods are completely equivalent in our model and one is chosen for the sake of convenience.

Results of the test simulations are presented in Table 5.20. Predicted values of key variables are presented next to actual values whenever possible. It can be seen that most macroeconomic variables were predicted accurately, except for perhaps a slight overestimation of imports. The reasonable assumption of 9 percent depreciation rates resulted in excellent predictions of real GDP and GDP deflator. Computed deflators for sectoral gross outputs and real sectoral gross outputs are not presented as there are no actual values of these variables to make comparisons with.

Sectoral employment were estimated fairly well, except in sectors with small employment. Serious estimation errors can be found in the

Table 5.20. Results of test simulation at 1971

Macroeconomic variables	Projected values	Growth rates (%)	Actual values	Units
I) Macroeconomic Variables				
Gross domestic product	49.86	14.6	50.18	billions pesos
Total consumption	35.07	--	35.63	" "
Gross investments	9.59	--	9.43	" "
Imports with taxes	9.95	--	9.04	" "
Changes in stocks	1.30	--	1.12	" "
Corporate savings	1.51	--	1.35	" "
Corporate taxes	0.56	--	0.58	" "
Personal income	38.86	--	39.00	" "
Personal taxes	0.69	--	0.70	" "
Disposable income	38.17	--	38.30	" "
Depreciation	5.37	--	5.36	" "
Indirect taxes	4.25	--	4.99	" "
Exports[a]	8.91	--	8.91	" "
Government expenditures[a]	4.13	--	4.13	" "
Government construction[a]	0.82	--	0.82	" "
Foreign transfers to persons[a]	0.67	--	0.67	" "
Foreign transfers to government[a]	0.20	--	0.20	" "
Government transfers to persons[a]	0.69	--	0.69	" "
Net factor payments[a]	--	--	--	" "
Government income from property[a]	0.07	--	0.07	" "
Balance of trade	0.02	--	0.08	" "
Real GDP	30.21	5.2	31.30	billions 1965 pesos
GDP deflator	1.65	9.4	1.61	1965=1.00 millions

[a]

Population[a]	37.71	--	37.71	millions
Households[a]	6.35	--	6.35	"
Lorenz coefficient for earnings dist.	0.61	--	--	--
Lorenz coefficient for income dist.	0.47	--	0.49	--
Lorenz coefficient for consumption dist.	0.30	--	0.32	--

II) Sectoral information

Sector	Projected GDP in billions of pesos	Distribution (%)	Projected real growth rate (%)	Employment in millions	Distribution (%)	Actual employment in millions
Agriculture	9.23	18.5	4.5	5.46	43.3	5.42
Fisheries	1.79	3.6	6.0	0.46	3.8	0.53
Forestry	1.65	3.3	6.7	0.08	0.7	0.11
Mining	1.31	2.6	6.5	0.12	1.0	0.05
Food Manufacturing	3.06	6.1	5.7	0.19	1.6	0.20
Other Manufacturing	7.53	15.1	5.3	1.23	10.2	1.23
Construction	1.18	2.4	-1.0	0.44	3.7	0.42
Utilities	0.48	1.0	5.9	0.03	0.2	0.06
Transportation	1.91	3.8	5.9	0.46	3.8	0.53
Trade	6.80	13.6	6.4	1.44	12.0	1.30
Finance	3.47	7.0	5.8	0.06	0.5	0.10
Services	5.37	10.8	5.1	1.19	9.9	1.23
Government	2.88	5.8	--	0.89	7.4	0.88
Housing	2.39	4.8	--	--	--	--
Import taxes	0.80	1.6	--	--	--	--
Total	49.86	100.0	5.4	12.04	100.0	12.04

Table 5.20. Continued

III) Occupational information

Occupation	Employment in millions	Distribution (%)	Actual employment in millions	Wage index (1965=1.00)	Average wage in pesos	Relative wage (%)
Professionals	0.78	6.5	0.82	1.69	5257	364.3
Sales and clerical workers	1.81	15.0	1.85	1.68	2378	164.8
Farmers, fishermen, etc.	5.96	49.5	5.96	2.08	520	36.0
Skilled and semiskilled workers	2.10	17.4	2.05	1.80	1867	129.4
Manual workers	0.26	2.2	0.26	1.93	1644	113.9
Service related workers	1.14	9.5	1.10	1.57	1341	92.9
Total	12.04	100.0	12.04	--	1443	100.0

mining, utilities, and to a lesser extent, the finance sectors. Since these are small sectors, amounting to less than 2 percent of total employment, no adjustments were made. As mentioned earlier, serious underestimation of employment in the construction and government sectors were corrected by a simple rule for correcting the wage distortion matrix $\underline{\theta}$. The adjustments almost completely eliminated prediction errors in these sectors, as can be seen from Table 5.20. Predicted employment in large sectors agree closely with actual values.

The result is highly satisfactory, given that sectoral employment, and hence sectoral labor productivities, are determined endogenously. Other consistency models rely on exogenous growth of sectoral labor productivities. Hence, sectoral employment can be predicted accurately if sectoral output can be predicted accurately. Generally, sectoral outputs are easier to project, especially if the model is completely demand determined.

Our model generated Lorenz coefficient of income and consumption distribution, at 1971, of 0.47 and 0.30 respectively. These are both 0.02 less than the actual values. We can therefore infer that prediction of income and consumption distributions were slightly on the side of overestimation of equality. However, the improvement of income distribution, from 1965 to 1971, was clearly shown by our projections. Therefore, the model is directionally accurate with respect to changes in income distribution.

In summary, our model predicts well in terms of the usual macroeconomic variables, real GDP, sectoral employment and income distribution. This is especially gratifying given that different parts of the model were

put together in an unorganized (econometrically speaking) fashion, using data and guesstimates from different sources. The data requirements for such a comprehensive model are not unreasonable, if one is willing to accept the unrigorous nature of estimation.

CHAPTER VI. SOME EMPIRICAL RESULTS

In this chapter, we shall analyze certain policies for improving income distribution, employment and growth performances of the Philippines' economy. Some of these policies were instituted by the recent declaration of martial rule. Policies will be analyzed by projecting the model from 1972 to 1985 under different policy assumptions. The starting year, 1972 was chosen as the model was estimated using data until 1971. The terminal year 1985 was chosen as it is approximately ten years from the present moment.

To facilitate analysis of different policies, the model will be computed under the assumption of no change, or neutral policy. Results from projection under different policies can then be compared with results from projection under neutral policy. All comparisons refer to 1985 projections.

For all projections, the parameters τ, φ and $\underline{\theta}$ are kept at their 1972 levels (see Tables 5.19 and 5.20).

Projection Under Neutral Policy

A neutral policy is defined as a policy of no change. As far as possible, all exogenous variables, simulation parameters and instrument variables were assumed to behave in a similar manner as in the basic test simulation. Where actual values of exogenous variables were used in the basic test simulation, time trend equations of these variables were substituted. These equations are listed in Table 6.1, which also documents all assumptions made concerning projection under neutral policy.

Table 6.1. Assumptions of neutral policy[a]

Exogenous variables:

1) E_i^*, i = 1, ..., 12: total exports was projected using a stant growth rate estimated by the following equation:

$$\ln (E \cdot 10^{-3}) = \underset{(119.70)^b}{8.1665} + \underset{(12.6714)^b}{0.0930}\, t ,$$

$$R^2 = 0.8694$$
(1947-1972)

with sectoral allocation based on ratios of the 1972 export vector (at purchasers' prices) projected by the test simulation.[c]

2) GC_i, i = 1, ..., 12:
3) W_{kg}, k = 1, ..., 6:
} total government expenditures

G was projected using a constant growth rate estimated by the following regression equation:

$$\ln (G \cdot 10^{-3}) = \underset{(290.41)^b}{7.5942} + \underset{(37.3984)^b}{0.0994}\, t ,$$

$$R^2 = 0.9819$$
(1946-1972)

with sectoral allocation based on 1972 ratios projected by the test simulation.

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[a]Time periods over which regressions were estimated are presented in parenthesis after R^2's.

[b]t-value significant at 1 percent.

[c]This assumption will be relaxed in a later simulation exercise. It is recognized that export substitution will take place even if government pursues a "do nothing" policy. The assumption of equal growth rates was made here so that effects of export substitution can be analyzed and compared later.

Table 6.1. Continued

4) GYP: government income from ownership of property was projected using a constant growth rate estimated by the following equation:

$$\ln (GYP \cdot 10^{-3}) = \underset{(54.99)^b}{4.5063} + \underset{(10.0532)^b}{0.0838}\, t \;,$$

$$R^2 = 0.8017$$
(1946-1972)

5) TRRTP: foreign transfers to the private sector, was projected using a constant growth rate estimated by the following equation:

$$\ln (TRRTP \cdot 10^{-3}) = \underset{(30.14)^b}{5.4801} + \underset{(8.9170)^b}{0.1741}\, t \;,$$

$$R^2 = 0.7677$$
(1947-1972)

6) TRGTP: net government transfer payments to households, was projected using a constant growth rate estimated by the following equation:

$$\ln (TRGTP \cdot 10^{-3}) = \underset{(97.79)^b}{5.5373} + \underset{(20.2064)^b}{0.1164}\, t \;,$$

$$R^2 = 0.9422$$
(1946-1972)

7) TRRTG: foreign transfers to government was projected using a constant growth rate estimated by the following equation:

$$\ln (TRRTG \cdot 10^{-3}) = \underset{(52.54)^b}{4.7130} + \underset{(7.2766)^b}{0.0901}\, t \;,$$

$$R^2 = 0.7257$$
(1951-1972)

Table 6.1. Continued

8) GCNTR: government construction was projected using a constant growth rate estimated by the following equation:

$$\ln (GCNTR \cdot 10^{-3}) = \underset{(57.61)^b}{6.2394} + \underset{(9.4282)^b}{0.1093}\, t ,$$

$$R^2 = 0.7803$$
(1946-1972)

9) NF: net factor payments from abroad was projected by a constant growth rate estimated by the following equation:

$$\ln (NF \cdot 10^{-3}) = \underset{(34.07)^b}{5.4314} + \underset{(7.3022)^b}{0.1184}\, t ,$$

$$R^2 = 0.6808$$
(1946-1972)

10) 1^s:

11) $EDUC_q$, $q = 1, \ldots, 4$:

12) 1_3^s:

13) 1_5^s:

14) HH:

15) ρ_i, $i = 1, \ldots, 12$:

} same as in Table 5.18

Simulation parameters:

1) δ_j, $j = 1, \ldots, 12$:

2) σ_j, $j = 1, \ldots, 12$:

} same as in Table 5.18

Output

Projected values of certain endogenous variables are presented in Table 6.2. Growth rates of key variables are also presented. It can be seen that GDP at current prices will reach a level of 207.57 billion pesos by 1985, representing a growth rate of 11.1 percent per year, while real GDP in 1965 prices will reach a level of 59.54 billion pesos, representing a real growth rate of 4.84 percent. These are substantially lower than growth rates over the 1965-1971 period. The discrepancies can be explained by the fact that these projections are based on growth rates of exogenous variables over the 1946-1971 period, and that the growth rates of both monetary and real GDP over 1965-1971 were above average. Rapid increases of government expenditures, government construction and exports were observed in 1971, resulting in a real GDP growth rate of 7.3 percent during 1970-1971, compared to 3.7 percent and 3.5 percent during 1969-1970 and 1971-1972 respectively. Improvements of export performance was primarily due to increases in prices of primary export commodities. Increases in government expenditures and government construction were probably based on political considerations. However, such high rates of growth of exports and government expenditures are probably not sustainable over the long-run without changes in policies. Thus, projections under lower growth rates of exogenous variables, estimated over a longer period, are more realistic under an assumption of neutral policy.

Changes in the pattern of sectoral GDP are as expected from any growing economy. Shares of all primary sectors (agriculture, fisheries, forestry and mining) and of the food manufacturing sector declined

Table 6.2. Projection under neutral policies, 1985

Macroeconomic variables	Projected values	Growth rates (%)	Units
I) Macroeconomic variables			
Gross domestic product	207.57	11.1	billions pesos
Total consumption	155.61	--	" "
Gross investments	40.31	--	" "
Imports with taxes	-2.59	--	" "
Changes in stocks	3.68	--	" "
Corporate savings	6.62	--	" "
Corporate taxes	2.28	--	" "
Personal income	162.05	--	" "
Personal taxes	3.48	--	" "
Disposable income	158.56	--	" "
Depreciation	23.48	--	" "
Indirect taxes	18.88	--	" "
Exports[a]	31.85	--	" "
Government expenditures[a]	15.45	--	" "
Government construction[a]	5.67	--	" "
Foreign transfers to persons[a]	6.94	--	" "
Foreign transfers to government[a]	0.67	--	" "
Government transfers to persons[a]	2.97	--	" "
Net factor payments[a]	-3.66	--	" "
Government income from property[a]	0.65	--	" "
Balance of trade	-3.52	--	" "
Real GDP	59.54	4.84	billions 1965 pesos
GDP deflator	3.49	--	1965=1.00
Population[a]	57.44	--	millions
Households[a]	9.42	--	"

[a]Exogenously determined.

Lorenz coefficient for earnings dist.	0 5664	--	--
Lorenz coefficient for income dist.	0.4183	--	--
Lorenz coefficient for consumption dist.	0.2463	--	--

II) Sectoral information

Sector	Projected GDP in billions of pesos	Distribution (%)	Projected real growth rate	Employment in millions	Distribution (%)
Agriculture	31.83	15.3	3.36	6.14	33.8
Fisheries	5.93	2.9	3.98	0.49	2.7
Forestry	5.66	2.7	4.54	0.10	0.6
Mining	4.70	2.3	4.97	0.28	1.5
Food manufacturing	9.95	4.8	3.38	0.27	1.5
Other manufacturing	32.42	15.6	4.78	2.19	12.1
Construction	4.43	2.1	3.66	0.91	5.0
Utilities	2.57	1.2	5.94	0.07	0.4
Transportation	8.37	4.0	5.05	0.91	5.0
Trade	26.35	12.7	4.50	2.57	14.2
Finance	16.60	8.0	5.21	0.14	0.8
Services	29.71	14.3	6.13	2.41	13.3
Government	10.58	5.1	--	1.68	9.3
Housing	15.21	7.3	--	--	--
Import taxes	3.27	1.6	--	--	--
Total	207.57	100.0	4.84	18.15	100.0

Table 6.2. Continued

III) Occupational information

Occupation	Employment in millions	Distribution (%)	Wage index (1965=1.00)	Average wage in pesos	Relative wage (%)
Professionals	1.71	9.4	3.34	10,192	261.5
Sales and clerical workers	3.31	18.2	3.68	5,250	134.7
Farmers, fishermen, etc.	6.67	36.7	6.39	1,598	41.0
Skilled and semiskilled workers	3.62	19.9	4.36	4,460	114.4
Manual workers	0.87	4.8	2.33	1,918	49.2
Service related workers	1.98	10.9	4.74	3,801	97.5
Total	18.15	100.0	--	3,898	100.0

substantially. Other sectors showing decline in their share of GDP are construction, trade and government. Sectors which increased their share of GDP are other manufacturing, utilities, transportation, finance, services, and housing. Reflecting this pattern of GDP by sector are real sectoral growth rates. Generally, tertiary sectors have above average growth rates.

Employment

The pattern of sectoral employment follows in a similar manner. Agriculture has declined significantly as an important employer, although it still remains as the largest employer, accounting for approximately 34 percent of total employment. The food manufacturing, fisheries and forestry sectors also declined in terms of sectoral share of employment. All other sectors, including government, gained in terms of share of total employment.

All sectors show positive growth rates of employment. Naturally, the first three primary sectors: agriculture, fisheries and forestry, are slow growers in terms of employment. Surprisingly, the two manufacturing sectors do not show high growth rates of employment. A sluggish growth rate of employment in the food manufacturing sector can be explained by low income elasticity of demand for food. Growth rate of employment in the other manufacturing sector is higher because of a higher income elasticity of demand. Although with a sluggish employment growth rate, the other manufacturing sector is an important labor absorber because it accounted for approximately 10 percent of total employment in 1971. Employment generation in the trade sector can be described in a

similar manner. The remaining sectors: mining, construction, utilities, transportation, finance, services and government; all show high growth rates of employment. However, their importance as labor absorbers is directly related to their share in total employment. In this respect, the service and government sectors, perhaps also to a lesser degree the construction sector, are important.

Sectoral pattern of labor absorption depends to a large extent on sectoral output and employment by occupation, which is partly determined by employment by education attainment. A low growth rate of employment in the rural sectors, excluding mining, can be accounted for by the low (0.8 percent) autonomous growth rate of employment in occupation three (farmers, fishermen, farm workers etc.). This low growth rate on employment was extrapolated from the late 1960's; a period of high rural-urban migration.

Although a low growth rate of employment (supply) with primary education was assumed, this segment of employment (supply) was large, amounting to 60.6 percent of total employment (supply) in 1971. Therefore, large increases in the absolute number of employed (supply) in this category can be expected. The increase of employment (supply) with primary education from 1971 to 1985 is approximately 3.02 million workers, approximately half of the total increase in employment (supply) of 6.11 million workers. As can be seen from Table 5.15, this will contribute significantly to increases in employment (supply) as skilled and semi-skilled workers, clerical and sales workers, and lastly, service workers. Growth of employment (supply) with secondary education also contributes mainly to employment (supply) of skilled and semiskilled workers, and

sales and clerical workers. Employment (supply) increases in these occupations are mainly absorbed in secondary and tertiary sectors, resulting in high growth rates of employment in these sectors. Sectoral growth rates of employment are, of course, modified by demand considerations. Hence growth rates of employment in the manufacturing sectors are lower than in tertiary sectors. Secondary sectors with high growth rates of demand, such as construction and utilities, show growth rates of employment comparable with most tertiary sectors.

A small but rapidly growing segment of employment is employment with college education. It contributes mainly to employment in the professional, and sales and clerical occupations. Growth of employment in the professional occupation is mainly absorbed by the services and government sectors. This accounts for the high growth rate of employment in the government sector.

Income distribution

Our model essentially specifies that a given amount of labor, decomposed by occupation, has to be completely absorbed into the economy. The income distribution implications of this complete absorption are then calculated and derived. Therefore, income distribution also depends crucially on the supplies of labor by occupation. The improvement of income distribution, as indicated by the drop of the Lorenz coefficient of income inequality from 0.47 in 1971 to 0.42 in 1985 can be explained in this context. A slow growth of employment in occupation three (farmers, fishermen, farm workers, etc.), essentially an assumption of rapid rural-urban migration, caused a rapid rise in average wage of occupation

three.[1] As can be seen from Table 6.2, the wage index for occupation three reaches a level of 6.39 in 1985, the highest of all wage indices. This, and the declining weight of occupation three in overall income distribution determination contributed significantly to the overall improvement in income distribution.

