

EXPLAINING STRUCTURAL CHANGES IN THE THAI ECONOMY:
IMPLICATIONS FOR AGRICULTURE

By

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DECLARATION

Except where otherwise indicated
this sub-thesis is my own work.

A handwritten signature in cursive script, reading "A. Montrivat".

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ABSTRACT

Industrialization in Thailand has led to a rapid growth of the manufacturing sector, relative to other sectors. The overall growth rate of the economy during the last 25 years has been impressively high, and substantial structural changes have taken place. However the traditional agricultural sector has been affected adversely by the growth process.

This study examines some of the economic factors that have contributed to the past growth of the Thai economy and attempts to analyse, in a general equilibrium approach, the impact of exogenous shocks on the agricultural sector. Expansion of cultivable land in the past assisted the crop diversification program and in the expansion of agricultural production. The rapid growth of the manufacturing sector has tended to cause some upward pressure on real wages and attracted labour from agriculture. The price policy pursued by the government has had an urban bias and discriminated against agriculture while the manufacturing sector received assistance from the industrial protection policy. The recent deterioration in the terms of trade, together with the fixed exchange rate policy, has tended to enhance the adverse effects on the agricultural sector.

The findings of this study supports the view that a policy change towards trade liberalization should lead to more efficient use of resources in the economy and benefit agriculture. It should be noted, however, that the model used in the analysis does not incorporate unemployment and technological change and the impact of a change in the terms of trade is only partially analysed. Despite the limitations of

this model, the results indicate the potential of this type of modelling exercise.

ABBREVIATIONS

CGE	Computable General Equilibrium
EEC	European Economic Community
EIU	Economist Intelligence Unit
GDP	Gross Domestic Product
GNP	Gross National Product
ha	hectares
IBRD	International Bank for Reconstruction and Development
ICOR	Incremental Capital Output Ratio
IMF	International Monetary Fund
NESDB	National Economic and Social Development Board
OAE	Office of Agricultural Economics
U.S.	United States

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CHAPTER 1

INTRODUCTION

Thailand has long been known as an agricultural country. Industrialization in the Thai economy effectively began in the early 1960s and, since then, the country has shown impressive growth. The nation, as a whole, has experienced very high growth rates in real GDP during the past two decades. The 1960-1984 annual average growth rate in real GDP was 7 per cent per annum. In spite of the crises caused by the 1973-1974 and the 1977-1981 oil price shocks, the real GDP growth rate was as high as 8 per cent per annum between 1975-1979 and 5.6 per cent per annum between 1979-1984. This rapid growth has brought about a very significant restructuring of the economy. The share of agriculture in real GDP has declined (from 40% in 1960 to 23% in 1984) while manufacturing and service sectors have become more important. Diversification has taken place in most sectors and there have been high export and employment growth rates. Pakkasem (1983, p.1) argued that

Thailand's economic development should be viewed as a transition to modern forms of economic organization, rather than just a traditional view of economic expansion.

Despite the rapid rate of industrialization, agriculture has been growing steadily in absolute terms. Rice has long been the dominant agricultural product. During the last 25 years, however, substantial progress has been made in the diversification of crop production. New commercial (non-traditional) crops, such as maize, cassava, sugar cane and kenaf, are now grown and the output mainly exported. But rice (traditional crop), which is both the staple food and an export crop, still covers over

half the cultivated area in Thailand. A substantial tax on rice exports, known as the rice premium, has depressed the domestic rice price below international prices. This has probably acted as an incentive in promoting the cultivation of other crops. Increases in crop production have been mainly the result of an expansion of the cultivation into reserve land. Since the end of the 1970s such expansion has reached its limit and the land frontier has been closed. Yields of major crops, show no significant or consistent upward trends. The growth rate of agriculture, which averaged (in real terms) over 5 per cent per annum between 1960-1979, fell to less than 3.5 per cent per annum between 1979-1984. This indicates that future production gains will need to come from the intensification of crop cultivation and improvements in technology.

1.1 Objectives of the Study

The rapid expansion of Thai agriculture took place in a policy environment characterized by a significant urban bias. High levels of industrial protection and discriminatory trade policies impacting on the agricultural sector were pervasive features of government policy during the 1960s and 1970s. On the other hand, the development of roads and other infrastructural facilities (facilitated by the U.S. war effort in Vietnam) made substantial areas of new land accessible and cultivable. This coincided with the rapid expansion in world demand for products such as maize and tapioca. Some explanations of Thai economic growth are in accordance with the "vent for surplus" model popularized by Myint (1958). The relative importance of exogenous factors and government policies in the economic development of the country remains to be analysed in a rigorous way. In this study, we hope to make a start in this direction using a general equilibrium approach.

Specifically, this study attempts to analyse, in a general equilibrium framework, the impact of various exogenous and policy changes

on the agricultural sector, taking account of the impact of inter- and intra-sectoral changes that have taken place since 1970. The study will focus largely on the crop production component of the agricultural sector, which forms the largest share of agricultural production in the Thai economy.

1.2 Organization of the Study

Chapter 2 describes the characteristics and structural changes in the Thai economy over the past 20-25 years and discusses some government policies and policy changes during that period. This is followed by a discussion of the recent performance of major crops grown in the country and their relative importance in the nation's exports.

In chapter 3, a general equilibrium framework is developed. The impact of structural changes in the Thai economy on agriculture is then discussed in this context, including the impact of increased cultivable land endowment, government policies and changing terms of trade.