However, an examination of incomes in rural agriculture and fisheries will reveal that substantial poverty still exists in the rural areas. Table 6.3 shows the projected earnings of workers in occupation three, in the agriculture and fisheries sectors, to be 3004 and 5043 current pesos respectively. Although a substantial improvement since 1965, relative to the overall average earnings can be inferred, these still compare unfavorably with average earnings of 9102 pesos for all workers in all sectors. Noting that occupation three accounts for 37 percent of total employment in 1985, the severity of the rural poverty problem cannot be overemphasized.

Severity of the rural poverty problem is increased by the existence of even lower income groups within the groups mentioned in the previous paragraph. In this connection, landless laborers and tenant farmers who derive no income from ownership of land and capital, are important. Calculations show that average wage rates (i.e. excluding returns to land and capital) of occupation three in the agriculture and fisheries sectors to be 1519 and 2010 pesos respectively, substantially below average earnings (including returns to capital) of these groups (i.e. 3004 and 5043 pesos). There are no statistics on the importance of landless laborers

[1]This does not imply in any way that migrants will be productively employed in urban areas.

and tenant farmers. However, closure of the land frontier, expansion of farm sizes, and increase in total rural employment certainly imply that absolute number of landless laborers will increase. Any increase of farm ownership outside the agricultural sector will imply an increase in tenant farmers.

Table 6.3. Projected average earnings (in current pesos) of occupation three in the agriculture and fisheries sectors, under neutral policy[a]

Sector/Occupation	Year 1965	Year 1985
Agriculture/3	475 (25%)[b]	3004 (33%)[b]
Fisheries/3	916 (49%)[b]	5043 (55%)[b]
All sectors/All occupations	1881	9102

[a]Projections are under the assumption of the allocation matrix in Table 5.16.

[b]Figures in brackets are average earnings as a percent of overall average earnings.

Table 6.4. Projected average wages (in current pesos) of selected groups under neutral policy[a]

Sector/Occupation	Year 1965	Year 1985
Agriculture/3	237 (29%)	1519 (39%)
Fisheries/3	315 (39%)	2010 (52%)
Trade/2	1134 (141%)	4170 (107%)
Services/6	681 (85%)	3231 (83%)
Food Manufacturing/4	1027 (128%)	4474 (115%)
Other Manufacturing/4	1147 (143%)	4999 (128%)
All professionals	3754 (467%)	10192 (261%)
All workers	804	3898

[a]Figures in brackets are average wages as a percent of overall average wage.

The severity of the rural problem due to the existence of absolutely poor landless workers and tenant farmers within the poor rural population is modified to a certain extent by rapid rural-urban migration. It can be safely assumed that rural-urban migration reduces the severity of the rural poverty problem by increasing rural wage rates. However, rural-urban migration of unskilled workers merely transfer the poverty problem to urban areas. Corresponding to our assumption of slow growth of employment in occupation three, high growth rates of urban related occupations were generated. The result is slow growth of urban wages as indicated in Table 6.4.

High growth rates of employment of urban related occupations resulted in comparatively slow growth of wages of these workers. Especially affected by a high growth rate of supply is the occupational group: professionals. The high growth rate of employment (supply) with college education has resulted in a drastic drop of relative wages of professional workers, as indicated in Table 6.4.

Conclusion

In summary, the overall pattern of projected wage movements, with the exception of wages for manual workers, is for wages below average wage to rise relatively, and for wages above average wage to drop relatively. Thus, improvement of overall income distribution is generated. The pattern of wage movements is the result of complex interactions between our assumptions concerning labor supplies by occupation, rural-urban migration, and patterns of sectoral demand and sectoral outputs. The most crucial assumption is the implicit assumption of rapid rural-urban

migration, or the explicit assumption of low growth rate of rural employment.

Even with the improvement of overall income distribution, poverty groups can still be easily identified in the projected state of the economy in 1985. Of particular importance in rural areas are landless laborers and tenant farmers. In the urban areas, manual workers can be singled out.

To illustrate the important relationship between decreasing employment in agriculture, and improvement in income distribution, we will simulate the model under an assumption of high growth rate of agriculture employment. This is the topic of the next exercise.

Projection Under Slow Rural-Urban Migration

To get a feel for the effects of slow rural-urban migration on the economy, the model was simulated under the assumptions: i) employment in occupation three (farmers, fishermen, farm workers, etc.) grows at an annual rate of 2 percent; and ii) employment in occupation five (manual workers) grows at an annual rate of 3.5 percent. Other exogenous variables, policy variables, and simulation parameters were as assumed in Table 6.1.

The assumed 2 percent growth rate of employment in occupation three is substantially higher than the 0.8 percent assumed in the previous simulation. However, the 2 percent growth rate, below the 3 percent labor force or population growth rate, still allows for some degree of migration.

Projected values of certain endogenous variables are presented in Table 6.5.

Income levels and employment

Growth rate of monetary GDP at 11.1 percent is equal to that projected under neutral policy. This is not surprising since macroeconomic demand variable, projected by the Keynesian model, are virtually independent of real variables and sectoral allocation.[1]

To examine the consequences of our assumptions on real outputs and income, it is necessary to first examine the behavior of employment by occupation. As shown in Table 6.5, employment in occupation three increased and employment in occupation five decreased, directly as a result of our assumptions. Employment in all other urban oriented occupations also declined. This has forced a sectoral reallocation of employment in favor of the three rural sectors: agriculture, fisheries and forestry. Sectoral employment in all other sectors declined compared to projections under neutral policy.

As marginal productivities of labor are lower in the agriculture and fisheries sectors, this reallocation has the effect of decreasing total real GDP. Increases of real output in the sectors: agriculture, fisheries and forestry, due to additional allocation of employment, are not sufficient to compensate for losses of output in other sectors. Consequently, projected real GDP is only 57.86 billion 1965 pesos, compared to 59.54 billion 1965 pesos as projected under neutral policy. The

[1]Note that macroeconomic projections can be affected by changes in sectoral composition of gross outputs, which affects total indirect taxes (T1) and total depreciation (DEP).

Table 6.5. Projection under assumption of low rural-urban migration

Macroeconomic variables	Projected values	Growth rates (%)	Units
I) Macroeconomic variables			
Gross domestic product	206.99	11.1	billions pesos
Total consumption	154.98	--	" "
Gross investments	40.28	--	" "
Imports with taxes	-42.47	--	" "
Changes in stocks	3.63	--	" "
Corporate savings	6.60	--	" "
Corporate taxes	2.28	--	" "
Personal income	161.35	--	" "
Personal taxes	3.47	--	" "
Disposable income	157.88	--	" "
Depreciation	23.41	--	" "
Indirect taxes	18.84	--	" "
Exports[a]	31.85	--	" "
Government expenditures[a]	15.45	--	" "
Government construction[a]	5.67	--	" "
Foreign transfers to persons[a]	6.94	--	" "
Foreign transfers to government[a]	0.67	--	" "
Government transfers to persons[a]	2.97	--	" "
Net factor payments[a]	-3.66	--	" "
Government income from property[a]	0.65	--	" "
Balance of trade	-3.40	--	" "
Real GDP	57.86	4.61	billions 1965 pesos
GDP deflator	3.58	--	1665=1.00
Population[a]	57.44	--	millions
Households[a]	9.42	--	millions

[a]Exogenously determined.

Lorenz coefficients for earnings dist.	0.5793	--	--
Lorenz coefficients for income dist.	0.4330	--	--
Lorenz coefficient for consumption dist.	0.2603	--	--

II) Sectoral information

Sector	Projected GDP in billions of pesos	Distribution (%)	Projected real growth rate (%)	Employment in millions	Distribution (%)
Agriculture	31.71	15.3	3.52	7.14	39.4
Fisheries	5.90	2.9	3.94	0.57	3.1
Forestry	5.65	2.7	4.38	0.11	0.6
Mining	4.70	2.3	4.38	0.18	1.0
Food manufacturing	9.90	4.8	3.33	0.24	1.3
Other manufacturing	32.35	15.6	4.47	2.01	11.1
Construction	4.42	2.1	3.10	0.72	4.0
Utilities	2.56	1.2	5.61	0.06	0.3
Transportation	8.35	4.0	4.58	0.77	4.2
Trade	26.27	12.7	4.17	2.39	13.2
Finance	16.55	8.0	4.95	0.13	0.7
Services	29.61	14.3	5.85	2.21	12.2
Government	10.58	5.1	--	1.63	9.0
Housing	15.16	7.3	--	---	--
Import taxes	3.26	1.6	--	--	--
Total	206.99	100.0	4.61	18.15	100.0

Table 6.5. Continued

III) Occupational information

Occupation	Employment in millions	Distribution (%)	Wage index (1965=1.00)	Average wage in pesos	Relative wage (%)
Professionals	1.70	9.4	3.37	10,206	262.4
Sales and clerical workers	3.11	17.1	3.91	5,580	143.5
Farmers, fishermen, etc.	7.77	42.8	5.46	1,366	35.1
Skilled and semiskilled workers	3.32	18.3	4.74	4,851	124.7
Manual workers	0.44	2.4	4.63	3,809	97.9
Service related workers	1.82	10.0	5.15	4,130	106.2
Total	18.15	100.0	--	3,889	100.0

corresponding decline in real GDP growth rate is from 4.84 percent to 4.61 percent. Real growth rates of all sectors, except agriculture, are lower as compared to projection under neutral policy.

Note that despite increased employment in the fisheries and forestry sectors, real growth rates of these sectors declined. The reduction in GDP growth rate has caused a slow down in investments, and therefore availability of investments to be allocated to all sectors. In the fisheries and forestry sectors, increases in employment are not sufficient to offset decline in capital availability.

Income distribution

Compared with projection under neutral policy, income distribution has worsened slightly with the Lorenz coefficient of inequality at 0.4330. This worsening of income distribution can be almost entirely attributed to worsening of rural incomes. Projected average earnings of occupation three in agriculture is 2568 current pesos in 1985, a drop of 15 percent compared to 3004 current pesos as projected under neutral policy.[1] The projected wage index for occupation three is 5.46 compared to 6.39 projected earlier. This has resulted in a decline of average labor income of occupation three in the agriculture and fisheries sectors from 1519 and 2010 current pesos to 1298 and 1718 current pesos respectively. Noting from Table 6.6 that average wage of all workers is virtually unchanged compared to projection under neutral policy, the decline in

[1]Although real GDP has declined, this comparison is valid as changes in macroeconomic variables expressed in current pesos are not significantly affected.

wages of occupation three in agriculture represents an increase in the severity of the rural absolute poverty problem. Landless laborers and tenant farmers will earn substantially less with slow rural-urban migration.

On the other hand, manual workers are now relatively well off, as shown in Table 6.6. This will contribute to the elimination of the urban poverty problem. Wages of all other urban related occupations also increased, thus widening the income gap between occupation three and urban oriented occupations. This widening of rural-urban income gap has caused the deterioration of overall income equality, as compared to projection under neutral policy.

Table 6.6. Comparison of projected average wages in 1985 (in pesos) for selected groups under different policies[a]

Sector/Occupation	Policy: Neutral policy	Policy: Slow rural-urban migration
Agriculture/3	1519 (39.0%)	1298 (33.4%)
Fisheries/3	2010 (51.6%)	1718 (44.2%)
Trade/2	4170 (107.0%)	4432 (114.0%)
Services/5	3231 (82.0%)	3487 (89.7%)
Food manufacturing/4	4474 (114.8%)	4866 (125.1%)
Other manufacturing/4	4999 (128.2%)	5437 (139.8%)
All professionals	10192 (261.5%)	10206 (262.4%)
All workers	3898	3889

[a]Wages in current pesos. Figures in brackets are average wages as a percent of overall average wage.

Some observations

The above exercise illustrates an important consideration frequently overlooked in the formulation of agriculture development policies. Because of Engel's law stating that income elasticity of demand for food is less than one, agricultural development and growth in average agricultural labor productivity (or income) in the long run would necessitate reallocation of rural population in terms of rural-urban migration. This can be easily seen from the equation:

$$\epsilon r_y + r_{pop} = r_{prod} + r_{emp}$$

or:

$$r_{prod} + Er_y = r_{pop} - r_{emp}, \qquad \epsilon < 1,$$

where:

E = income elasticity of demand for agricultural products;

r_y = rate of growth of per capita income;

r_{pop} = population growth rate;

r_{prod} = growth rate of labor productivity in agriculture;

r_{emp} = growth rate of employment in agriculture.

Assuming that agriculture policies are directed towards maintaining productivity growth at least as high as per capita income growth, i.e. $r_{prod} \geq r_y$, then the implication:

$$r_{pop} - r_{emp} \geq 0$$

can be easily derived. As population reproductive rate in rural areas are at least as high as overall population reproduction rate, the above inequality implies that net rural-urban migration is a prerequisite for

achieving labor productivity growth at least as high as per capita income growth.

In our exercise of slow rural-urban migration, r_{emp} was increased. As r_{pop}, ϵ, r_y remained fairly constant, this resulted in a decline in r_{prod}, and therefore a lower growth rate of per capita agricultural or rural income. As r_y remained fairly constant, this also implies a widening gap between rural and urban average incomes, thus resulting in a worsening of overall income distribution.

The above result is based on the assumption of constant income distribution within the agricultural sector. In most developing countries, the proportion of labor force or population in the agricultural sector is large. Consequently changes in income distribution within the agricultural sector can have considerable impact on overall income distribution. For example, a reduction in income inequality in rural areas can contribute significantly to improvement in overall income distribution.

Neglecting the inherent slow growth of demand for agricultural products can lead to failure of the usual agriculture development policies. The usual policy package including such items as improved irrigation, improved seeds, increase use of fertilizers and insecticides, agriculture research, extension, double cropping, mechanization, increase agriculture credit, etc., are all geared towards increasing labor productivities. Even creation of marketing boards and better transportation and storage facilities have the effect of inducing regional specialization of production into more efficient areas, therefore increasing labor productivity in the long run. Increase of supply relative to demand will

lead to decrease in total revenues because price elasticities of demand for agricultural products are generally less than one.

The constraining effect of demand on growth of per capita income in the agricultural sector can be avoided by instituting policies directed towards encouraging rapid rural-urban migration. Rapid migration implies a slow growth of agricultural employment, thus reducing the impact of rising labor productivity on total supply, and forestalling any price depressing effects. However, the rate of labor absorption in the urban industrial sector have been disappointing in the past. Rapid migration had merely shifted rural poverty into urban poverty. In fact the call for accelerated agricultural development efforts was partly promoted by socially undesirable effects of rapid rural-urban migration.

The inability of the urban sector to absorb migrants in a socially desirable manner in the past can be largely attributed to wrong industrial development policies. Emphasis had been on protected capital intensive industries generating only marginal employment effects. It is conceivable that conditions might exist such that future development of the manufacturing and service sectors can permit a high rate of labor absorption.[1] Thus, socially undesirable effects of rapid migration such as urban slums, poverty and crime can be avoided to a certain extent. This subject will be given more detail considerations in the next simulation exercise.

On the demand side, many short run policies can stimulate a high growth rate of demand for agricultural products. Most politically

[1]These conditions require low capital intensity and high absolute growth in the urban manufacturing and service sectors.

attractive is the achievement of self-sufficiency in food. By erecting protectionist policies such as import quotas and high tariffs, a high growth rate of demand for food produced domestically can be generated in a food importing country. A wide spread positive effect on agricultural development can be achieved by simple actions of custom officers at border points. However, protectionist policies always lead to decline in real GDP. This decline is to some extent compensated by social returns of self-sufficiency in food and agricultural development.

Examination of trade statistics will reveal that the Philippines is a net exporter of food items. However, more detail examination will reveal that of all total food exports, approximately 90 percent is accounted for by fruits, vegetables, sugar and sugar preparation. Fruits and vegetables consist of mainly canned fruits and their juices, and various coconut products. Sugar and sugar products consist mainly of centrifugal sugar exported to the world markets. Philippines is still a net importer of food items such as cereals and cereal preparations, fish and fish preparations, meat and meat preparations, dairy products and eggs and feedstuffs for animals. Net import of these food items is in the order of 180 million U.S. dollars in 1970. Net import of rice and corn in 1972 is approximately 43 million U.S. dollars with rice accounting for 80 percent of this deficit.

With the deficit food products such as rice, corn, meat, eggs and dairy products and fish being produced by the traditional rural sector, a policy of self-sufficiency in food can contribute significantly to raising incomes in this sector. Technical feasibility of self-sufficiency

is enhanced by recent progress in agriculture research and advances in agronomic techniques.

The short run nature of a self-sufficiency in food program is obvious. Once self-sufficiency is reached, growth rate of demand for food is once again limited by Engel's law. Possibility of export into foreign markets is also limited because agricultural development had been induced by protectionist policies.

Another policy that leads to rapid growth of demand in food in the short run is income redistribution. Because of Engel's law, a redistribution of income in favor of the poor will raise total demand for food. The dramatic effects of income redistribution on food consumption are documented in most land redistribution efforts. The increase of on farm consumption resulting from land redistribution is well-known. The net result is usually reduction of agricultural savings, reduction in the supply of food for markets, and increase in food prices. The short run effect is obvious; as once redistribution is completed and equilibrium established, growth rate of demand for food is again limited by the usual factors.

In the long run, prospects for rapid increase in demand for agricultural output, especially food items, are bleak. It is conceivable that increased extension efforts and better information on nutrition can contribute to increase in demand for food. However, their impact consists mainly of changing food composition, rather than increase in food consumption. Changing composition of total food intake also implies high growth rates for certain food items. In this connection, protein related

foods such as fish and fish preparations, meat, poultry, eggs, dairy products, etc., can be important. Thus, good prospects exist for the development of the fisheries and livestocks sector.

Engel's law certainly does not apply to agricultural products that are exportable. Therefore, demand related constraints of development of traditional agriculture can be overcome to some extent by crop diversification. Increases in proportion of acreages devoted to crops such as pineapples, sugar cane, coconuts, rubber, etc. can contribute significantly to income generation in traditional agriculture.

Summary and conclusion

Higher rural-urban migration coupled with appropriate urban industrial development policies, has the effect of improving income distribution and accelerating economic growth. Migration has the effect of equilibrating rural and urban incomes, thus improving overall income distribution. As marginal products of labor are higher in urban areas, total output is also increased. Because of demand constraints, successful agricultural development and increasing of average income in rural areas depend crucially on sustained rural-urban migration. Sustained rural-urban migration allows the translation of productivity increases in agriculture to increases in income levels. In the short run, demand related constraints can be overcome by policies such as a self-sufficiency in food program, income or land redistribution and better nutritional information. In the long run, Engel's law is binding. Certain agricultural products such as meat, poultry, fish, etc., which have high income elasticities of demand will be exempted. Improvements in average rural

income should rely heavily on these products. Crop diversifications into exportable products will also be helpful.

Social disruptions such as urban slums, high urban crime rates, etc. should not lead to policies restricting the rural-urban flow of population. Past problems can be partly attributed to inappropriate industrial development policies in favor of capital intensive industries with little labor content and restricted by small domestic markets. Future urban and industrial development should concentrate on the objective of productive labor absorption on a large scale. This aspect of economic development will be the subject of the next simulation.

The conclusion of this simulation exercise should not be interpreted as advocating for a rapid rural-urban migration policy per se. The simulation exercise serves to merely demonstrate the impact of a reduction of migration on economic growth and income distribution, ceteris paribus. The next simulation exercise should also be interpreted in a similar spirit, i.e. it serves to help us understand certain aspects of the Philippines economy. It is only towards the end of this chapter that policy recommendations are made. These policy recommendations are more clearly presented in the last chapter.

Extensive Labor Intensive Urban Development

It was mentioned in the previous simulation exercise that successful agricultural development, based mainly on policies inducing labor productivity increases, depends crucially on sustained rural-urban migration. However, if serious urban poverty, crime and slums problems are to be avoided, the urban manufacturing and services sector will have to absorb

migrants more successfully than in the past.

The traditional service sector has been one of the major labor absorbers in the past.[1] Income elasticities of demand for traditional services such as domestic services and vendors, are high. Further, supply of such services is not limited by the savings constraint as capital requirements are low, or nonexistent as in the case of domestic services. Much can be done to increase demand related to low skill service workers, thus contributing to both objectives of economic growth and equality. Promotion of tourism will no doubt contribute significantly in this direction. Consumption pattern of tourists, emphasizing lodging, food, transportation, local crafts and arts, has high labor content in terms of low skill service workers and semiskilled workers. Although capital requirements and hence import content of certain tourist goods such as lodging and transportation are high, investments, especially in hotels, consist partly of construction with comparatively low import content and high semiskilled labor content. Furnishing of hotels can be done with emphasis on local products without loss of attractiveness.[2]

Therefore in the extensive labor intensive urban development program, we assumed a high rate of growth of exports from the service sector. The assumed growth rate was 12 percent, a guesstimate as to the

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[1]Growth of modern professional services, although phenomenal in the 1960's, had little labor content in terms of low skill service workers. They therefore contribute little to the objective of income equality.

[2]This statement will not apply to countries with virtually no manufacturing sector to support the construction sector. It is believed that the manufacturing sector in the Philippines economy can provide a substantial amount of materials and furnishing required in hotel construction.

result of tourist promotion efforts. It should be mentioned that since the declaration of martial rule, promotion of tourism is explicitly stated as official policy.

As discussed in Chapter II, past industrialization policies based on import substitution had resulted in low labor absorption. Extensification of markets for output into exports was precluded by protection from international competition. Domestic demand was limited by low per capita income. Cost minimization, and hence more labor intensive techniques of production, was not encouraged because of lack of competition internationally, and monopolistic position of firms domestically.

Future industrialization policies should be based on manufactured exports. In this manner, both the market "extensification", and labor intensification problems can be solved simultaneously. By encouraging foreign inflow of capital to finance investments in labor intensive manufacturing, the savings and technology problem can also be solved.[1] In this connection, multinational corporations can contribute significantly.

As in the assumption of high service exports, we assumed a high growth rate of exports from the other manufacturing sector. A growth rate of 12 percent was assumed. Growth rate of exports from the food manufacturing sector was assumed to be unchanged. It is believed that the food manufacturing sector, consisting mainly of fruit canning and

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[1]Note that technology transferred may not be appropriate for resource endowment in the Philippines. However low capital intensity, although desirable, is not a prerequisite for large scale labor absorption (see page 7.11).

sugar refining has been fully developed in terms of export potential.

Under the labor extensive labor intensive urban development program, it was also assumed that government construction grows at an annual rate of 12 percent, instead of 10.4 percent as assumed under neutral policy. The high growth rate was assumed because of social overhead capital needed to complement a high growth rate of exports from the services and manufacturing sectors. As the unskilled and semiskilled labor content of construction is high, it was also assumed that a high growth rate of government construction is pursued partly for its employment and income distribution consequences.

Results of this projection are presented in Table 6.7.

Income and employment

Increased growth rates of government construction and exports from the other manufacturing and services sectors caused a high growth rate of monetary GDP. Growth rate of monetary GDP is 11.5 percent, half a percentage point higher as compared to projection under neutral policy. Moreover, a high level of exports stimulated investments in machineries, and a high growth rate of GDP stimulated private construction. Consequently, private capital formation in various sectors increased, and a slightly higher, but not significantly different, growth rate of real GDP resulted. Real growth rate of GDP is at 4.86 percent, as compared to 4.84 percent projected under neutral policy.

There is a slight improvement in the balance of payments in the order of 60 million pesos. This is not surprising as the policy under

Table 6.7. Projection under extensive labor intensive urban development

Macroeconomic variables	Projected values	Growth rates (%)	Units
I) Macroeconomic variables			
Gross domestic product	219.64	11.5	billions pesos
Total consumption	163.05	--	" "
Gross investments	43.85	--	" "
Imports with taxes	-44.96	--	" "
Changes in stocks	3.98	--	" "
Corporate savings	6.99	--	" "
Corporate taxes	2.41	--	" "
Personal income	170.17	--	" "
Personal taxes	3.67	--	" "
Disposable income	166.49	--	" "
Depreciation	24.80	--	" "
Indirect taxes	20.13	--	" "
Exports[a]	34.23	--	" "
Government expenditures[a]	15.45	--	" "
Government construction[a]	5.67	--	" "
Foreign transfers to persons[a]	6.94	--	" "
Foreign transfers to government[a]	0.67	--	" "
Government transfers to persons[a]	2.97	--	" "
Net factor payments[a]	-3.66	--	" "
Government income from property[a]	0.65	--	" "
Balance of trade	-3.34	--	" "
Real GDP	59.77	4.86	billions 1965 pesos
GDP deflator	3.66	--	1965=1.00
Population[a]	57.44	--	millions
Households[a]	9.42	--	millions

[a]Exogenously determined.

Lorenz coefficients for earnings dist.	0.5669	--	"	"
Lorenz coefficients for income dist.	0.4190	--	"	"
Lorenz coefficients for consumption dist.	0.2469	--	"	"

II) Sectoral information

Sector	Projected GDP in billions of pesos	Distribution (%)	Projected real growth rate (%)	Employment in millions	Distribution (%)
Agriculture	33.05	15.1	3.36	6.14	33.8
Fisheries	6.11	2.8	3.95	0.49	2.7
Forestry	5.76	2.6	4.50	0.10	0.6
Mining	4.82	2.2	4.87	0.27	1.5
Food manufacturing	10.25	4.7	3.31	0.26	1.4
Other manufacturing	34.86	15.9	4.92	2.20	12.1
Construction	5.02	2.3	4.07	0.96	5.3
Utilities	2.73	1.3	5.93	0.07	0.4
Transportation	8.79	4.0	4.98	0.89	4.9
Trade	27.71	12.7	4.50	2.57	14.2
Finance	17.62	8.0	5.23	0.14	0.8
Services	32.14	14.7	6.24	2.45	13.5
Government	10.58	4.8	--	1.62	8.9
Housing	16.18	7.4	--	--	--
Import taxes	3.44	1.6	--	--	--
Total	219.04	100.0	4.86	18.15	100.0

Table 6.7. Continued

III) Occupational information

Occupation	Employment in millions	Distribution	Wage index (1965=1.00)	Average wage in pesos	Relative wage (%)
Professionals	1.71	9.4	3.45	10,623	258.7
Sales and clerical workers	3.31	18.2	3.86	5,522	134.5
Farmers, fishermen, etc.	6.67	36.7	6.63	1,658	40.4
Skilled and semiskilled workers	3.62	19.9	4.67	4,770	116.2
Manual workers	0.87	4.8	2.50	2,044	49.8
Service related workers	1.98	10.9	5.09	4,055	98.8
Total	18.15	100.0	--	4,106	100.0

discussion is primarily an export promotion policy. However, the gains in balance of payments is small because growth of GDP also induced increased demand for imports.

Sectoral distribution of GDP responded directly to the changed pattern of final demand. GDP share of other manufacturing, construction, finance, and services sectors increased as compared to projection under neutral policy.[1] Increase in monetary income and the slight worsening of income distribution also caused an increase in demand for housing. Therefore, GDP share of the housing sector also increased.

Sectoral distribution of employment responded in a similar manner. Shares of the sectors: other manufacturing, construction, finance and services increased. However, labor absorption of increased exports is disappointing. Percentage increase in employment in the services and other manufacturing sectors, as compared to projection under neutral policy, are 1.6 percent and 0.4 percent respectively. Exports of these sectors in 1985, as projected under neutral policy, are 16.7 percent (other manufacturing) and 14.5 percent (services) of sectoral final demand. Therefore, the impact of a 2.7 percent increase in growth rates of exports is limited. Conversely, government construction, as projected under neutral policy, represents approximately 50 percent of final demand in the construction sector in 1985. Therefore, an increase in growth rate from 10.4 percent to 12 percent provided a substantial lift to the

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[1]Recall that construction demand is allocated between the construction sector and the finance sector, because the finance sector contains the real estate subsector.

construction industry. A 5.4 percent increase in employment, as compared to projection under neutral policy, was registered.

Income distribution

Projected income distribution as measured by the Lorenz coefficient worsened slightly, although not significantly different from projection under neutral policy. The projected Lorenz coefficients for distributions of earnings, income and consumption in 1985 are 0.5669, 0.4190 and 0.2469 compared to 0.5664, 0.4183 and 0.2463 as projected under neutral policy.

A clearer picture of income movements among different groups can be seen from Table 6.8. It can be seen that average wages of urban oriented occupations improved relatively compared to average wage of occupation three. Percentage increase in average wage of occupation three, compared to projection under neutral policy, is 3.8 percent, lowest of all increases. Urban oriented occupations such as skilled and semiskilled workers, sales and clerical workers, professionals, manual workers, and service workers, all registered relatively high percentage increase in average wage.

From Table 6.8, we can also detect an improvement in urban income distribution. Wages of low income urban occupations such as skilled and semiskilled workers, manual workers and service workers gained relatively compared to high income occupations such as professionals, sales and clerical workers.

Table 6.8. Comparison of occupational average wages in 1985 (in pesos) under neutral policy and under extensive labor intensive urban development[a]

Occupation	Extensive labor intensive urban development		Neutral policy		% Change
Professionals	10623	(258.7%)	10192	(261.5%)	4.2
Clerical and sales workers	5522	(134.5%)	5250	(134.7%)	5.2
Farmers, fishermen, farm workers	1658	(40.4%)	1598	(41.0%)	3.8
Skilled and semiskilled workers	4770	(116.3%)	4460	(114.4%)	7.0
Manual workers	2044	(49.8%)	1918	(49.2%)	6.6
Service workers	4055	(98.8%)	3801	(97.5%)	6.7
Total	4106		3898		5.3

[a]Figures in brackets are average wage rates by occupation as a percentage of overall average wage rate.

Summary and conclusion

The extensive labor intensive urban development program, as its name implies, is essentially directed towards the urban sector. Increases in demand for labor in the low income occupational groups result in an improvement in urban income distribution. The degree of improvement depends on the extent of autonomous demand that can be generated in the labor intensive sectors such as other manufacturing, construction and services. Even with our assumption of slight changes in the growth rates of exports from the other manufacturing and services sectors, and slight increase in government construction, the improvement in urban income distribution is perceptible.

While neglecting the rural agricultural sector, this development strategy resulted in a widening rural-urban income gap, and thus causing an overall deterioration of income distribution.

The urban development strategy of encouraging exports provided a positive stimulus to the economy in terms of demand. Investments were increased as a consequence, thus generating a higher growth rate of GDP.

Given the conclusion of widening rural-urban income gap, it is essential that the extensive labor intensive urban development program be balanced by agricultural development policies designed to raise per capita income levels in the rural areas. Such policies will be tested in the next simulation exercise.

A Balanced Development Program

In the previous simulation, it was concluded that an agricultural development program, emphasizing income growth in the agriculture and rural sectors, is desirable to counterbalance the undesirable income distribution effects of an extensive labor intensive urban development program. The primary function of such a program is to narrow the widening rural-urban income gap.

Assumptions

We retained the assumptions made in the previous section, concerning increased growth rates of government construction, and increased growth rates of exports from the services and other manufacturing sectors. This is done because of desirable income distribution and growth effects of these assumptions on the urban sector. Moreover, the Philippines government has officially announced a high growth rate of manufactured exports and promotion of tourism as official policies.

The major obstacle facing agricultural development is the generation of demand. The current food, especially rice shortage should be interpreted as a cyclical phenomenon due to changing weather conditions, especially typhoons. Therefore while in the very short run, increase in food production can be easily absorbed without any adverse effects on prices, this trend cannot be projected into the long run.

On a longer time horizon, we assumed that a policy of self-sufficiency in food is pursued by the government. Imports in the

agricultural sector was assumed to decline by 90 percent by the year 1985.[1] It was assumed that imports in this sector, consisting of live animals for food, rice, fruits and vegetables (fresh), crude rubber, oil seeds and kernels etc. can be produced domestically if a sufficiently strong tariff and import quota policy is pursued. Imports in the food manufacturing sector was assumed to decline by 50 percent by the year 1985.[2] The decline in imports in the food manufacturing sector was assumed to be smaller because some food items in the current import list can only be produced domestically at extremely high costs. Food items such as wheat flour and its preparations, rye, dairy products such as cheese and butter, canned temperate fruits, etc. are examples. Imports into the fisheries sector is negligible and hence reduction of imports is meaningless. Imports of frozen fish and canned fish preparations are registered in the food manufacturing sector. As the backward linkage from the food manufacturing sector to the fisheries sector is strong, the reduction of imports in the food manufacturing sector can be expected to provide a positive stimulus to demand in the fisheries sector.

A reduction in sectoral imports implies a reduction of total imports. However, in the sectoral imports allocation procedure, total imports is as projected by the macroeconomic model. To avoid this inconsistency, the excess import capacity was assumed to spill into all other sectors in the proportion of their sectoral imports.

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[1]Sectoral imports are a function of GDP. By a decline of 90 percent, it is meant that actual imports, under a protectionist policy, will only be 10 percent of imports under a neutral policy, at every level of GDP.

[2]See number 1.

Note that a food import restriction policy by itself is exactly the industrialization by import substitution policy in reverse. However, improvements in the balance of payments can be expected as increase in agriculture and food production will cause little import leakage in terms of intermediate inputs, raw materials and capital goods. The import capacity, directed at industrial goods, and the limitation of food imports will cause an improvement in the terms of trade between agricultural and urban sectors, in favor of the agricultural sector. Hence, an improvement of rural incomes as compared to urban incomes can be expected.

To avoid a precipitous rise in food prices, it was assumed that policies are adopted to increase labor productivity in agriculture. These include the usual "Green Revolution" policies. To approximate the impact of these policies on the model it was assumed that productivities of intermediate inputs in agriculture increased by 20 percent, i.e. α_{i1}, $i = 1, \ldots, 12$, are all increased by 20 percent at the expense of the capital coefficient γ_1.[1] A Hicks neutral rate of technological progress in agriculture of 1 percent was also assumed, i.e. $\sigma_1 = 0.01$.

Results of the simulation are presented in Table 6.9.

Income and employment

Growth rate of monetary GDP at approximately 11.6 percent is slightly higher compared to projections under extensive labor intensive urban development program. The shift in sectoral production towards the agriculture, fisheries and food manufacturing sectors has caused lower

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[1]The absolute difference between γ_1 and λ_1 was kept unchanged. β_{1k}, $k = 1, \ldots, 6$ remained unchanged.

leakages of expenditures in terms of indirect taxes, and thus a higher level of monetary income.

A higher growth rate of real GDP as compared to projection under extensive labor intensive urban development, was obtained. The main source of real growth, as can be seen from Table 6.9, is the agricultural sector with a positive rate of technical progress. Moreover, the self-sufficiency in food program stimulated demand in the agricultural sector, thus additional agricultural employment is generated. This also contributed to growth in the agricultural sector.

Sectoral GDP share of agriculture and food manufacturing responded directly to import restrictions on food. Other sectors that show minor and nonsignificant increase in GDP share compared to projection under extensive labor intensive urban development, are fisheries, transportation, trade, finance and housing. These slight improvements are primarily due to backward linkages from the food manufacturing and agriculture sectors, and changed demand patterns due to an improvement in income distribution. The other manufacturing sector shows a substantial decline in terms of GDP share despite high backward linkages from the food manufacturing and agriculture sectors. Recall that import capacity is now primarily directed at other sectors besides food manufacturing and agriculture. As the other manufacturing sector accounts for approximately 80 percent of imports in other sectors, the spill over of import capacity into this sector has a substantial depressing effect on final demand. This is part of the mechanism turning the terms of trade between agriculture and manufacturing in favor of agriculture.

Sectoral employment responded in a roughly similar manner. Share of agriculture and food manufacturing employment increased. However, the comparatively weaker increase in demand in the fisheries sector cannot effectively compete with the agriculture sector for the rural labor force. Consequently, employment share of the fisheries sector declined as compared to projection under extensive labor intensive urban development. Other sectors that show minor but not significant increase in employment share are construction, transportation and trade. The other manufacturing sector shows a decline in employment due to reasons mentioned in the previous paragraph.

As expected, the projected ratio of agriculture price to absolute price level increased as compared to projection under extensive labor intensive urban development.[1] Not too much emphasis should be placed on the magnitude of such projections. Recall that we did not have data to test the accuracy of sectoral price projections, or sectoral real output. However, increase of relative price of agriculture and food can be interpreted as evidence that our model is directionally correct in price projections.

Income distribution

A comparison of Tables 6.7 and 6.9 shows that the agricultural development program has a slight but positive impact on income equality. Further, the Lorenz coefficient of distribution for earnings, income and consumption at 0.5656, 0.4174 and 0.2454 respectively are slightly lower

[1]The ratio increased from 1.00 to 1.08. The ratio of the price of the food manufacturing sector to the absolute price level increased from 0.91 to 0.95.

compared with coefficients of 0.5664, 0.4183 and 0.2463 respectively as projected under neutral policy. Recalling that the extensive labor intensive urban development program resulted in a slight deterioration of income equality, we can conclude that the incorporation of an agriculture development program has more than compensated for the undesirable income distribution effects of the extensive labor intensive urban development program.

The source for the improvement of income distribution is brought out more dramatically in Table 6.10, which compare average wages for different occupations computed under the present and previous simulations. Note that the position of occupation three (farmers, fishermen, farm workers, etc.) has improved compared to all other occupations. We therefore infer that the rural urban income gap has been narrowed by the incorporation of an agriculture development program. The spill over of import capacity into the other manufacturing sector has even caused a relative decline in average wages of occupation four (skilled and semi-skilled workers) and five (manual workers).

Summary and conclusion

The simulation illustrates the important relationship between demand generation and income distribution. By increasing final and intermediate demand in the agriculture sector, income distribution is improved.