A simple computable general equilibrium model for Thailand is developed in chapter 4 to analyse, quantitatively, the intersectoral impact of the changes identified in chapter 3. The description of the model, its assumptions and data base, and experiments performed with this model are discussed. This is followed by a summary of results and conclusions.

Chapter 5 concludes this study with (1) the implications drawn for future policies; and (2) limitations of the study.

CHAPTER 2

OVERVIEW OF THE THAI ECONOMY : 1960-1984

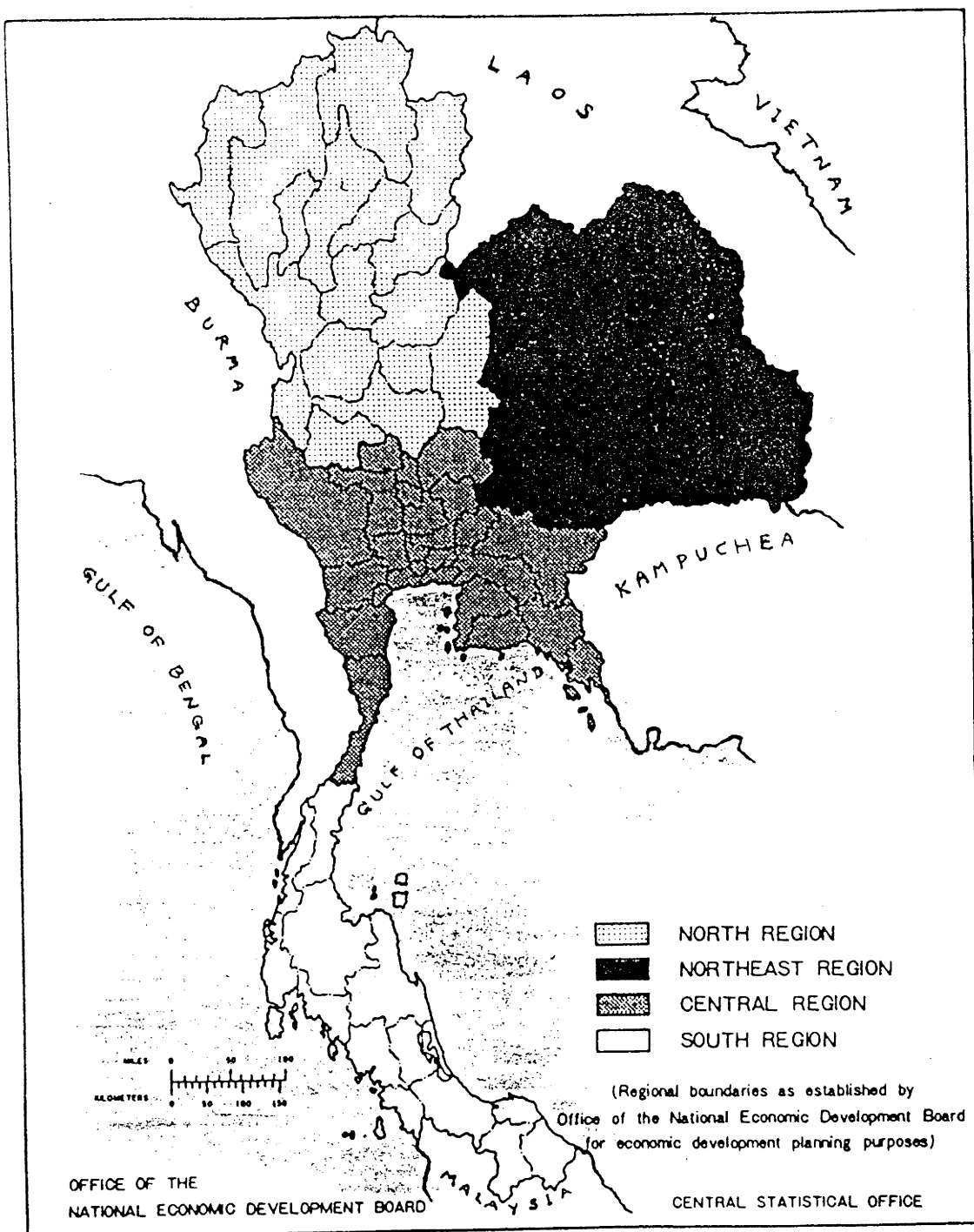
General background of the Thai economy is given in section 2.1. We present the overview of economic growth and structural changes of the Thai economy since 1960 in sections 2.2 and 2.3, respectively. Section 2.4 summarizes the growth pattern during the past two decades. Since implications of the structural changes on the crop component of agricultural sector is the concern of this study, we conclude this chapter with the discussion in section 2.5 on recent performance of rice, rubber, sugar cane, maize and cassava which, at present, are the most important crops and export items of Thailand.

2.1 General Background

Thailand is a country in Southeast Asia, bordered by Malaysia and the sea to the south, Burma to the West and North, Laos to the North and Northeast and Kampuchea to the Northeast and East. It is divided into 4 geographic regions with different cultural and socio-economic features; i.e. the plain and lowland Central Region, the rolling semi-arid Northeastern Region, mountainous Northern Region and the Peninsular isthmus Southern Region. It has a monsoon climate with ample rainfall, causing frequent floods in the North, Northeast and Central Regions. The mid-year population in 1984 was estimated at 50.04 millions.