The rise in agricultural per capita income will be dampened if employment in the agriculture sector increases as a response to the rise in income. Thus, improvements in income equality can be retarded. A computation of the present simulation with increased employment in

Table 6.9. Projection under a balanced development strategy, 1985

Macroeconomic variables	Projected values	Growth rates (%)	Units
I) Macroeconomic variables			
Gross domestic product	220.32	11.6	Billions pesos
Total consumption	164.42	--	" "
Gross investments	43.91	--	" "
Imports with taxes	-45.23	--	" "
Changes in stocks	4.07	--	" "
Corporate savings	7.03	--	" "
Corporate taxes	2.42	--	" "
Personal income	171.68	--	" "
Personal taxes	3.71	--	" "
Disposable income	167.97	--	" "
Depreciation	24.93	--	" "
Indirect taxes	19.99	--	" "
Exports[a]	34.23	--	" "
Government expenditures[a]	15.45	--	" "
Government construction[a]	6.85	--	" "
Foreign transfers to persons[a]	6.94	--	" "
Foreign transfers to government[a]	0.67	--	" "
Government transfers to persons[a]	2.97	--	" "
Net factor payments[a]	-3.66	--	" "
Government income from property[a]	0.65	--	" "
Balance of trade	-3.58	--	" "
Real GDP	60.64	4.12	billions 1965 pesos
GDP deflator	3.63	--	1965=1.00
Population[a]	57.44	--	millions
Households[a]	9.42	--	millions

[a]Exogenously determined.

Lorenz coefficients for earnings dist.	0.5656	--	"	"
Lorenz coefficients for income dist.	0.4174	--	"	"
Lorenz coefficients for consumption dist.	0.2454	--	"	"

II) Sectoral information

Sector	Projected GDP in billions of pesos	Distribution (%)	Projected real growth rate (%)	Employment in millions	Distribution (%)
Agriculture	33.86	15.4	4.50	6.17	33.9
Fisheries	6.18	2.8	4.00	0.47	2.6
Forestry	5.73	2.6	4.53	0.09	0.5
Mining	4.69	2.1	4.83	0.26	1.4
Food manufacturing	10.75	4.9	4.02	0.27	1.5
Other manufacturing	34.09	15.5	4.90	2.16	11.9
Construction	5.04	2.3	4.22	0.97	5.3
Utilities	2.74	1.2	6.04	0.07	0.4
Transportation	8.85	4.0	5.11	0.90	5.0
Trade	27.94	12.7	4.56	2.58	14.2
Finance	17.82	8.1	5.30	0.14	0.8
Services	32.23	14.6	6.35	2.45	13.5
Government	10.58	4.8	--	1.62	8.9
Housing	16.36	7.4	--	--	--
Import taxes	3.45	1.6	--	--	--
Total	220.32	100.0	5.12	18.15	100.0

Table 6.9. Continued

III) Occupational information

Occupation	Employment in millions	Distribution (%)	Wage index (1965=1.00)	Average wage in pesos	Relative wage (%)
Professionals	1.71	9.4	3.46	10,632	256.9
Sales and clerical workers	3.31	18.2	3.88	5,554	134.3
Farmers, fishermen, etc.	6.67	36.7	6.98	1,741	42.1
Skilled and semiskilled workers	3.62	19.9	4.64	4,726	114.3
Manual workers	0.87	4.8	2.50	2,038	49.3
Service related workers	1.98	10.9	5.10	4,066	98.3
Total	18.15	100.0	--	4,135	100.0

Table 6.10. Comparison of occupational average wages in 1985 (in pesos) under balanced development strategy and extensive labor intensive urban development[a]

Occupation	Balanced development		Extensive labor intensive urban development		Ratio
Professionals	10632	(257.1%)	10623	(258.7%)	1.00
Clerical and sales workers	5554	(134.3%)	5522	(134.5%)	1.01
Farmers, fishermen, farm workers	1741	(42.1%)	1658	(40.4%)	1.05
Skilled and semiskilled workers	4726	(114.3%)	4770	(116.2%)	0.99
Manual workers	2038	(49.3%)	2044	(49.8%)	0.99
Service workers	4066	(98.3%)	4055	(98.8%)	1.00
Total	4135		4106		1.01

[a]Figures in brackets are average wage rates by occupation as a percent of overall average wage rate.

occupation three will reveal this result. Further, real output will decline as labor is allocated to sectors with lower marginal productivities of labor.

The increase in food demand directed at domestic production is achieved through import restrictions. As mentioned earlier, this is essentially the industrialization by import substitution policy in reverse, turning the terms of trade in favor of agriculture. To the extent that import restrictions on food items and distortion of market prices will cause misallocation of resources, growth of the economy is impaired. Here lies the conflict between the income distribution and growth objectives. However, the trade off between these two objectives is inherent in the policy followed, rather than in the functioning of the economy. Moreover, in the long run, growth of the economy does not necessarily lead to deterioration of income distribution.

A Redistribution of Income

A question often asked by economists is whether a redistribution of income will lead to demand and supply patterns that will reinforce the initial redistribution effort. We shall attempt to answer this question with our model, capturing only the effects of income distribution on consumption patterns and the effects of consumption patterns on income distribution. Other variables such as employment by occupation, investments, imports, etc. are assumed to be independent of income distribution parameters.

The model, with assumptions similar to that of neutral policy is simulated with one minor change. The linkage between distribution of earnings and household income distribution is changed to:

$$L_{FDY} = L_E^{\ 1.7948}$$

Comparing this equation with a similar equation on page 148, it can be seen that we are associating a more equitable income distribution with each value of L_E.[1]

Table 6.11 compares projected Lorenz coefficients in 1985 with projection under neutral policy. The improvements in Lorenz coefficients of income and consumption distributions are natural as we hypothesized such improvements. The Lorenz coefficient of earnings distribution shows a slight improvement indicating that income redistribution is very weakly reinforcing. One might even argue that the small difference is not significant, thus concluding that income redistribution is neutral as to its impact on income distribution.

Conclusions that an autonomous income redistribution will reinforce itself through changes in demand patterns are usually based on the assumption that commodities with high income elasticities of demand are produced by high income groups, and vice versa. This is certainly true for food products. However, goods and services such as domestic services, prepared foods, construction, etc. are counter-examples. Greater equality of income will lead to reduced demand for these goods and services, and hence lower income for their producers.

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[1]The exponent in the equation was chosen to give a Lorenz coefficient of income distribution of 0.45 in 1965.

Table 6.11. Comparison of Lorenz coefficients in 1985 under projection under neutral policy and under projection with income redistribution

Lorenz Coefficient	Neutral Projection	Income Redistribution
Earnings	0.5664	0.5660
Income	0.4183	0.3601
Consumption	0.2463	0.1935

CHAPTER VII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The stated objective of this dissertation is to construct an intersectoral consistency model of the Philippines for the purpose of analyzing income distribution, sectoral employment and growth implications of different development policies. The organization of work to achieve this objective was outlined in Chapter I, and will not be repeated here. Instead, we shall briefly recapitulate the main conclusions of the various chapters under the heading "Summary and Conclusions" below. Under the heading "Recommendations", policy recommendations relevant to the Philippine economy will be made. Lastly, we shall critically examine the shortcomings of our model and recommend directions for future research.

Summary and Conclusions

This dissertation began by examining the performance of the Philippines economy since independence after World War II. Industrialization policies in the 1950's and 1960's were characterized by import substitution. These policies resulted in high growth rates of the industrial sector. However, the policies pursued, implying a high import content of intermediate inputs, high demand for imported capital goods, and markets limited by domestic income, resulted in a tapering of industrial growth in the late 1960's. Exports earnings generated by coconuts, sugar, abacca, and minerals were sluggish during the 1950's and 1960's because

of depressed world prices. Consequently, slow growth of foreign exchange earnings severely constrained the importation of raw materials and capital goods for industrialization.

Agriculture was characterized by a decade of land expansion in the 1950's and a decade of yield increases in the 1960's. By the late 1960's, it was generally agreed that the land frontier had essentially been reached. However, the "Green Revolution" oriented policies were beginning to take hold, stimulating yield increases.

The changing patterns of income distribution during these two decades of development had been disappointing. Income distribution in rural areas worsened continuously for two decades, and taking a sharp turn for the worse during the late 1960's. The worsening of rural income distribution was thought to be primarily due to uneven application of "Green Revolution" policies favoring large farmers, leading to land consolidation in favor of large farms.

Income distribution in urban areas worsened in the 1950's and early 1960's as a result of capital intensive industrialization protected by import restrictions. However, the trend reversed itself slightly in the late 1960's as the pace of industrialization slackened because of balance of payments difficulties.

Rural-urban income gap widened in the 1950's and early 1960's, thus contributing to the worsening of income distribution. This was directly the result of policies favoring high growth of demand in the industrial sector. However in the late 1960's, the gap narrowed significantly because of slow industrial growth and high growth rates in the agriculture

sector. A decline in the growth rate of agricultural employment from approximately 3.3 percent in the 1950's to 0.8 percent in the late 1960's also contributed to narrowing the rural-urban per capita income gap. The Lorenz coefficient of income inequality stood at 0.49 in 1971.

Data on the efficiency of labor utilization indicated an improvement in terms of average number of hours worked. However, open unemployment rate remained essentially unchanged around 7 percent to 8 percent of labor force. No data exist on the extent of underemployment although rough estimates by experts indicated a serious problem with the under and unemployment rate at 25 percent.

Given that development policies in the past had resulted in little improvements in terms of income distribution, it is necessary to redesign future policies giving explicit considerations to the objective of income equality. In this connection, increasing amount of productive employment in modern sectors and reduction of underemployment can contribute significantly.

Chapter III was devoted to a theoretical analysis of the income distribution and employment problem in terms of a two sector (modern-traditional) model, with the hope of formulating development policies to correct the problem. The modern sector is subdivided into efficient and inefficient firms. Inefficient firms re those whose existence depends on protectionist or import substitution policies. Here the usual argument that import substitution results in high capital-labor ratio, deterioration of income equality, low employment generation and balance of payments difficulties apply. However in the modern efficient sector, defined as

comprising of modern firms whose existence does not depend on protectionist policies, we found that there are quite natural explanations for high capital intensities. Based on the assumption that price of capital goods is the same as in industrialized countries, but the price of labor is lower, it is perfectly rational for certain industries to be located in developing countries without modifying their capital intensive technologies developed in industrialized countries. Such industries are characterized by high transportation cost of finished product, no large returns to scale of production, and simple skill requirements in terms of labor inputs. Examples are tourism, airlines, textiles and electronics.

The existence of highly efficient manufacturing and service modern subsectors implies that the modern sector can contribute significantly in future development efforts. Financing of investments in these efficient subsectors can rely heavily on inflow of foreign capital, especially by multinational corporations. The employment, income distribution and growth impacts of such a policy emphasizing exports of manufactured goods and services had yet to be investigated. However, the impacts were expected to be favorable as these industries contain a high level of low skill labor, and "extensification" of these industries through export growth is feasible.

Discussion of the traditional sector concentrated on traditional urban services and traditional agriculture. These are viewed as highly efficient sectors as they are not protected by import quotas or tariffs. The high growth of traditional services was attributed to high income elasticities of demand for such services, and the relative ease by which

production can be increased. In particular, little capital is needed and capital required can be domestically produced. Hence, growth of this sector is not subjected to the balance of payments constraint.

A rather dismal picture was painted for the traditional agricultural sector. Although supply of this sector can be increased substantially through accelerated implementation and extensification of "Green Revolution" policies, growth in demand in this sector is severely limited by growth of demand for food. The growth of demand for food is subjected to Engel's law, implying a slower rate of growth of demand relative to income. Therefore in the long run, per capita income growth in the traditional agricultural sector can only be achieved through rural-urban migration and improved technology of production. In the short run, various policies can be implemented to stimulate a high growth rate of demand. Programs such as self-sufficiency in food grains, better nutritional information, and government stockpiles of grain, etc. will increase demand in the traditional agricultural sector.

The tentative policy conclusions arrived at in Chapter III were: i) improved output and export performance of the efficient modern sectors; ii) a sustained high rate of rural-urban migration; and iii) intensification and extensification of "Green Revolution" policies to cover all farmers. These policies will improve growth and income equality in the Philippines economy in the long run. Income distribution can be improved at the expense of growth in the short run by a self-sufficiency in food program stimulated by restrictions on food imports.

At this point, it was proposed that an intersectoral consistency model be constructed in order that the proposed policies can be tested for all their implications and ramifications. Similar work was done in the past by Thorbecke and Sengupta (45), and ILO (16) and other authors. We therefore undertook a review of past consistency models, emphasizing their weak points. This is not to deny the important contributions of these studies, but merely to indicate areas where improvements can be made.

Areas of weakness of past consistency models are: i) lack of supply constraints; ii) sectoral disaggregation were not along a modern-traditional breakdown, making the models less suitable for the analysis of income distribution and growth policies; iii) exogenous growth rates of labor productivities; iv) computation of personal instead of household income distribution; and v) lack of consideration for technical progress. In Chapter IV, we developed a model on the theoretical level, which overcame some of these problems. The model is essentially a multisector Solow growth model with Cobb-Douglas sectoral production functions involving intermediate inputs. Sectoral supply is therefore constrained by sectoral investments, employment, use of intermediate inputs and technical change. Demand aggregates are projected by the usual Keynesian model while the consumption vector is determined by total income and income distribution. Sectoral breakdown of other final demand variables such as investments, exports, imports, etc. are achieved by various other means. Equality of supply and demand at each sector is achieved by price adjustments.

Exogenous education policies determine labor supply by occupation. Assuming exogenous unemployment rates by occupation, employment by occupation are then determined. The model then completely distributes employment by occupation into employment by sector, thus determining labor productivities by sector endogenously. At the same time, employment and earnings by sector and occupation are determined. Assuming some allocation of nonlabor income, the Lorenz coefficient of earnings distribution is then calculated. The Lorenz coefficient of household income distribution is then related to the Lorenz coefficient of earnings distribution by an exponential equation. Assuming a log-normal household income distribution, the determination of the Lorenz coefficient completely specifies the parameters of the log-normal distribution.

The method of labor absorption was chosen because it was deemed to be more relevant for income distribution determination. Certain sectors in the economy can be classified as survival sectors. Labor, when not employed in other sectors is inevitably demoted into these sectors to make a living. These sectors can absorb unlimited amounts of labor because of low capital requirements, the subsistence nature of output (in subsistence agriculture), and production centered around the family. A model specifying that a given amount of labor has to be completely absorbed will duplicate the process of labor being demoted to traditional sectors, and hence give a more accurate representation of income distribution.

In Chapter V, the complete model was estimated. The Keynesian model was estimated by two-stage least-squares and found to predict demand

reasonably well. Next, the input-output model was presented. It was discovered that a sectoral breakdown along modern-traditional lines cannot be achieved due to data limitations. A conventional sectoral breakdown was used. This remains a serious disadvantage of the model. Considerable adjustments were made to the table in order to i) achieve consistency with national accounts; and ii) impute wages to self-employed and unpaid family workers. Various parameters needed for the model were computed using the adjusted input-output table. As a partial exercise, labor content of one unit of final demand in various sectors was calculated and excellent results obtained. In the next section, nonlinear sectoral consumption functions were estimated using the 1971 household expenditure survey in the Philippines. It was discovered that savings cannot be related to income distribution because of data unreliability. Therefore, sectoral consumption functions were related to total consumption and distribution of total consumption. Sectors which show a convex consumption function are mining, construction, utilities, finance and housing, and services. The other manufacturing sector shows an essentially linear consumption function. Other sectors, particularly food manufacturing, fisheries and trade show concave consumption functions.

The education submodel was constructed using the 1965 labor force survey with education questionnaires. Employment in occupation three (farmers, fishermen, farm workers, etc.) and five (manual workers) were assumed to be exogenously determined, with heavy considerations given to migration patterns. Next, an arbitrary allocation of net capital income was assumed and distribution of earnings in 1965 calculated. The

exponential functions relating the Lorenz coefficients of earnings, income and consumption distributions were then constructed.

The model was simulated over a test period 1965-1971 with the view of guesstimating some unknown parameters and testing for reliability of the model. It was found that minor adjustments had to be made to the matrix of wage distortions, depreciation coefficients and indirect tax rates. Otherwise, the model projected reasonably well in terms of sectoral employment and real growth. A slight overestimation of income equality resulted, but the model was correct in its prediction of increasing income equality in the late 1960's.

In Chapter VI, various policy simulations were conducted, emphasizing the policies derived in Chapter III. Certain simulations were limited by the conventional sectoral disaggregation, but rough approximations can be made. Since Chapter VI deals exclusively with policy recommendations, it will be discussed in the section below.

Recommendations

Policy recommendations

The model shows that if there are no major policy changes in the Philippines economy, especially compared to the late 1960's, the economy will achieve a reasonable real growth rate of approximately 4.8 percent while income distribution will continue to improve. While there is some doubt as to the extent of improvement, the trend towards improvement is clear.

The main cause of improvement in income distribution is a high sustained rate of rural-urban migration, thus tending to narrow the rural-urban income gap. However, while the model shows an improvement in income distribution, it also indicates that considerable pockets of poverty still exist in rural and urban areas. In the rural areas, agricultural workers without any income from ownership of land or capital still earn less than half of average wage in 1985. In the urban areas, the poor class of workers is manual workers with incomes only slightly higher than agricultural workers. The usual conclusion that service workers contribute significantly to urban poverty does not hold as incomes of these workers are kept up by high demand for traditional services.

Given the projected state of the economy, various policies derived in Chapter III were tried out and their results compared. Based on these simulations and comparisons, the following policies are recommended for the Philippines:

Sustained rural-urban migration Rural-urban migration is a prerequisite for successful long run agricultural development increasing per capita income in the rural areas. Simulation with a high growth rate of agriculture employment resulted in worsening of income distribution and declining real GDP growth. Migration serves the purpose of equalizing, or tending to equalize, marginal products of labor in rural and urban areas. A slow down in the rate of migration therefore widens the gap between rural and urban incomes and results in a less efficient pattern of output. Therefore, growth of total output is reduced.

As a secondary effect, a worsening of income distribution also implies a lower aggregate demand for food items. Therefore, incomes in the agricultural sector are further reduced.

Past social disruptions resulting from high migration can be solved by less costly methods, and should not lead to direct controls on migration in the long run. Urban development can concentrate on labor absorption of low skill groups, thus reducing urban poverty. Urban slums can be reduced by low cost government housing projects. Urban crimes can be controlled by more effective police forces, less corruptions and stronger criminal laws.

Extensive labor intensive urban development To absorb the large number of migrants productively, and to reduce income inequality in the urban sector, an extensive labor intensive urban development program is recommended. An important component this program is accelerated industrialization emphasizing different outputs as compared to past industrialization under import substitution. Low capital intensity is desirable, but not crucial to the success of this program. The emphasis should be on exports and utilization of low skill workers. The opening up of export markets allow extensification of industrialization. Therefore, even if employment generation per unit of investments is low, extensification will allow for large scale production and hence large labor absorption. The emphasis on low skill labor will provide for improved income distribution within the urban sector. The savings problem can be solved by relying heavily on foreign capital and multinational corporations. Foreign investments should therefore be encouraged.

In a similar manner, services and other sectors related to low skill workers with high export potentials should be encouraged. An excellent example is tourism which emphasizes heavily on unskilled and easily trained service workers. Therefore, a tourist promotion program is highly recommended. Investments in the tourist industry should be encouraged, and can provide a stimulus to the labor intensive construction sector.

A major instrument in the urban development program is government construction, which is mainly directed at the labor intensive construction sector. Emphasis should be on social overhead capital needed to complement other development programs. An important area where government construction can contribute significantly is low cost public housing to combat the urban slums problem.

Simulation of the model with this program resulted in a slight worsening of income distribution because of its neglect of the rural sector. Hence an agriculture development policy is needed to balance the undesirable side effects of the urban development program.

Agriculture development The prospects for long term agriculture development and per capita income improvements in the rural areas are rather bleak unless agriculture labor force is to grow slowly. Assuming that the above two policy recommendations are accepted, we can then ambitiously design an agriculture development program.

The usual agriculture development policies are recommended. They consist of improved seed varieties, increased use of fertilizers and insecticides, irrigation projects, agriculture research and extension, mechanization, etc. These are designed to increase labor productivities

in the agriculture sector. Given a slow growth of agriculture employment, productivity increases can then be translated into income increases. These policies should also be focused on smaller and poorer farmers, therefore improving income distribution within the agricultural sector.

In the short run, improvement in income equality can be accelerated, and rural-urban migration slowed down, at the expense of economic growth. If increase in food prices are politically tolerable, a restrictive policy on food imports will result in rapid rise of food prices, and hence a redistribution of income towards the rural sector. Thus overall income distribution can be improved. Moreover, the increase in demand can provide a positive stimulus to the acceptance of agriculture development policies outlined in the previous paragraph. To the extent that import restrictions on food result in misallocation of resources, there is a trade off between income distribution and growth objectives. To the extent that improved rural incomes slow down migration, the urban adjustment problem due to inflow of migrants can be neutralized.

It should be noted that the income redistribution features of a self-sufficiency in food program are short run in nature. Once self-sufficiency is attained, growth of the food producing sector is again under the influence of low income elasticities of demand. Moreover, not unlike industries fostered under import substitution policies, competitiveness of agriculture products in the world market is lost by years of production under protectionistic policies.

In conclusion, economic growth is not necessarily inconsistent with improvement in income distribution in the long run. The

policies described above, excluding the self-sufficiency in food program, are vital to such a long run objective. Further, they are closely interconnected and failure of one policy will nullify efforts in the other two areas.

In the short run, policies can be pursued to achieve rapid gains in the income equality objective and lessen the urban adjustment problem due to rapid rural-urban migration, at the expense of economic growth. These policies rely on arguments besides the classical assumption that saving is a convex function of income. They are essentially market distortion policies, distorting market prices in favor of the poorer rural sector.

Recommendations for future research

The model we had constructed is a disaggregated macroeconomic model. It has indicated to us broadly the policy directions that might be taken in order to foster economic growth and income equality. These can be considered as guide lines for detail economic or development planning at the project level, and for day to day policy decisions.

Data limitations had forced us into a certain pattern of sectoral disaggregation, at the cost of considerable refinements in policy recommendations. Therefore efforts should be directed at the collection of more detail data, perhaps even on a microeconomic level, along a modern-traditional breakdown. In particular, it is important to know the behavior of enterpreneurs in the traditional sectors, such that policies can be designed to improve their incomes. These policies can then be tested in a consistent manner using a model similar to what we have constructed.

Certain important macroeconomic relationships are nonexistent or weak in our model. Strengthening or incorporation of these relationships will result in considerable improvements. To mention a few, these are: i) the determination of imports as a function of consumption, investment, and government expenditure patterns; ii) the determination of noncompetitive imports as related to the production process; iii) the relationships and interactions between labor demand by occupation, labor supply by occupation and education policies; iv) the determination of household income distribution from earnings patterns and distributions; v) the determination of sectoral capital accumulation and their effects on productivities; and vi) the incorporation of balance of payments constraints on an empirical level.

The consistency model is most suited for checking the macroeconomic implications of development projects in a consistent manner. However, our simulations also suggested projects that might contribute to income distribution and/or growth objectives. These should be extensively investigated at the microeconomic level. If possible, detail plans of execution and financing of these projects should be formulated. To mention a few projects of such potentials, they are: i) a self-sufficiency in food program; ii) a government low cost housing program; and iii) a tourist promotion program.

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APPENDIX A. THE RELATIONSHIP BETWEEN ECONOMIC DEVELOPMENT AND THE LORENZ COEFFICIENT OF INCOME INEQUALITY

Assume a two sector (modern-traditional) model. Notation concerning average household incomes and allocation of households between the two sectors are as outlined in Table A.1.

Table A.1. Notation of average household income and population of households in different sectors

	Traditional sector	Modern sector	Remarks
Average household income	x	bx	$b > 1$
Proportion of households	ρ	$(1-\rho)$	$0 \leq \rho \leq 1$
Proportion of total income	$\frac{\rho}{\rho(1-b)+b}$	$\frac{(1-\rho)b}{\rho(1-b)+b}$	

Given the above notation, and assuming no dispersion of income within sectors, the Lorenz coefficient of income inequality, denoted as L, can be derived as

$$L = \rho - \frac{\rho}{\rho(1-b)+b}$$

Assume that economic development has its impact by increasing the proportion of households in the modern sector, while the ratio of average traditional household income to average household income remains constant, i.e., b = constant. Then the impact of economic development on the Lorenz coefficient of income equality can be analyzed by examining the derivative

$$\frac{dL}{d\rho} = 1 - \frac{b}{[\rho(1-b)+b]^2} \quad .$$

Note that

$$\left.\frac{dL}{d\rho}\right|_{\rho=1} = 1 - b < 0, \quad \text{i.e.,} \quad \left.\frac{dL}{d(1-\rho)}\right|_{\rho=1} > 0$$

At the initial stages of development when the economy does not contain a modern sector ($\rho=1$), the appearance of a modern sector will result in worsening of income distribution. Conversely, at the final stages of development as the traditional sector starts to vanish, the Lorenz coefficient will improve. This can be seen from the equation

$$\left.\frac{dL}{d\rho}\right|_{\rho=0} = 1 - \frac{1}{b} > 0, \quad \text{i.e.,} \quad \left.\frac{dL}{d(1-\rho)}\right|_{(1-\rho)=1} < 0$$

The above relationship is more clearly demonstrated if we graph L against ρ, assuming b = constant. This is done in the following diagram. Note that income distribution worsens initially before improving at the final stages of development.

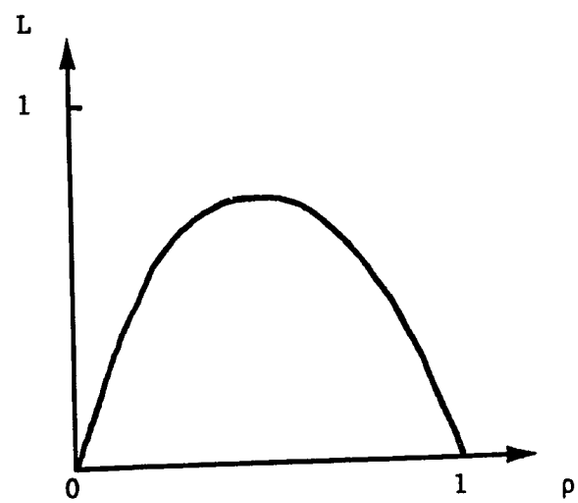

Figure A.1. The relationship between the Lorenz coefficient of income inequality and modern economic growth

The above computation assumes a constant ratio between average incomes of the two sectors. If development implies that this ratio can be forced towards unity, then income distribution as measured by the Lorenz coefficient, can be improved. More rigorously

$$\frac{dL}{db} = - \frac{[\rho^2 - \rho]}{[\rho(1-b)+b]^2} > 0$$

The relationship between the Lorenz coefficient of income inequality and modern economic growth (assuming that b = constant) as shown in Figure A.1 is closely related to the measurement of income dispersion by the Lorenz coefficient. The Lorenz coefficient implicitly assumes that the mean income is best, and a coefficient of zero is achieved only when all persons in the economy have the mean income. As Morley and Williamson (30) pointed out, in the case of a developing country, this implicit assumption is equivalent to the assumption that "misery loves company".

In a predominantly traditional economy, overall mean income is closer to mean income in the traditional sector. A small shift of population out of the traditional sector will hardly affect overall mean income because of the heavier weight of the traditional sector in terms of population. However, deviations from the mean are increased because mean income in the modern sector, compared to mean income in the traditional sector, is further away from overall mean income. Therefore, the Lorenz coefficient of inequality becomes larger. A similar argument will show that growth of the modern sector will improve income distribution if the modern sector is dominant.

A generalized Lorenz coefficient

We now propose a generalized measure of dispersion to take into account objections raised against the Lorenz coefficient earlier.

Let x be a real n-tuple describing n characteristics of a household that we are interested in. For example, $x = (x_1, x_2, \ldots, x_n)$ where x_1 is household income, x_2 is education of head of household, x_3 is some measure of health conditions, etc. Distribution of all households over the set of all possible characteristics can be represented by a density function $f(x)\,dx = f(x_1, x_2, \ldots, x_n)\,dx_1, \ldots, dx_n$.

Let A be a subset (closed) consisting of the vectors x which are socially approved, and such that society does not prefer in one way or another distribution within this approved set A. Given any vector x, let the extent of social disapproval be represented by a function d(x,A). We can also specify that d(x,A) = 0 if x is in A, i.e., there is no social disapproval of points in A since A is the socially approved set.

A generalized Lorenz coefficient can now be defined as

$$L = \frac{\int_{R^n} d(x,A)\, f(x)dx}{1 + \int_{R^n} d(x,A)\, f(x)dx}$$

Note that if no households lie outside the socially approved set A, then the integral in the above expression has a value of zero and L = 0, a case of no socially disapproved deviations. If the integral is infinite, a case of infinite social disapproved deviations, then L = 1. In the special case when n = 1, x = household income, A = mean household income $= \mu$, $d(x,A) = (x-\mu)^2$, then

$$L = \frac{var(x)}{1 = var(x)}$$

where var(x) denotes the variance of the distribution f(x). This measure is not unlike the usual Lorenz coefficient when L = 0 for perfect equality.

The generalized Lorenz coefficient is most suited for the measurement of the extent of absolute poverty. Let n = 1, x = household income, and ℓ = the income level below which households are considered absolutely poor. Then A can be defined as A = $[\ell, \infty]$ and d defined as

$$d(x,A) = \begin{cases} (x-\ell)^2 & \text{if } x \leq \ell \\ 0 & \text{if } x \geq \ell \end{cases}$$

The generalized Lorenz coefficient constructed will indicate an improvement in the absolute problem when the proportion of households in the absolute poverty category decrease and/or households in the absolute poverty category show improvement in income while still remaining as absolutely poor.

APPENDIX B. NATIONAL INCOME ACCOUNTS OF THE PHILIPPINES IN MILLIONS OF CURRENT PESOS[1]

[1]From (35) and unpublished tables from Office of Statistical Coordination and Standards, National Economic Council, Philippines unless specified otherwise.

Year	Gross domestic product	Private consumption	Private savings	Disposable income
46	4,354	3,684	130	3,814
47	5,306	4,280	297	4,577
48	5,525	4,101	596	4,697
49	6,014	5,166	25	5,191
50	6,401	5,009	557	5,566
51	7,132	5,800	212	6,012
52	7,471	6,093	120	6,213
53	7,977	6,293	314	6,607
54	8,289	6,660	249	6,909
55	8,934	7,344	44	7,388
56	9,818	7,817	265	8,082
57	10,694	8,660	277	8,937
58	11,306	8,987	543	9,530
59	12,318	9,503	775	10,278
60	13,153	10,082	849	10,931
61	14,411	10,811	1,297	12,108
62	16,206	12,174	1,213	13,387
63	18,980	13,313	2,173	15,486
64	20,336	14,332	2,211	16,543
65	22,292	15,454	2,904	18,358
66	24,669	17,145	2,724	19,869
67	27,620	19,514	2,709	22,223
68	30,816	22,644	1,575	24,219
69	34,396	25,632	2,157	27,789
70	41,978	30,162	1,927	32,089
71	50,180	35,628	2,674	38,302
72	56,750	41,683	1,439	43,122

Personal taxes	Personal income	Net factor payments from abroad	Depreciation	Corporate savings
6	3,800	-3	265	59
11	4,588	-40	290	112
12	4,709	-54	315	119
13	5,204	-61	325	90
19	5,585	-30	335	66
22	6,034	-61	370	110
23	6,236	-37	385	185
24	6,631	-110	408	192
25	6,934	-113	407	157
29	7,417	-133	430	217
32	8,114	-131	480	233
39	8,976	-128	522	216
42	9,572	-95	551	225
44	10,322	-130	599	350
56	10,987	-170	795	273
82	12,190	-99	905	225
127	13,514	-67	1,088	473
172	15,658	-82	1,353	554
213	16,756	-98	1,560	580
239	18,597	-123	1,799	411
238	20,107	-144	2,026	720
301	22,524	-298	2,279	780
362	24,581	-384	2,637	1,006
422	28,211	-307	3,093	806
594	32,683	-799	4,158	1,410
702	39,004	-648	5,357	1,349
896	44,018	-855	6,327	1,255

Year	Corporate taxes	Indirect taxes	Government income from property	Total government expenditure	Transfers from government to pesos
46	12	181	12	242	19
47	27	273	21	379	19
48	40	344	22	446	38
49	45	355	20	460	55
50	58	377	34	496	61
51	84	517	39	538	67
52	101	595	28	588	66
53	100	588	24	622	70
54	105	626	36	643	82
55	120	684	42	695	93
56	131	787	43	755	90
57	136	829	47	810	93
58	149	823	49	871	99
59	174	880	71	939	122
60	208	977	64	1,019	144
61	196	1,120	65	1,200	162
62	202	1,228	86	1,364	155
63	241	1,458	77	1,656	192
64	257	1,538	73	1,802	163
65	274	1,491	88	2,030	205
66	258	1,721	105	2,165	207
67	302	2,003	124	2,386	245
68	384	2,204	316	2,690	342
69	414	2,297	102	3,132	502
70	403	3,515	69	3,379	511
71	577	4,525	72	4,132	687
72	649	4,990	228	4,508	710

Import taxes	Changes in stocks	Gross investment	Private construction	Government construction
10	126	456	379	13
21	166	841	615	53
27	123	998	667	137
27	67	835	443	198
26	85	719	398	188
29	68	827	523	162
30	67	792	471	161
32	99	957	580	165
40	156	880	451	167
152	165	918	435	197
230	120	1,134	533	249
184	151	1,366	666	262
165	190	1,331	614	259
201	217	1,551	717	266
244	236	1,999	870	372
275	306	2,379	826	308
337	389	2,626	792	322
396	504	3,327	1,097	420
400	445	4,051	1,384	339
368	497	4,347	1,569	442
427	452	4,528	1,433	481
519	517	5,773	1,640	647
579	555	6,099	1,514	643
572	591	6,302	1,486	993
742	969	7,643	1,639	540
--	1,116	9,430	1,835	819
--	1,298	9,754	1,940	1,570

Year	Investment in machineries	Foreign transfers to person	Foreign transfers to government	Merchandise exports (f.o.b.)
46	64	-21	73	--
47	173	26	190	540
48	194	40	260	654
49	194	31	406	522
50	133	23	309	674
51	142	16	30	778
52	160	30	52	670
53	212	6	38	772
54	262	7	45	783
55	286	16	48	779
56	352	11	67	875
57	438	67	57	859
58	458	59	39	991
59	568	86	47	1,059
60	757	177	132	1,240
61	1,245	227	51	1,340
62	1,512	297	53	2,102
63	1,810	251	53	2,552
64	2,328	363	59	2,605
65	2,336	286	101	2,697
66	2,614	205	173	3,220
67	3,486	445	282	3,199
68	3,942	354	169	3,343
69	3,823	412	190	3,331
70	5,464	548	155	3,259
71	6,776	665	195	7,178
72	6,244	862	218	6,675

Exports from the agriculture sector[1]	Exports from the fisheries sector[1]	Exports from the forestry sector[1]	Exports from the mining sector[1]
--	--	--	--
--	--	--	--
--	--	--	--
248.4	.5	6.4	31.3
364.4	.2	20.6	31.1
383.4	.2	35.0	62.5
258.3	.2	34.6	79.1
309.0	.2	54.7	80.0
304.9	.2	65.7	81.0
285.3	.3	76.0	91.7
324.8	.2	87.9	127.4
336.1	.2	83.7	126.2
334.5	.2	130.7	122.7
351.5	.3	149.9	126.9
399.8	.3	191.3	158.7
317.5	.3	232.1	178.6
504.3	.4	396.1	225.4
674.9	1.2	496.6	267.8
626.7	1.6	461.6	245.9
646.5	1.3	519.1	306.1
642.7	5.0	721.5	463.8
526.9	4.2	747.7	454.0
491.7	5.7	762.7	497.6
372.3	7.0	790.5	685.5
239.5	11.2	643.7	774.8
--	--	--	--
--	--	--	--

[1]Proportion of sectoral exports (imports) to total merchandise exports (imports) as in (7) with total merchandise exports (imports) as in (35).

Year	Exports from the food manufacturing sector[1]	Exports from the other manufacturing sector[1]	Non-merchandise exports	Merchandise imports (c.i.f.)
46	--	--	--	--
47	--	--	587	1,463
48	--	--	598	1,355
49	137.8	97.5	359	1,341
50	166.6	91.2	269	774
51	186.1	110.8	288	1,112
52	217.8	80.0	317	1,002
53	234.0	94.2	369	1,101
54	232.1	99.1	335	1,134
55	236.1	89.7	352	1,390
56	228.9	105.8	351	1,374
57	209.4	103.5	345	1,582
58	268.9	134.0	283	1,427
59	278.3	152.1	285	1,353
60	355.3	134.6	178	1,735
61	434.7	176.8	293	2,003
62	597.5	378.3	574	2,787
63	644.1	467.4	608	3,019
64	687.0	582.2	728	3,718
65	616.5	607.5	1,186	3,781
66	661.7	725.3	1,324	4,046
67	679.5	786.6	1,504	5,062
68	746.2	839.1	1,141	5,509
69	714.2	761.6	1,019	5,397
70	730.8	859.0	1,588	7,872
71	--	--	1,736	8,347
72	--	--	2,136	8,550

[1]Proportion of sectoral exports (imports) to total merchandise exports (imports) as in (7) with total merchandise exports (imports) as in (35).

Imports to the agriculture sector[1]	Imports to the fisheries sector[1]	Imports to the forestry sector[1]	Imports to the mining sector[1]
--	--	--	--
--	--	--	--
--	--	--	--
--	--	--	--
--	--	--	--
--	--	--	--
35.1	.02	0.4	64.3
24.9	.03	0.2	77.1
26.6	.02	0.3	82.3
41.2	.03	0.7	88.8
34.7	.03	1.5	92.3
48.2	.04	1.8	97.0
66.4	.04	1.0	104.0
38.4	.03	1.3	101.6
49.4	.06	1.1	113.4
89.4	.05	0.9	108.1
103.8	.05	2.0	190.7
161.5	.06	2.1	204.6
168.1	.06	3.7	248.4
230.7	.07	3.1	240.5
142.7	.08	3.5	275.7
208.8	.10	2.5	304.8
170.2	.11	1.8	344.2
145.1	.09	1.2	347.8
130.5	.08	1.1	383.9
--	--	--	--
--	--	--	--

[1]Proportion of sectoral exports (imports) to total merchandise exports (imports) as in (7) with total merchandise exports (imports) as in (35).