There are significant contrasts in the level of development achieved in different regions. The 1979 per capita income (NESDB estimate) was, in terms of US dollars, 317 for Bangkok Metropolis, 771 for the most fertile

Figure 2-1: MAP OF THAILAND BY REGION



Central Region, 554 for the Southern Region, 383 for the Northern Region and 218 for the poorest Northeast Region. Thus the Bangkok per capita income in 1979 was over 6 fold that of the Northeast Region. As pointed out by Muscat (1966, p.28),

The failure of large inland areas to participate in the general level of development of the country to a significant extent was due primarily to the simple fact of physical isolation: they were not connected with the engine of growth, international trade, which was propelling the rest of the economy, while the absence of any deliberate government policy to stimulate development in these regions meant that there was no 'outside' economic force capable of breaking the low productivity - low income - low investment circle in which these areas were bound.

Recently government policies have shifted from the sole emphasis on the overall growth of the economy to greater concern with the problems of rural poverty and economic inequality, as stressed in the objectives of the present National Plan (The Fifth National Economic and Social Development Plan 1982-1986, NESDB 1981, pp.2-3).

2.2 Economic Growth

The Thai economy has experienced an impressive growth rate during the past few decades. Table 2-1 below shows that the average real GDP growth rates in the 1960s and the 1970s were almost 8 and 7 per cent per annum respectively. They declined during 1980-1984 to an average 5.6 per cent per annum. Non-agricultural sectors, in particular manufacturing and services, have been growing at much higher rates than agriculture for the corresponding periods. Crop production has been growing steadily at a somewhat declining rate, averaging at 4.5 per cent per annum during 1960-1984.

As seen in Table 2-2 per capita GNP grew quite rapidly, despite a high population growth rate during 1960-1980, in recent years both these rates have declined. The growth potential of the Thai economy increased remarkably during the 1960s and public capital formation contributed

Table 2-1: Average Growth Rate of GDP at Constant 1972 Prices

(% p.a.)				
Sectors	1960-70	1970-80	1980-84	1960-84
1. Agriculture	5.5	4.2	3.7	4.7
Crops	4.9	4.3	4.1	4.5
Livestock	3.3	6.1	4.4	4.6
Fisheries	20.1	2.3	2.7	9.5
Forestry	4.0	1.7	-2.4	1.9
2. Non-agriculture	9.3	8.0	6.1	8.2
Mining	11.2	6.3	2.0	7.6
Manufacturing	10.7	10.0	6.1	9.7
Services	8.8	7.4	6.3	7.8
GDP	7.9	6.9	5.6	7.1

Source : calculated from NESDB, National Income of Thailand, various issues

mainly to transport and irrigation (see Silcock 1970, p.169). The average annual growth rate of gross fixed capital formation, at constant prices, was 14 per cent between 1960-1970, declining to 6 per cent between 1970-1980 and to only 0.4 per cent between 1980-1984. The share of capital formation in real GDP rose from 15.4 per cent in 1960 to as high as 28.2 per cent in 1969 but has declined somewhat in recent years to 20 per cent in 1984 (see Table II.3 in Appendix II).

It is argued that the stability of Governments, their continuous adherence to 'laissez-faire' economic policies and development through private initiative, and their success in maintaining a climate suitable for private foreign investment were some of the important factors behind Thailand's admirable performance in the 1960s (see Marzouk 1972, p.19). During the 1970s there were some signs that domestic political problems may have disrupted this environment.

Table 2-2: Population and per capita GNP of Thailand,
Selected Years

Year	(a) Estimated mid-year population (millions)	(b) per capita GNP in 1972 prices (baht)
1960	26.39	2,584
1970	36.22 (3.2 %)	4,043 (4.6 %)
1980	46.46 (2.5 %)	6,126 (4.6 %)
1984	50.40 (2.1 %)	6,875 (2.9 %)

Source : (a) United Nations, Demographic Yearbook,
various issues

(b) NESDB

Note : figures in parentheses represent average
annual growth rate from the preceeding year.

2.3 Structural Changes

The rapid growth of manufacturing has brought about substantial structural changes in the Thai economy. Agriculture's share in GDP declined significantly from 40 per cent in 1960 to 23 per cent in 1984, while manufacturing increased its share in GDP from 12 per cent to 21 per cent and services from 46 per cent to 54 per cent for the corresponding years (Table 2-3).

Although the agricultural sector has been shrinking in terms of its share in GDP, it is still a major sector in the Thai economy. More than two-thirds of the total population find their livelihood in agriculture. In the early 1980s the agricultural labour force constituted over 70 per cent of the total labour force and agriculture provided some 65 per cent of the country's total exports while agricultural imports accounted for

Table 2-3: Structure of GDP at Constant
1972 Prices, Selected Years

(%)					
Year	Agri.	Mining	Mfg.	Servs.	GDP
1960	40.2	1.2	12.0	46.6	100.0
1961	39.4	1.3	12.5	46.8	100.0
1962	39.2	1.3	13.0	46.5	100.0
1965	36.1	1.7	14.3	47.9	100.0
1966	36.6	1.8	14.2	47.4	100.0
1967	33.1	1.9	14.9	50.1	100.0
1970	32.2	1.7	15.5	50.6	100.0
1971	32.2	1.8	16.0	50.0	100.0
1972	30.3	1.8	16.9	51.0	100.0
1975	30.5	1.2	18.1	50.2	100.0
1976	29.8	1.3	19.2	49.7	100.0
1977	27.6	1.5	20.3	50.6	100.0
1980	24.9	1.6	20.7	52.8	100.0
1981	25.0	1.5	20.7	52.8	100.0
1982	24.2	1.4	20.8	53.6	100.0
1983	23.7	1.3	21.1	53.9	100.0
1984	23.2	1.4	21.2	54.2	100.0

Source : calculated from NESDB, National Income of Thailand, various issues

some 12 per cent of the total imports. The availability, until recent years, of large land areas suitable for cultivation encouraged extensive farming and raised labour-productivity. The agricultural sector has been growing steadily and has generally performed well in increasing production, as reflected in its substantial contributions to GDP and exports.

Muscat (1966, pp.56-57) argued that the shift in the economic structure of the Thai economy during the early 1960s, in which agriculture was declining relative to secondary and tertiary industries, resulted from a slowing down in the relative rate of growth in agriculture. This sluggishness, he claimed, reflected technological stagnation, low and declining per capita productivity and utilization of all available natural flood land (where the risk of excessive flooding is not high). The yields of major crops during the past two decades have been relatively unchanged and the exhaustion of frontier land has become a constraint in recent years to raising agricultural production. This argument appears to have some validity today.

It is likely that these were not the only factors, however. With higher per capita income levels, consumer demand patterns have also changed. The shares of expenditure on manufactured goods and various services have been rising during 1960-1984 as can be seen from Table 2-4. This suggests that an expansion of the domestic market for these goods and services encouraged expansion of these sectors. The demand for services, in particular, could only be met by an expansion of that sector, as services are generally non-traded.

Thailand has participated actively in foreign trade, the openness of the economy is apparent, as indicated by the share of exports plus imports in GNP shown in Table 2-5, which varied between 0.30 - 0.48 during 1960-1983; and the economy has become more open during the last 10 years. The rapid growth in income during the past few decades has been

Table 2-4: Share of Private Consumption Expenditure
at Constant 1972 Prices, by Commodity Group

	(%)			
	1960	1970	1980	1984
Food	52.1	45.3	35.4	34.0
Beverages	3.7	5.7	9.2	8.8
Tobacco	3.6	3.5	4.3	3.7
Clothing & personal effects	7.7	8.9	9.4	9.0
Rent & water charges	5.8	4.4	3.6	3.7
Fuel & light	3.8	3.8	3.2	3.2
Furniture & household equip.	1.8	3.5	4.3	4.6
Household operation	1.9	2.2	2.1	2.1
Health expenses	5.5	5.8	7.6	8.8
Transp. & Communication	6.3	7.3	8.3	9.0
Recreation & Entertainment	6.4	8.2	11.1	11.2
Miscellaneous services	1.3	1.4	1.5	1.8
Total private consumption	100.0	100.0	100.0	100.0

Source : NESDB

Table 2-5: External Transactions
as Percentage of GNP

(%)				
Year	1		1	2
	Exports	Imports	Exports plus Imports	Exports minus Imports
1960	15.6	17.9	33.5	-1.9
1961	16.5	17.5	34.0	-0.5
1962	14.5	18.1	32.6	-3.1
1963	13.8	18.8	32.7	-4.6
1964	16.1	19.1	35.2	-2.6
1965	15.0	19.2	34.2	-3.8
1966	13.6	25.0	38.6	-10.9
1967	12.7	20.5	33.2	-7.4
1968	11.1	20.6	31.7	-8.9
1969	10.9	20.9	31.8	-9.4
1970	10.4	19.8	30.2	-9.0
1971	11.5	18.5	30.1	-6.6
1972	13.2	18.8	31.9	-5.1
1973	14.4	19.5	33.9	-4.6
1974	18.1	23.5	41.6	-5.0
1975	15.9	22.4	38.3	-6.2
1976	17.9	21.7	39.6	-3.6
1977	18.0	24.1	42.1	-5.9
1978	17.5	23.4	40.9	-5.6
1979	19.5	21.7	46.2	-7.0
1980	19.4	28.8	48.2	-9.0
1981	19.5	28.7	48.1	-8.6
1982	19.1	24.1	43.1	-4.5
1983	15.8	24.2	40.0	-7.2

Source : Department of Customs and NESDB

1
Note : domestic products only
2
including re-exports

accompanied by good performance in exports. The annual average growth rate of export value between 1960 and 1982 was about 14 per cent and that of import value was about 15 per cent during the period. The structure of Thai industry during the 1960s was characterized to a significant extent by high import content , particularly of capital goods, since a good part of the industry was of the assembly type (see Marzouk 1972, pp.92-93 and Ingram 1971, p.280). To a degree this remains the case today, imports of capital goods accounted for 25 per cent of the total imports in 1982, compared with 31 per cent in 1965.

It is apparent from Table 2-6 that although the agricultural balance of trade has shown a rising surplus during 1960-1983, the total merchandise balance of trade has shown a widening deficit over that period. Agricultural exports, which have formed the largest proportion of the country's total exports, were usually subject to wide fluctuations in the international prices of agricultural products. Table 2-7 reveals that the international terms of trade, which were relatively favourable to the Thai economy during most of the 1960s and the early 1970s, have deteriorated significantly since the mid 1970s due to the two rounds of the oil price increases during 1973-1974 and 1977-1981 and relatively low world price of the Thai agricultural exports for most years over the last decade.