Year	Imports to the food manufacturing sector[1]	Imports to the other manufacturing sector[1]	Nonmerchandise imports
46	--	--	--
47	--	--	45
48	--	--	67
49	--	--	81
50	--	--	103
51	--	--	84
52	151.6	750.6	84
53	178.4	820.4	66
54	174.6	850.3	74
55	235.3	1,023.9	81
56	227.8	1,017.6	90
57	252.6	1,182.5	99
58	253.7	1,001.8	85
59	166.3	1,045.3	84
60	240.8	1,330.2	110
61	274.8	1,529.7	190
62	396.7	2,093.7	423
63	386.1	2,264.7	357
64	448.6	2,849.1	309
65	503.6	2,803.0	506
66	506.1	3,117.8	556
67	592.0	3,953.8	730
68	607.6	4,385.0	726
69	570.5	4,332.3	786
70	474.9	6,881.5	890
71	--	--	693
72	--	--	754

[1]Proportion of sectoral exports (imports) to total merchandise exports (imports) as in (7) with total merchandise exports (imports) as in (35).

Foreign exchange reserves[1]	Exchange rate (pesos per U.S. dollar)[2]	Population (thousands)[3]	Households (thousands)[4]
885	2.00	18,463	3,339
907	2.00	18,845	3,419
840	2.00	19,234	3,501
520	2.00	19,791	3,585
711	2.00	20,364	3,671
608	2.00	20,953	3,759
612	2.00	21,560	3,849
592	2.00	22,184	3,942
545	2.00	22,826	4,036
418	2.00	23,486	4,133
449	2.00	24,166	4,232
280	2.00	24,866	4,334
291	2.00	25,585	4,438
326	2.00	26,326	4,544
472	3.60	27,088	4,653
292	3.45	27,915	4,786
418	3.91	28,767	4,923
422	3.91	29,645	5,064
325	3.91	30,550	5,209
776	3.91	31,482	5,358
914	3.90	32,444	5,512
1,016	3.93	33,434	5,669
888	3.93	34,454	5,812
787	3.94	35,506	5,999
992	6.43	36,590	6,170
--	6.43	37,707	6,347
--	6.78	38,858	6,529

[1]From (7).

[2]From (19).

[3]From census data with interpretation to obtain yearly figures.

[4]From census data with interpretation to obtain yearly figures.