Table 2-6: Balance of Trade

(Millions of Baht)						
Year	Balance of Trade			Agric. Balance of Trade		
	Exports	Imports	Balance	Exports	Imports	Balance
1960	8,614	9,622	-1,008	7,657	2,735	+4,922
1961	9,997	10,287	-290	8,818	3,138	+5,680
1962	9,529	11,504	-1,974	8,235	3,082	+5,153
1963	9,676	12,803	-3,126	8,310	3,108	+5,202
1964	12,339	14,253	-1,914	10,612	3,447	+7,165
1965	12,941	16,185	-3,245	10,860	3,437	+7,423
1966	14,310	25,347	-11,037	11,747	3,942	+7,805
1967	14,166	22,187	-8,022	11,054	4,157	+6,897
1968	13,679	24,103	-10,424	10,504	4,231	+6,309
1969	14,722	26,891	-12,169	11,036	4,205	+6,861
1970	14,772	27,009	-12,237	10,937	3,884	+7,053
1971	17,281	26,794	-9,513	12,470	3,855	+8,615
1972	22,491	30,875	-8,384	15,845	4,354	+11,491
1973	32,226	42,184	-9,558	22,629	5,339	+17,290
1974	50,325	64,044	-13,718	36,289	7,547	+28,742
1975	48,438	66,835	-18,398	33,750	8,738	+25,012
1976	60,797	72,877	-12,080	46,136	9,750	+36,386
1977	71,198	94,177	-22,979	51,831	12,985	+38,836
1978	83,065	108,899	-25,834	56,341	17,255	+39,086
1979	108,179	146,161	-37,982	72,058	20,255	+51,803
1980	133,197	193,618	-60,421	81,462	23,952	+57,510
1981	153,001	219,026	-66,025	101,492	27,814	+73,678
1982	159,728	196,616	-36,888	107,836	23,196	+84,640
1983	148,603	217,979	-69,376	95,985	27,680	+68,305

Source: Department of Customs

1

Note : domestic plus re-exports

Table 2-7: Trade Index and Terms of Trade

(1975=100)

Year	Exports			Imports			Terms of Trade
	Volume	Unit value	Value	Volume	Unit value	Value	
1960	36.3	52.8	19.2	28.5	46.2	13.2	114
1961	43.1	51.4	22.2	29.9	46.7	14.0	110
1962	41.9	50.5	21.2	35.7	43.9	15.7	115
1963	43.3	49.6	21.5	40.2	43.4	17.4	114
1964	54.6	50.1	27.4	44.7	43.4	19.4	115
1965	56.5	50.7	28.6	48.1	43.8	21.1	116
1966	59.8	52.2	31.2	58.8	42.7	25.1	122
1967	60.6	51.9	31.5	70.7	42.5	30.0	122
1968	58.7	51.7	30.3	80.7	40.4	32.6	128
1969	61.0	53.6	32.7	88.7	39.5	35.0	136
1970	64.7	50.7	32.8	91.2	42.7	38.9	119
1971	84.2	45.5	38.3	76.7	45.0	34.5	101
1972	99.8	50.1	50.0	88.7	47.5	42.1	105
1973	93.2	76.8	71.6	109.8	55.5	60.9	138
1974	104.3	106.1	110.7	101.6	89.8	91.2	118
1975	100.0	100.0	100.0	100.0	100.0	100.0	100
1976	139.4	97.3	135.6	105.0	105.6	110.9	92
1977	159.1	99.4	158.1	124.1	113.5	140.9	88
1978	171.7	107.4	184.4	133.1	122.3	162.8	88
1979	187.1	128.4	240.2	154.7	141.5	218.9	91
1980	194.9	151.7	295.7	160.8	175.7	282.5	86
1981	223.8	151.9	340.0	161.3	201.2	324.5	75
1982	259.5	136.6	354.5	138.4	212.7	294.4	64
1983	232.9	139.6	325.1	176.0	196.8	346.4	71

Source: Bank of Thailand

2.4 Pattern of Growth

The Thai agricultural sector is now facing serious structural problems as additional areas suitable for cultivation have been exhausted, and the growth rate of agricultural production has been declining. Mongkolsmai (1983, p.15) illustrated that the total productivity in agriculture was rising during the past two decades due mainly to the rapid increase in farm mechanization, nonetheless yields of major crops were rather low. These problems, together with growing population, call attention to the need for more efficient choice of production patterns and better use of resources. Furthermore, agricultural price policies (such as the rice premium) in stabilizing domestic prices, have kept the prices of farm products relatively low. These problems have also caused a 'supply deficiency' in exports, including agricultural exports. As Siamwalla (1975a, p.25) points out

The share of Thailand in total World trade of many export commodities has been small enough so that in all these cases, the major problem that is the limiting factor on export expansion appears as supply deficiency rather than as lack of foreign demand.

With regard to industrialization in Thailand, it has been argued that the pattern of industrial growth during the 1960s reflected the rapid increase in domestic demand rather than comparative advantages (see Akrasanee 1975, pp.275-276 and Marzouk 1972, p.202). The policy of import substitution (inward looking industrialization) through tariff protection, and industrial promotion policy including indirect subsidization of domestic production, which were emphasized in the 1960s, encouraged the development of industries with high import content. Exports of manufactured goods had not been encouraged until the early 1970s, when taxes on exports were generally reduced and in some cases manufactured exports were actively promoted. Since 1977 there have been structural adjustments in manufacturing industries, particularly through business and

excise taxes and import tariffs, with a strong trend towards export promotion (see Akrasanee and Ajanant 1983, pp.35-36).

Between 1964 and 1968 there was a rapid rise in United States military expenditure in Thailand in association with the Vietnam war. The service sector expanded significantly in response to the increase in demand from the military personnel coming for rest and recreation. Substantial excess capacity tended to emerge later in the service sector due to the phasing down of that military expenditure. However, this excess capacity in services did not create any serious problems as the increase in national income raised demand for some services. The service sector, in terms of its share in GDP, remained relatively unchanged during the 1970s (see Table 2-3), but has expanded in recent years, due probably to the rapidly growing tourist industry over the last decade.

2.5 Recent Performance of Major Crops

Within agriculture itself, production of crops has formed the largest share, between 71-78 per cent during 1960-1984 (see Table 2-8 below). During 1980-1984 average crop share in agriculture was 75.5 per cent, followed by livestock with 12.5 per cent, fisheries with 8.3 per cent and forestry with 3.7 per cent.

Thailand was essentially a one-crop (rice) economy, however, in recent decades substantial diversification in crop production has taken place. The need to develop a diversified agriculture for the Thai economy was perceived in the late 1950s, partly to avoid the risk of excessive dependence on a single crop and to provide a variety of raw materials for a growing economy (see Ingram 1971, p.257).

Siamwalla (1975a, p.36) pointed out the importance of large investment in road building to the agricultural sector:

A new frontier opened up in the upland areas, where the malaria eradication program made these areas habitable for the first time. Unlike the paddy areas whose links to the outside world are

Table 2-8: Share of Crops in Agriculture at Constant
1972 Prices, Selected Years

(%)							
Year	Rice	Rubber	Sugar cane	Maize	Cassava	Other crops	All Crops
1960	43.6	2.5	2.8	1.8	1.4	25.5	77.7
1961	44.0	2.7	2.1	2.1	2.1	24.4	77.3
1962	46.6	2.6	1.6	1.9	2.2	23.0	78.0
1965	40.4	2.5	1.7	2.8	1.4	27.3	76.0
1966	43.0	2.2	1.2	2.9	1.7	27.1	78.2
1967	36.7	2.3	1.5	3.3	1.5	28.9	74.1
1970	36.4	2.7	2.3	3.9	2.3	25.9	73.5
1971	35.0	2.8	2.0	4.8	2.6	25.9	73.1
1972	30.8	3.0	3.2	2.6	3.2	29.2	72.0
1975	31.9	2.6	4.8	4.7	4.0	25.6	73.4
1976	29.6	2.7	6.2	4.1	5.5	26.3	74.4
1977	27.8	2.9	4.3	2.6	6.7	27.2	71.5
1980	28.8	3.0	4.1	4.3	8.0	26.2	74.5
1981	29.1	3.0	4.9	4.6	8.6	25.1	75.3
1982	28.2	3.3	8.5	3.6	7.8	25.0	76.3
1983	29.4	3.4	5.7	4.3	8.1	25.2	76.0
1984	28.2	3.4	5.9	4.7	8.4	24.7	75.4

Source : calculated from OAE, Agricultural Statistics
of Thailand, various issues

assured by the age-old system of canals, the upland areas require links by road or rail. The rapid buildup of the highway network in the late 1950's and the early 1960's opened up vast areas for cultivation.

The progressive expansion of cultivation into new land, until recently, led to a rapid increase in the cultivation of upland crops such as maize, sugar cane and cassava. This seemed to be a response to external demand and these crops are now major export crops. Other important crops are rubber, coconut, kenaf, cotton, sorghum, groundnuts, soybean, vegetables and fruits. Diversification was, in some areas, limited by soil conditions, availability of water supplies and labour.

Table 2-9: Average Growth Rates of Planted Area and Production of Major Crops

	(% per annum)				
	Rice	Rubber	Sugar cane	Maize	Cassava
<u>A. Planted Area</u>					
1960-1970	2.4	10.2	-1.3	11.2	12.0
1970-1980	2.0	1.9	13.0	5.6	17.9
1980-1983	0.7	1.4	7.2	5.6	5.7
1960-1983	2.0	5.4	5.8	8.0	13.7
<u>B. Production</u>					
1960-1970	3.7	8.4	2.5	13.5	10.9
1970-1980	1.3	1.9	11.2	4.5	17.0
1980-1983	3.2	8.5	6.3	5.8	4.7
1960-1983	2.6	5.5	6.7	8.5	12.7

Source : calculated from Tables 2-10 and 2-11

Area planted to rice during 1960-1980 expanded, from 5.9 million hectares, producing less than 10 million tons in 1960, to 9.0 million

hectares, producing over 15 million tons in 1980, despite the rapid growth of both area planted with and production of other crops. It is widely argued that there was also some shift from rice to other crops, particularly in the Central Plain, due to the higher profitability of other crops. Chuchard and Tosoonthorn (1959) showed that:

Net return in 1957 derived from planting per rai¹ of sugar cane was 241.7 baht, maize 113.9 baht, groundnuts 103.4 baht and rice 5.6 baht.