APPENDIX C. GRAPHS OF PREDICTED VERSUS ACTUAL VALUES OF ENDOGENOUS VARIABLES IN THE MACROECONOMIC MODEL

Legend for Figures C.1 through C.15

X Actual

⊙ Predicted with lagged endogenous variables as given in the national accounts

X̲ Predicted with lagged endogenous variables predicted recursively

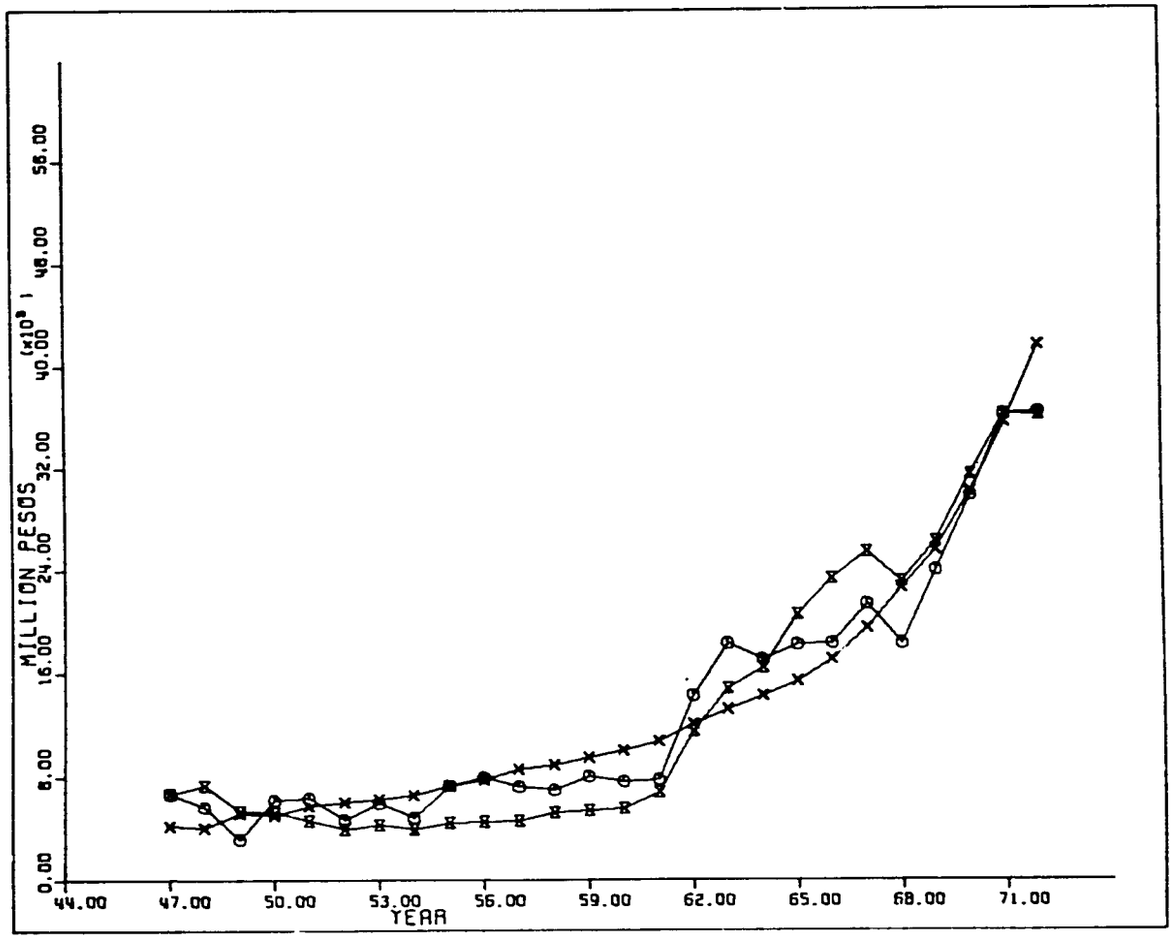

Figure C.1. Gross national product

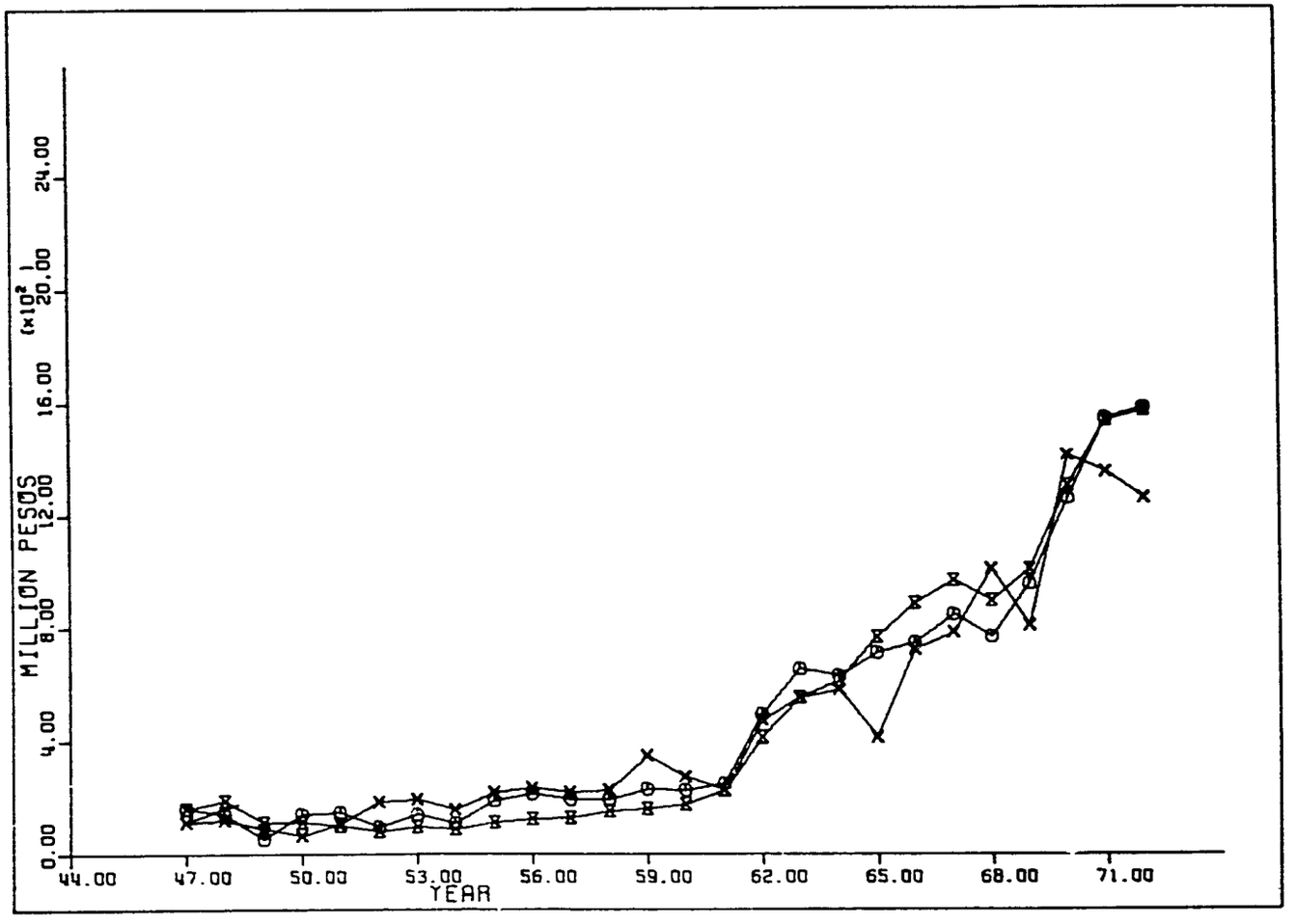

Figure C.2. Corporate savings

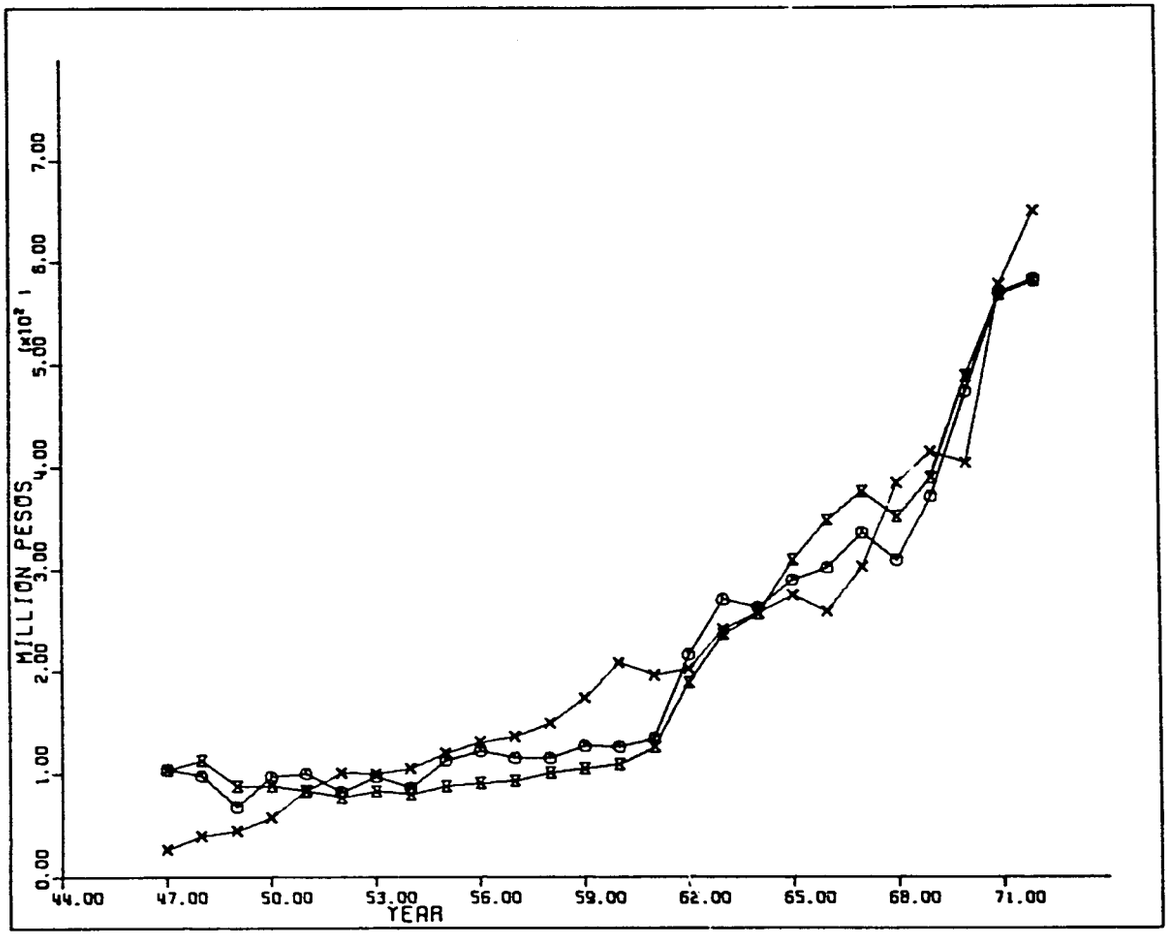

Figure C.3. Corporate taxes

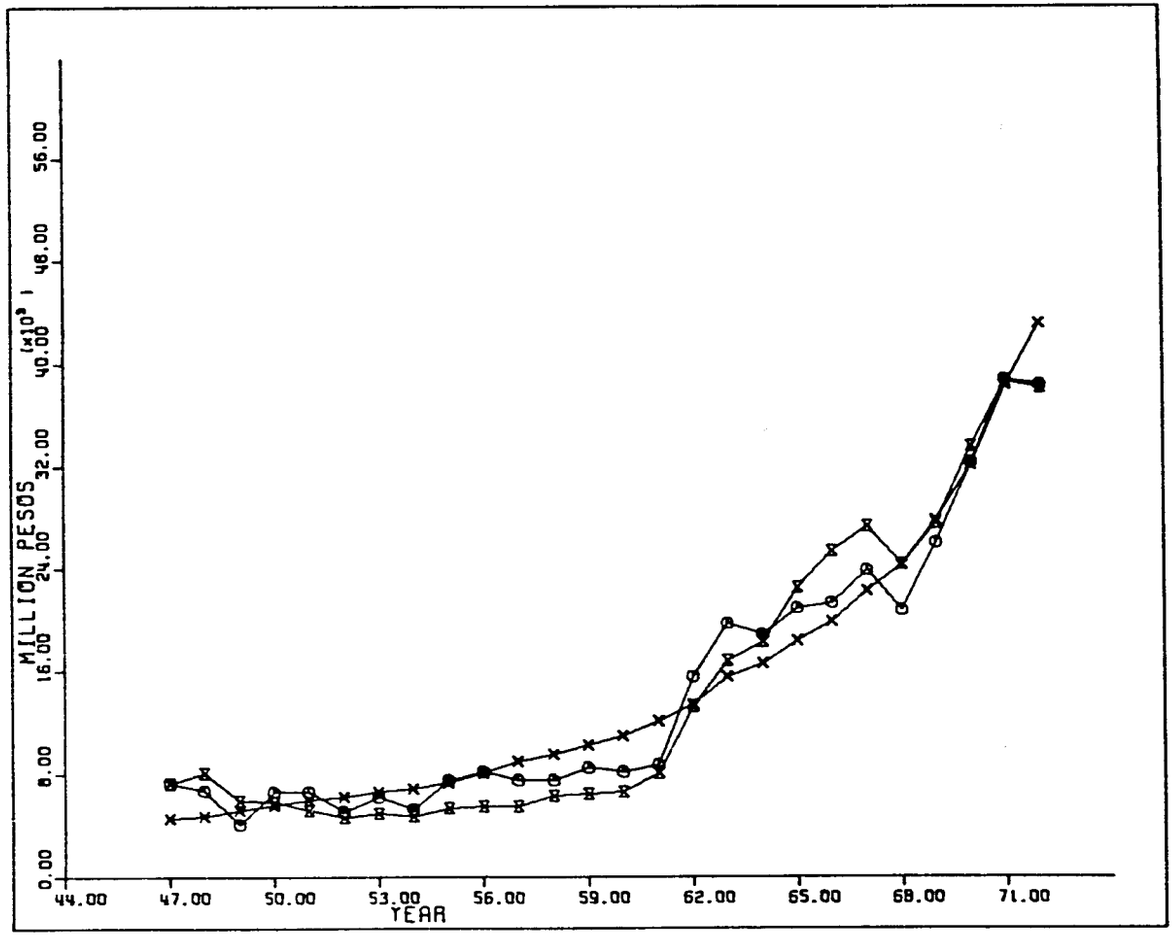

Figure C.4. Personal income

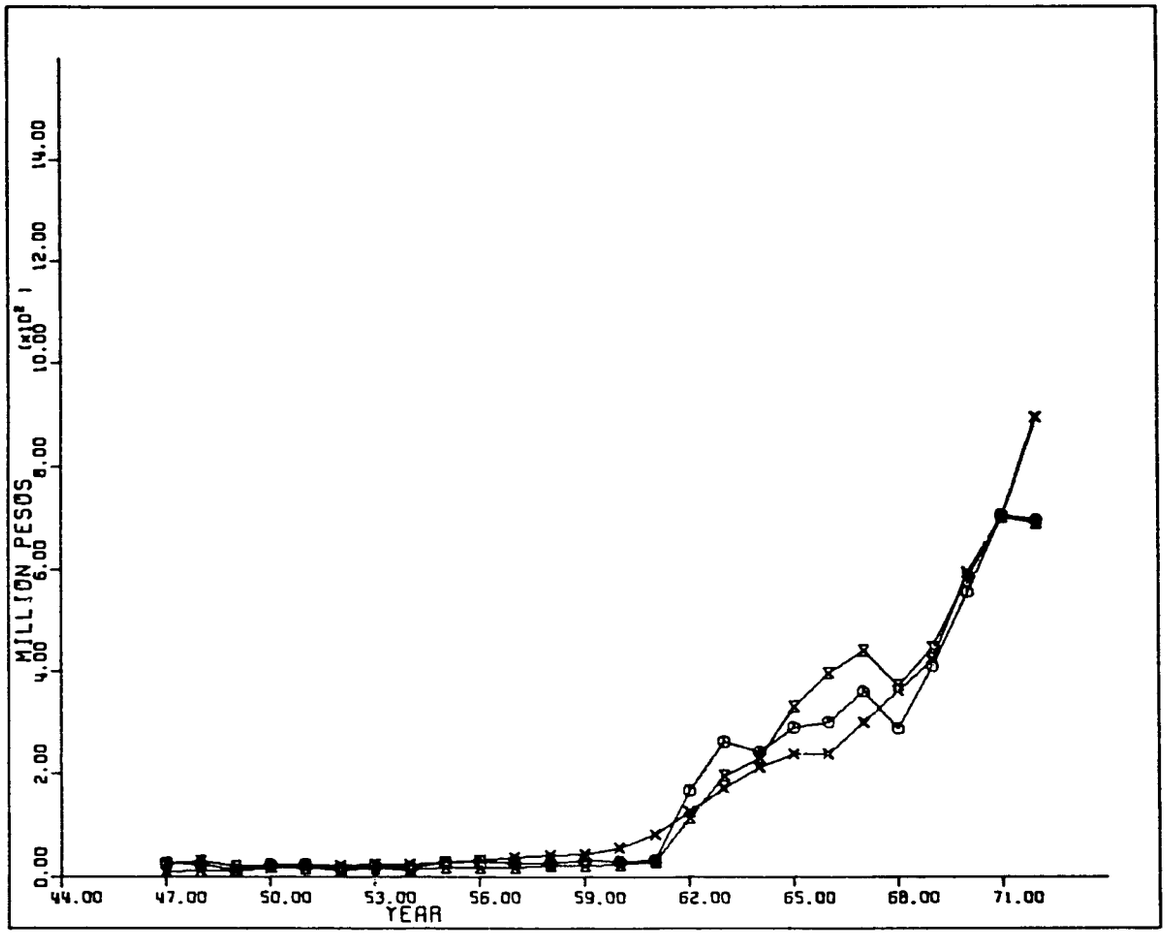

Figure C.5. Personal taxes

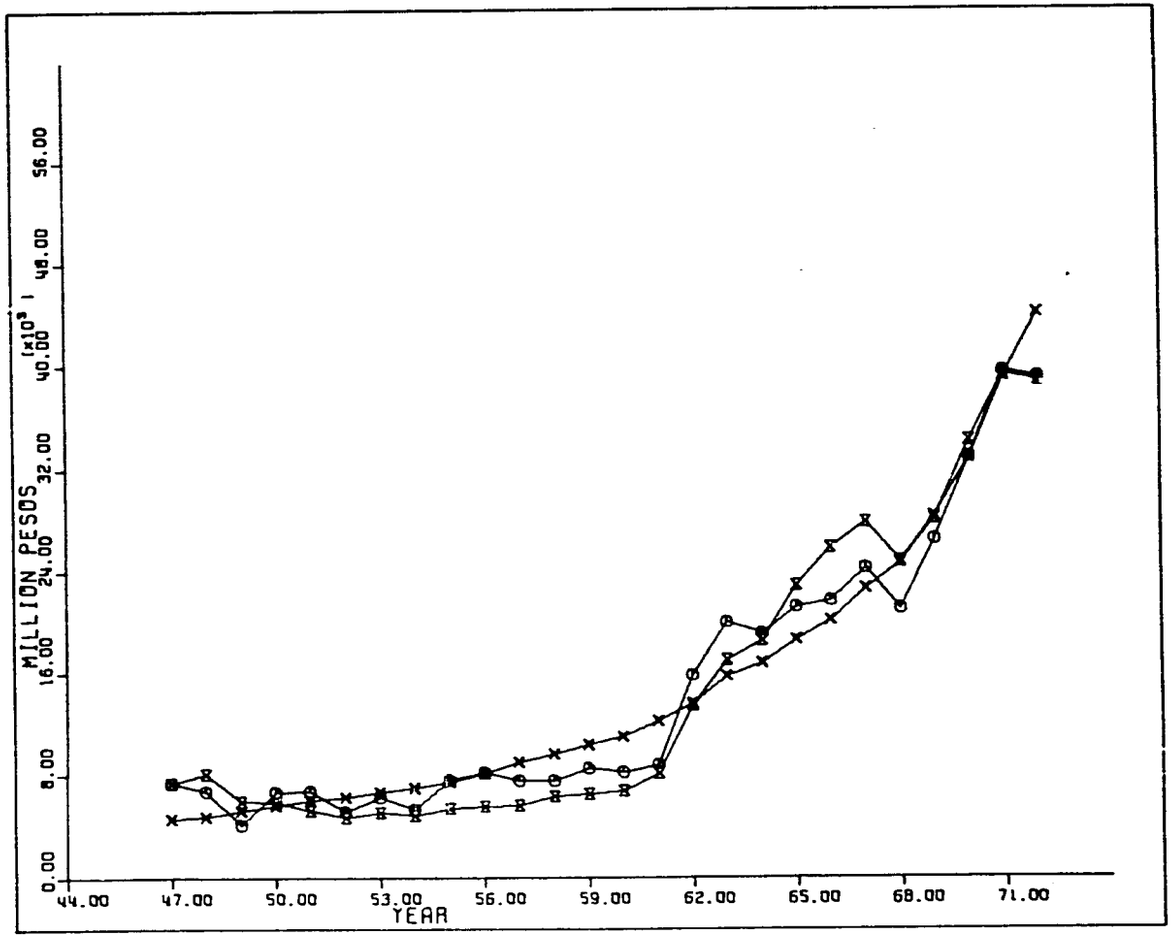