The profitability of these other crops, in relation to rice, might have been reduced in recent years due to the sliding down in the 'rice premium' and suppressed world prices of the exports of crop products other than rice. To gain some insights about the problems in agriculture, recent performance of 5 major crops in the Thai economy, i.e. rice, rubber, sugar cane, maize and cassava are reviewed below. Table 2-9 above shows that the growth rates of area planted with and production of rice were much lower than the corresponding rates calculated for the other major crops.

2.5.1 Rice

Rice is both the staple food for domestic consumption and a major export of Thailand. In fact it is the traditional crop and has been an integral part of the economy for centuries. Although its share in agriculture has fallen substantially, from 44 per cent in 1960 to 28 per cent in 1984, rice cultivation is still the major occupation of Thailand and occupies over half of the cultivated area in the country.

Prior to World War II, rice trade, both international and domestic, was entirely free. The rice premium, which is a fixed tax per ton of rice exported varying with the grade of rice, was introduced in 1955. One stated objective has been the need to reserve sufficient rice for domestic

¹1 rai = 0.16 hectare

consumption. The premium has also been used to stabilize the domestic price of rice at a relatively low level, in order to protect low-income urban consumers. The rice premium has been the subject of considerable controversy as Marzouk (1972, p.138) pointed out:

It has been criticized as being unfair to rice farmers, discouraging rice production and dampening down the purchasing power of the majority of people. On the other hand, its advantages in stabilizing domestic rice prices and in providing a source of budget revenue which is easy to collect are often stressed.

According to Usher (1978, p.24), one of the main effects of the rice premium is that "it perpetuates inefficient methods of rice farming by overpricing fertilizer, tractors, etc. in relation to rice". Chuchart and Tongpan (1965, p.2) made the criticism that "so long as all of the price risks are left for the farmers to bear, it is unreasonable to expect them to improve production, particularly when a large cash outlay is required".

The Government has argued that the proceeds of the rice premium are being returned to the agricultural sector in the form of irrigation projects, transportation facilities and agricultural extension activities, and that the abolition of the rice premium would simply increase the profits of middlemen. Chuchart and Tongpan (1965, p.65) concluded, on the basis of their study of the rice premium that "there is no evidence that the abolition of the rice premium would raise profits to middle-man merchants ... the existing competitive market will force the merchants to pay a higher price to farmers. This conclusion concurs with the conclusions of Siamwalla (1978) that rice middlemen and other marketing related operators earned quite low margins, thus they had no monopoly power over farmers. Ingram (1971, p.258) coined the issue into a development strategy:

Low domestic rice prices not only encourages agricultural diversification but also stimulates non-agricultural industries ... low rice prices permit firms to pay lower money wages and thus to compete with imported goods. Low wages also encourage foreign

capital inflows. The rice premium stimulates import substitution and the growth of new exports and thus contributes to the modernization of the Thai economy.

The rice premium is still a subject of vigorous debate. However many studies (see, e.g. Siamwalla (1975b), Usher (1978), and Konjing and Issariyanukula (1985)) tend to suggest that abolition or reduction of the rice premium would raise the competitive position of Thai rice exporters in international markets, but the need for alternative sources of tax to make up the loss in government revenues still remains the issue. It must be noted, however, that the importance of the rice premium as a source of tax revenue has declined sharply, from about 9 per cent of total tax revenue during the latter half of the 1960s to only about 2 per cent of the total tax revenue in the early 1980s.

Other forms of government intervention in the Thai rice industry include:

- export licensing and occasional allocation of export quotas in order to regulate or stabilize rice exports;
- reserve requirement of rice stocks on the part of exporter for sales upon demand to the government at a fixed proportion to rice exports and at a low price in return for export privileges;
- farm price support through a government purchase program to maintain or even increase the farm gate price of rice.

2.5.2 Rubber

Rubber was the first crop to encroach upon the traditional dominance of rice in the Thai agriculture. It was introduced from Malaysia to southern Thailand around 1901. But unlike Malaysia, where there was a preference for large-scale estate development, the rubber industry in Thailand was characterized by small farms and the industry grew at a much lower rate. The main expansion of the planting in Thailand was stimulated by the high demand for rubber during World War II and the Korean War (see Silcock 1970, pp.41-43, and U.S. Department of Agriculture 1972, pp. 32-33). The area planted to rubber expanded at an average annual rate of

over 10 per cent during the 1960s, but the rate fell to less than 2 per cent during 1970-1982. According to the information provided in EIU (1984, p.12), the growth on rubber production over the last 25 years was, initially, a result of new planting by smallholders, but latterly the sector has begun to reap the benefits of an extensive replanting scheme using high yielding stock and it is foreseen that the potential for further products is high.

Area planted to rubber in Thailand reached 1.6 million hectares and production of about 0.58 million tons in 1982. Rubber became the second major export crop (after rice) until the mid 1970s; subsequently the exports of sugar and tapioca products took its place (see Table 2-13). Exports of rubber product could be considered another traditional export of the country. Unlike most agricultural exports, its response to world market conditions is constrained by its lengthy planting period. Government intervention in the industry has been the tax imposed on the exports of rubber products and a replanting cessation.

International rubber prices fell during the 1960s, due to the competition from synthetic rubber, but recovered somewhat during the 1970s in the aftermath of the oil price rise that has had adverse effects on synthetic rubber production and prices. Natural rubber has, thus, become a product with greater stability in supply than the synthetic substitute.