Figure C.6. Disposable income

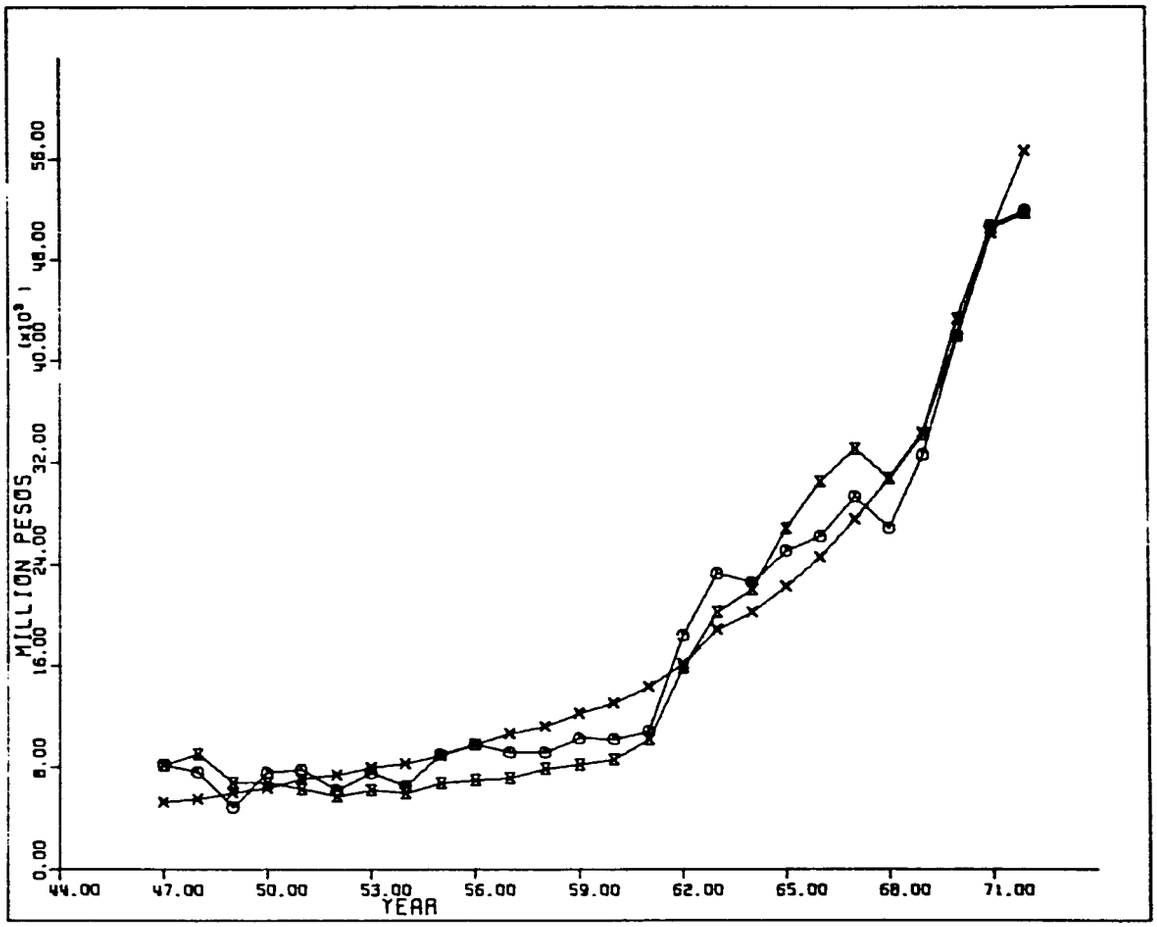

Figure C.7. Private consumption

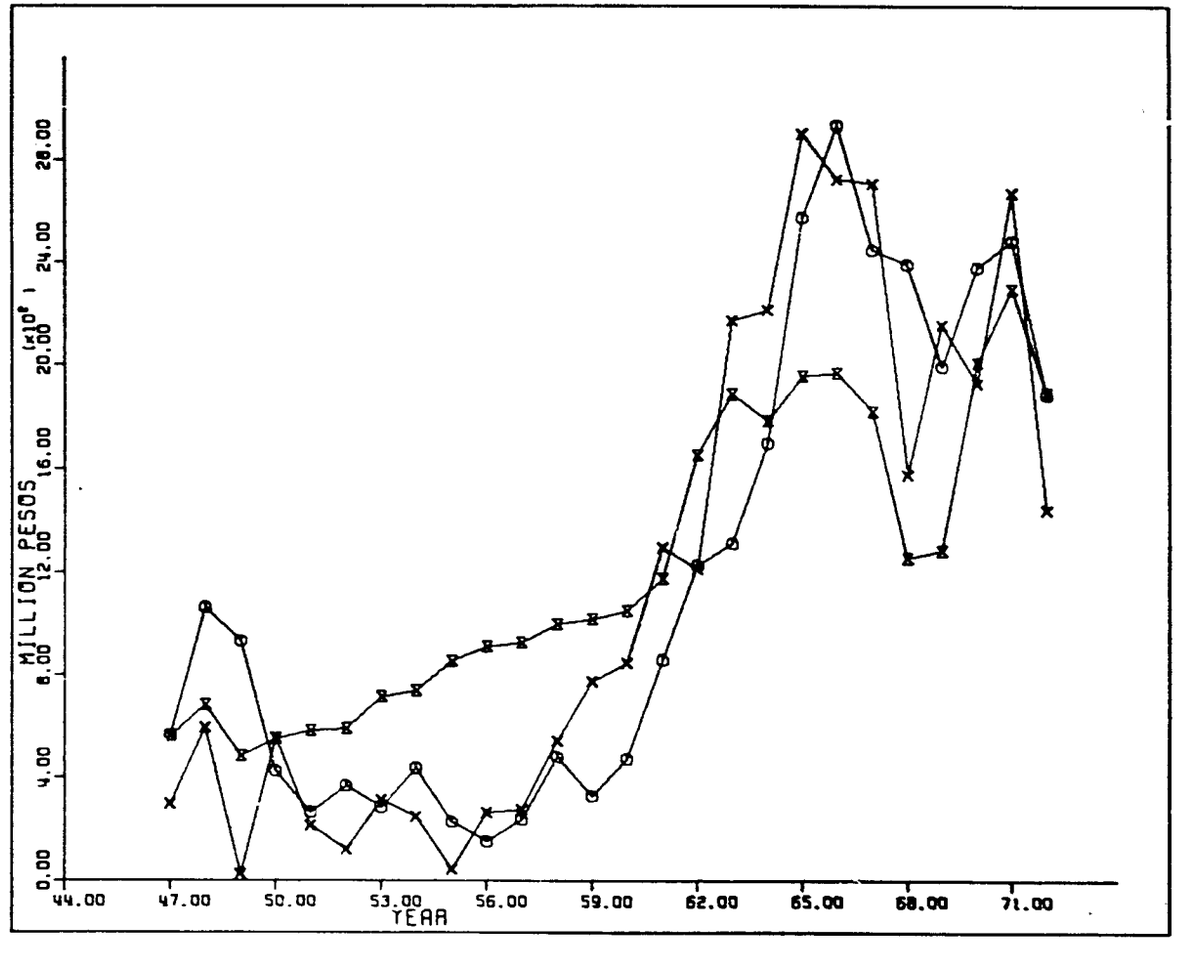

Figure C.8. Private savings

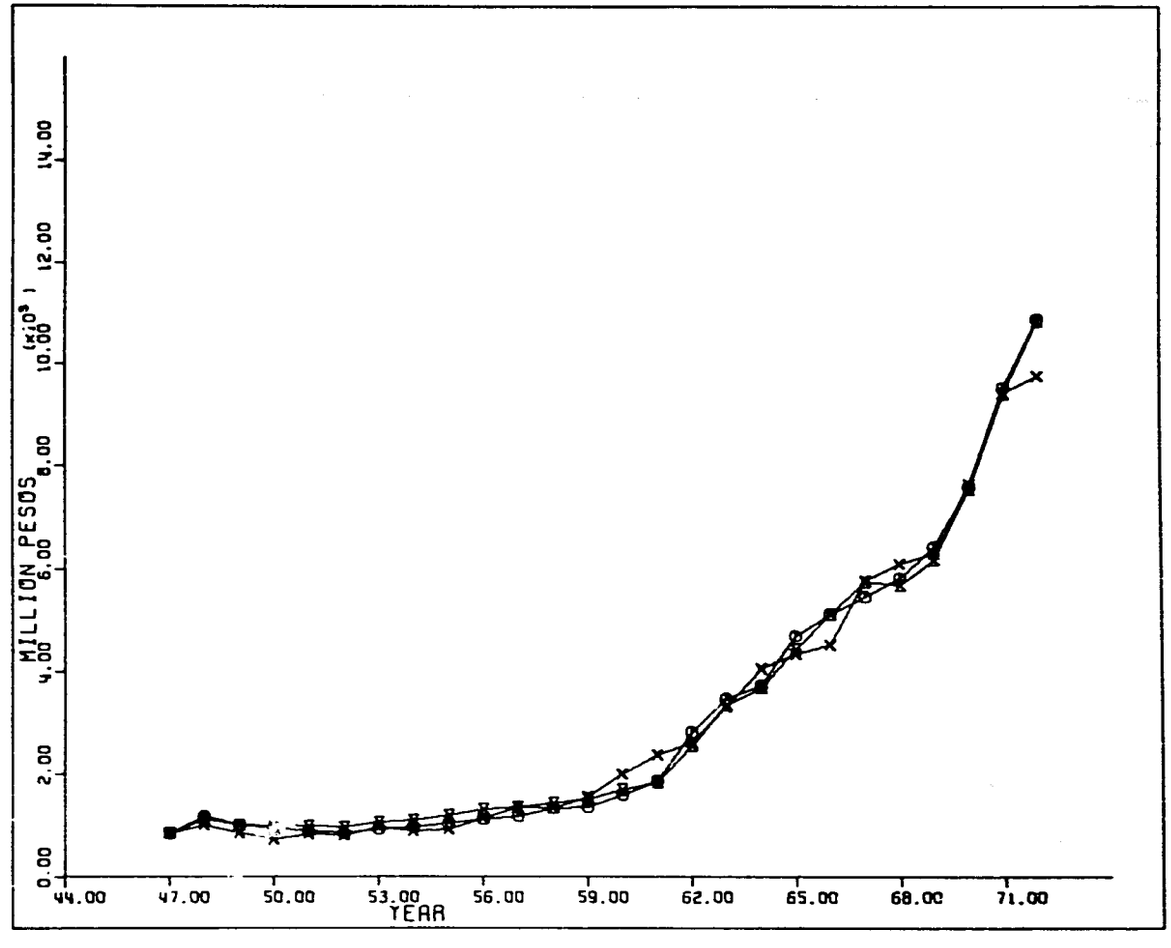

Figure C.9. Total investments

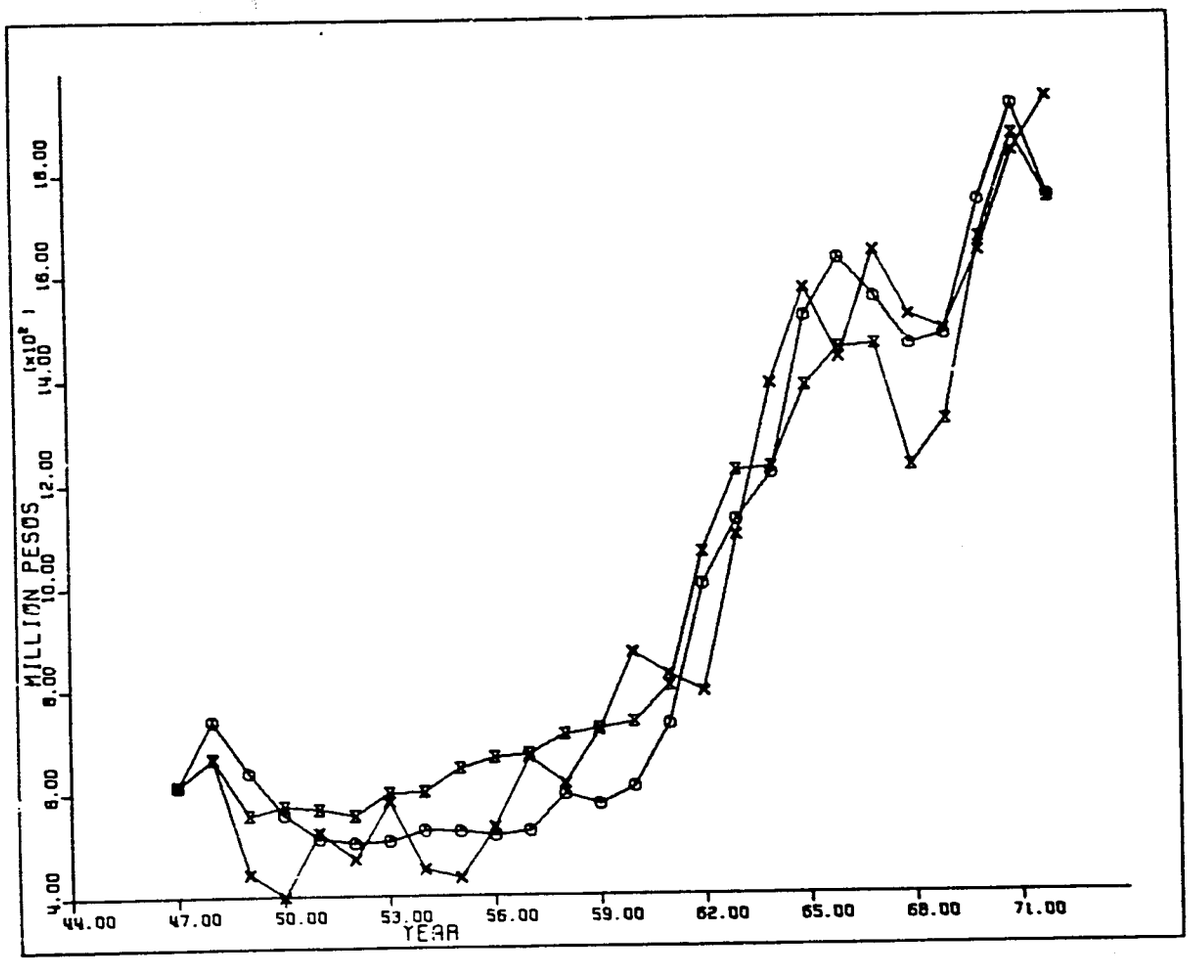

Figure C.10. Private construction

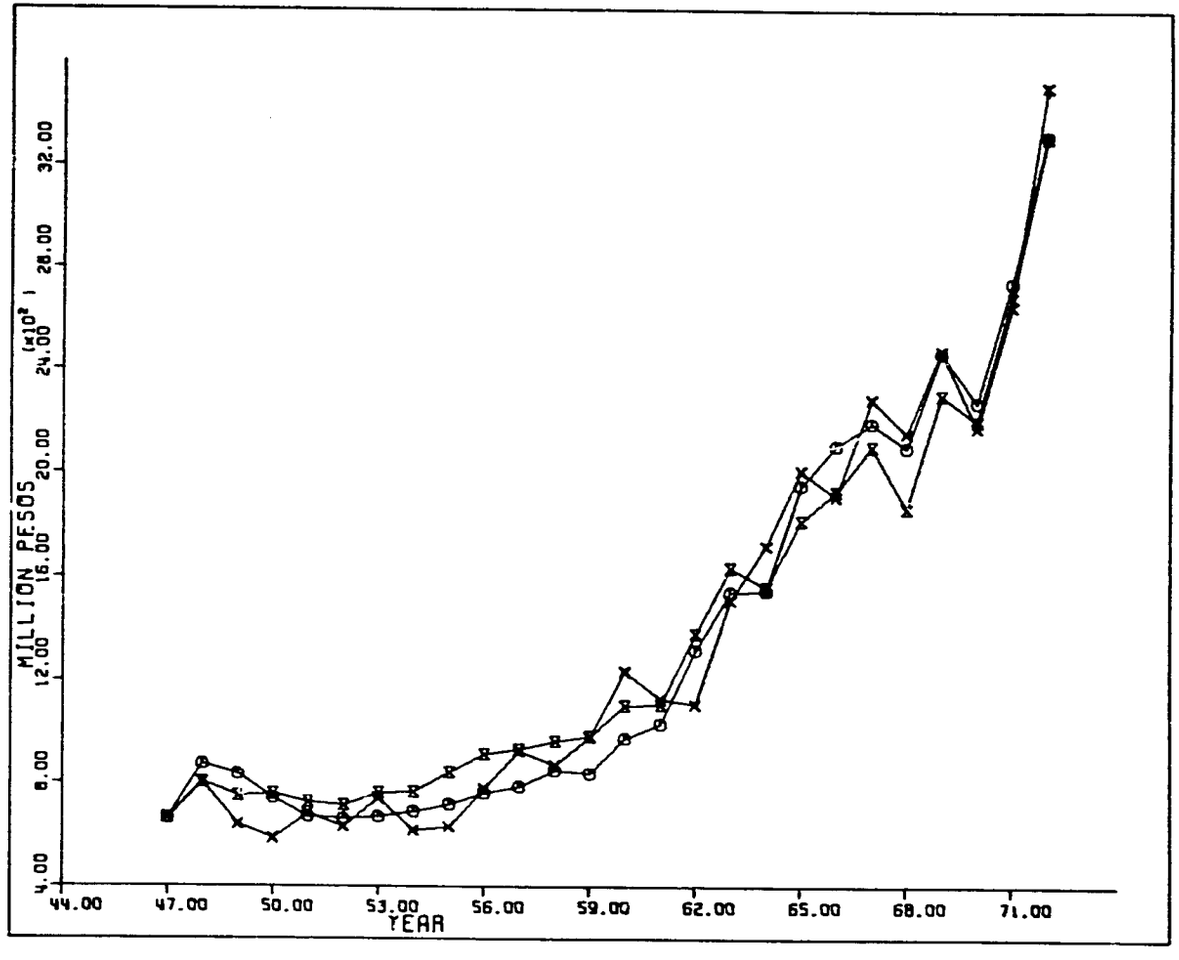

Figure C.11. Construction

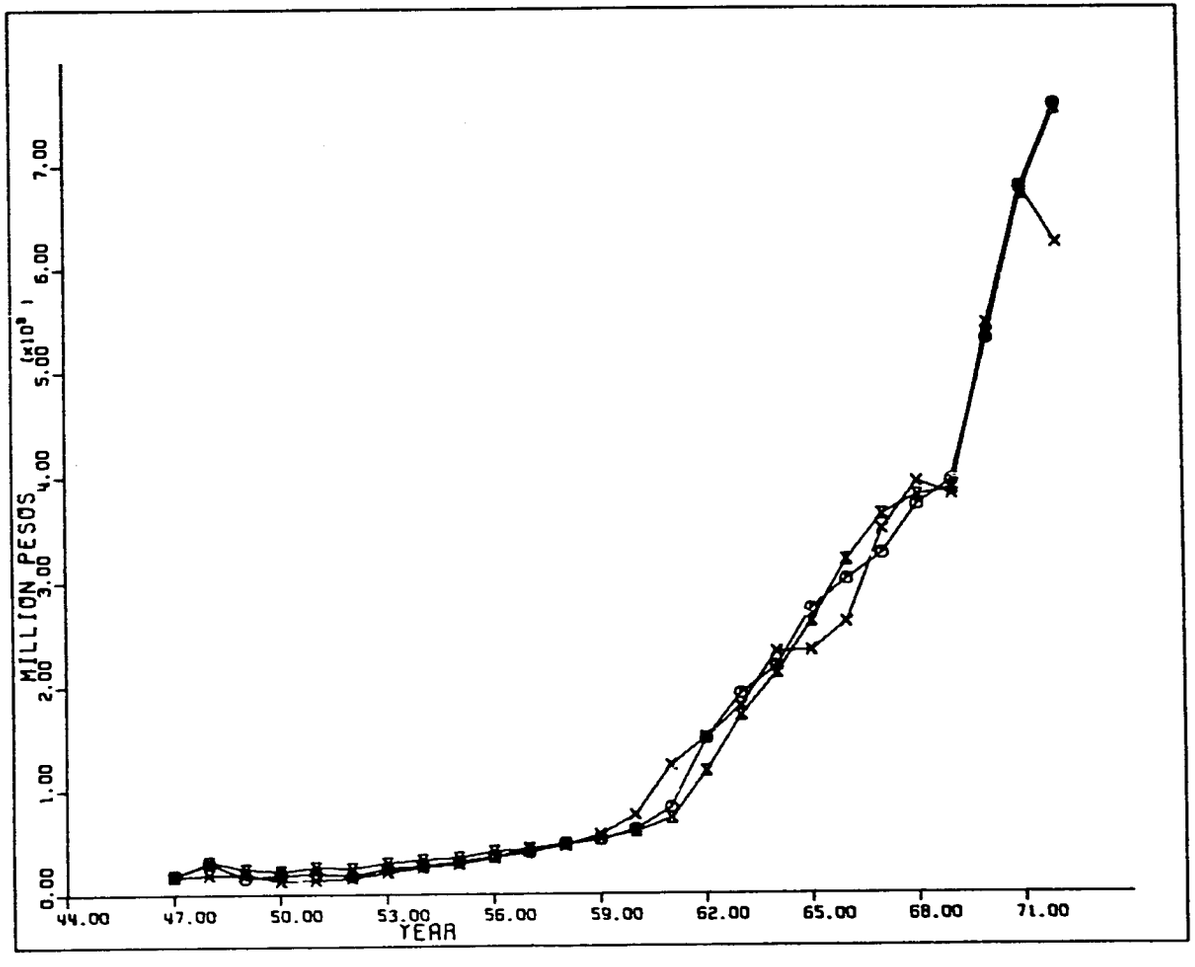

Figure C.12. Investments in machineries

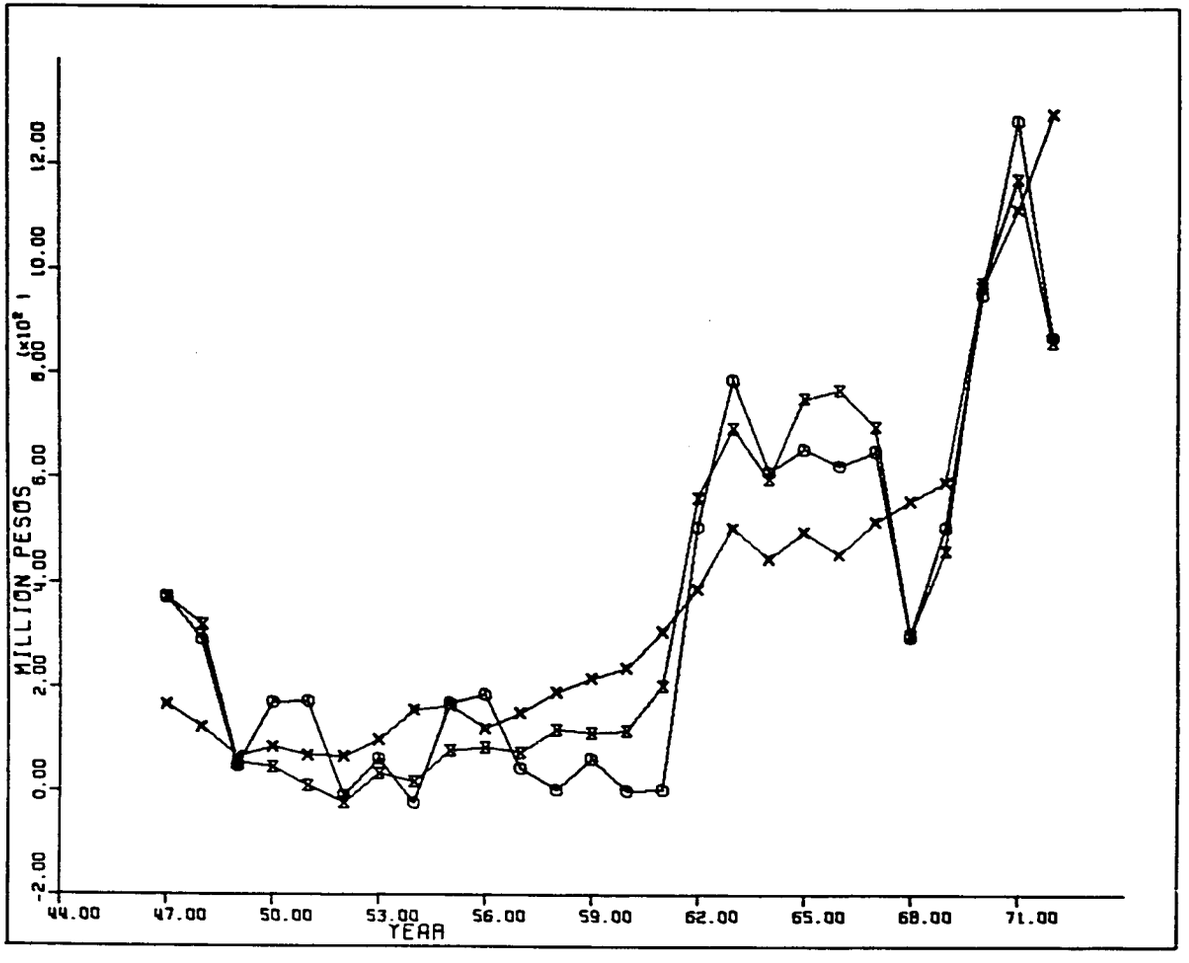

Figure C.13. Changes in stocks

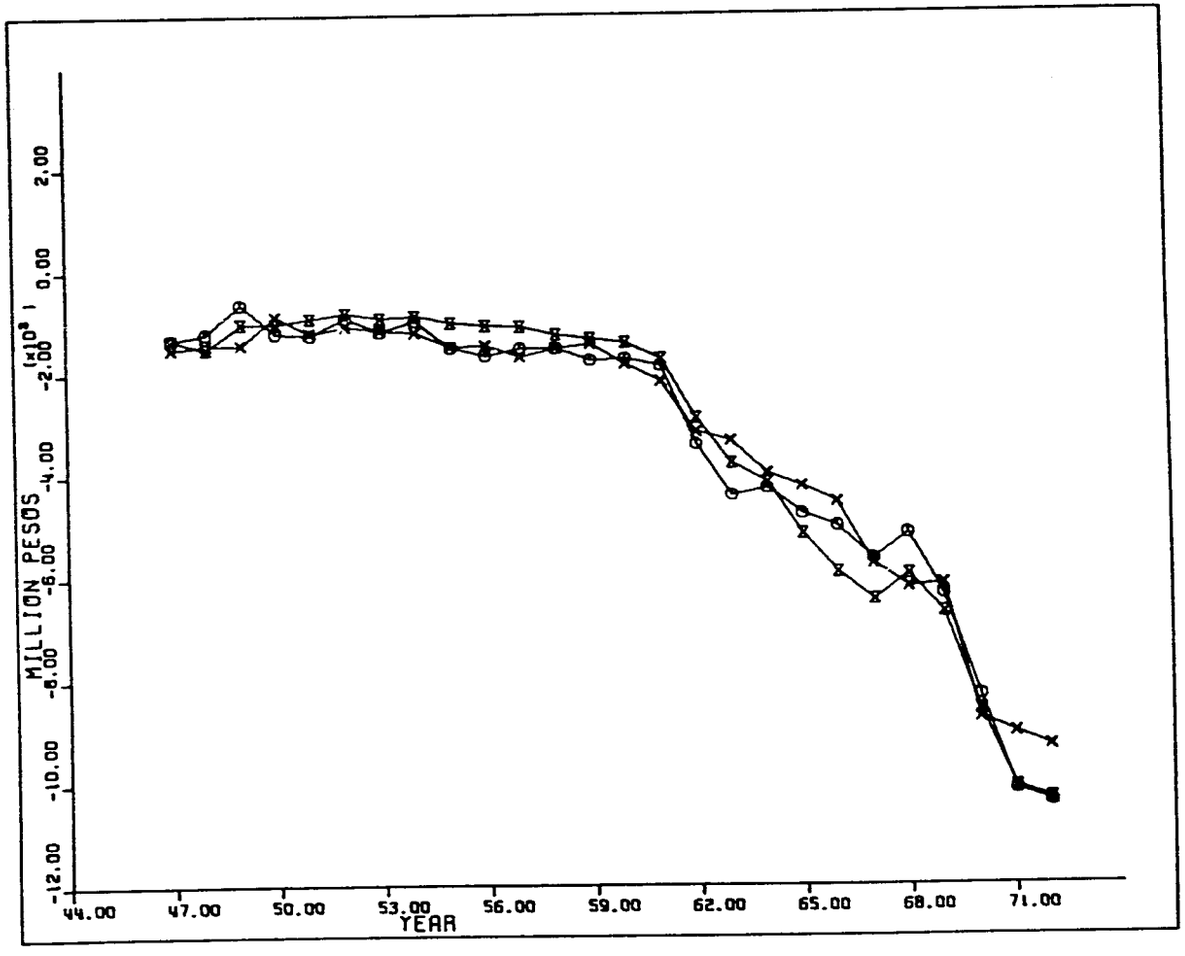

Figure C.14. Imports with import taxes

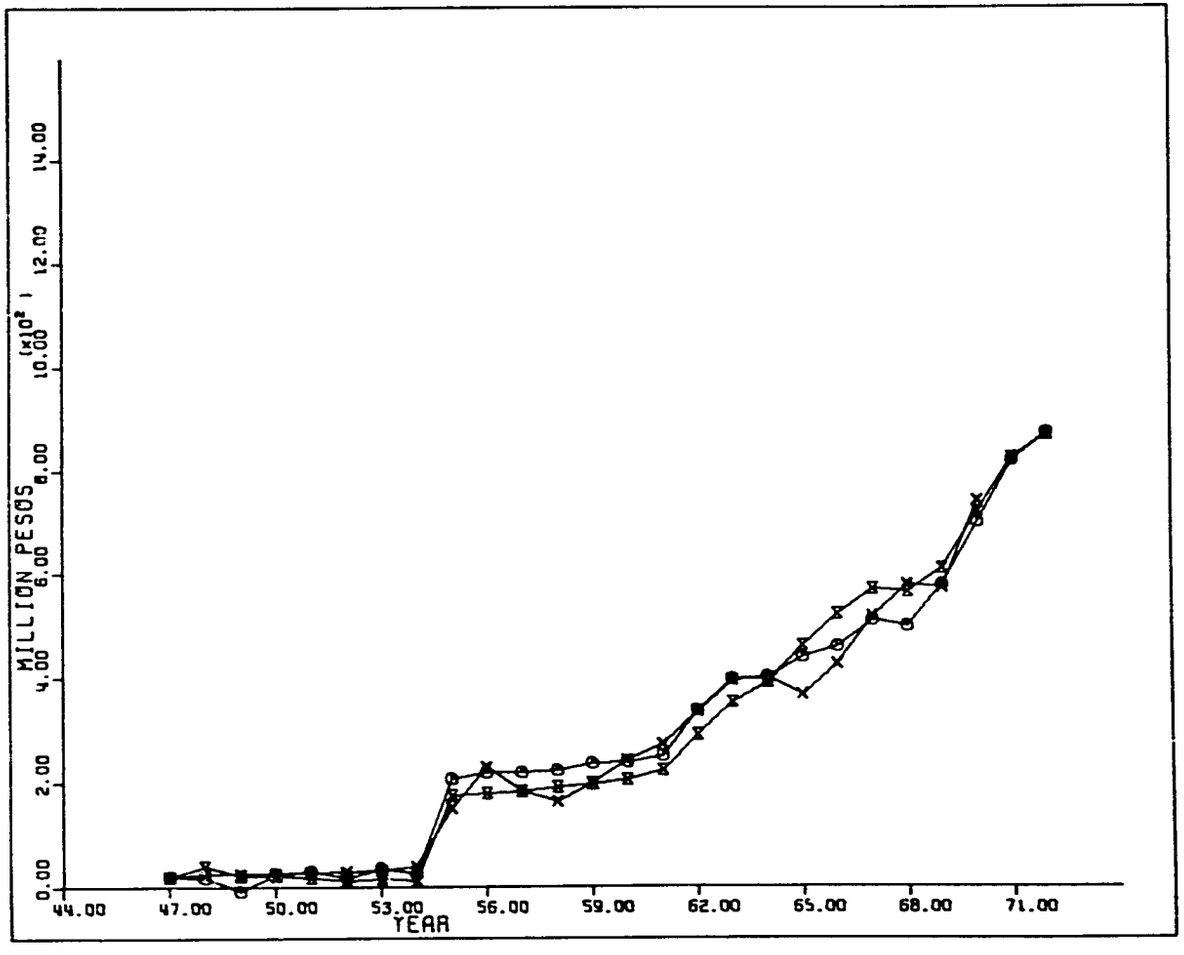

Figure C.15. Import taxes