Although rubber tapping has been the main source of income for the majority of population in Southern Thailand, the recent development of the oil palm industry and its export performance appears to provide a good prospect for another source of income in the region. The latter involves less cost and the plant has shorter gestation period, so farmers can expect returns sooner than with rubber planting.

2.5.3 Sugar cane

Until about 1960, Thailand was a net importer of sugar. Since then, "a remarkable expansion in production - aided and supported by the Government - has transformed Thailand into an exporter of sugar" (U.S. Department of Agriculture 1972, p.43). A major problem in the sugar industry has been excessive production. Pinthong and Siamwalla (1978, p.22) pointed out the political factor tending to encourage greater production:

The sugar industry in Thailand is very much involved with politics. Many sugar mills are run by the politically powerful families. The sugar cane farmer is in general much richer and more politically organized than the rice farmers. Thus, many policies have been pushed which favour the sugar millers and sugar cane farmers. Eventhough, governments seem to understand the problem of overproduction, they still impose the policies which give incentive to the farmers to expand their cultivated land and production.

From 1960 to 1971 area planted to sugar cane remained rather stagnant at around 0.14 million hectares with production around 4.9 million tons. A rapid expansion in the planted area took place between 1972-1977, reaching 0.567 million hectares and production expanding to 18 million tons in 1977. Both the planted area and the production of sugar cane fluctuated thereafter being 0.564 million hectares and of 22.8 million tons, respectively, in 1984.

Sugar policy has been designed to solve the short-run problems, with the objectives to clear the domestic market and stabilize domestic prices. A summary of sugar policy since 1960 is as follows:

- During 1960-1965, when the world price of sugar was low and there was a domestic surplus, the government subsidized sugar exports.
- During the 1961-1966 period government intervention aimed at protecting the home market by imposing import tariffs (the proceeds of which were used to foster exports) or by completely banning sugar imports.
- During 1973-1974, when there was a shortage of sugar on the world market and the world price for sugar was high, the

government imposed an export tax (sugar premium) in order to stabilize the domestic price.

- Policy in recent years have been the concurrent direct subsidization of both consumer and producer prices. The government set a floor price for sugar cane at farm level and a ceiling consumer price for sugar during 1975-1982 and a fixed income sharing ratio of 70:30 between sugar cane farmers and sugar millers.

The study by Konjing and Issariyanukula (1985, pp.142-143) indicates a very low market efficiency for transmitting the price information from abroad to the domestic market, and they recommend that stronger competition in export trade of sugar should be encouraged through the adoption of a policy that moves toward free trade.

2.5.4 Maize

"Maize is in many ways the most dramatic of all the 'miracle crops' that have developed since World War II to transform Thailand's rural economy" (Silcock 1970, p.83). Maize was widely grown for domestic consumption even before the war, its production rose more than 100 fold from the prewar annual average of 5 thousand tons to 544 thousand tons in 1960 and has been increasing steadily since then. The planted area increased rapidly from 0.286 million hectares in 1960 to about 1.78 million hectares in 1984. Estimated production was 4.1 million tons in 1984.

There is no clearcut evidence as to whether maize output expansion was influenced by the taxes on rice (rice premium). According to the evidence referred to by Silcock (1970, pp.89-90), rice needs more labour and water than maize. Even if labour were not a bottleneck, increased water requirements for rice cultivation might reduce the area that could be cultivated if rice were grown instead of maize.

Exports of maize increased rapidly at the average annual rate of about 13 per cent during 1960-1980, and constituted the second or third most important export crop until 1976, when exports of tapioca products

began to take its place. The problems faced in the export trade of maize have been unstable markets, breach of contract and price undercutting. As the maize policy, in the past, did not encourage price competition, a free trade policy was adopted in 1981. According to Konjing and Issariyanukula (1985, p.141), "The maize market under a free trade policy proved promising ... [thus the policy] should be continuously pursued with emphasis on upgrading quality, better market facilities, and effective quality control".

2.5.5 Cassava

Another upland crop which has experienced remarkable growth in recent years is cassava. Its planted area expanded from 72 thousand hectares in 1960 to about 1,405 thousand hectares in 1984, and the corresponding production increased from 1.2 to 20.0 million tons. In 1978 the export value of tapioca (cassava) products was as high as 10.9 billion baht, constituting 19.3 per cent of the total value of agricultural exports in that year, and took over for the first time the traditional position of rice as the top export crop of Thailand.

The growth of the cassava industry has been stimulated by the increasing external demand, mainly from the European Economic Community (EEC). However it has been anticipated that there was a distinct possibility that cassava exports might be restricted by an EEC import quota or a change in EEC tariff structure. The government, since 1980, has responded by introducing a policy aiming to reduce production and exports and stabilizing domestic prices. Konjing and Issariyanukula (1985, p.144) recommend that new markets should be searched for and a long-term strategy should be formulated to encourage cassava farmers to adopt alternative cropping systems which have better prospects.

2.6 Summary

The trend in yields of each of the 5 major crops discussed above has been stagnant or declined somewhat during the period 1960-1982, total production grew primarily due to expansion in cultivated area. The rapid growth in the non-traditional export crops (such as maize, cassava and sugar cane) in relation to rice may have been influenced by their relative prices in the world market. Table 2-18 shows that relative world prices of rice and sugar tended to favour rice production during most of the 1960s but reverted to favour sugar production afterwards, while relative world prices of rice and maize and of rice and tapioca products fluctuated a great deal and did not show any significant trend in favour of rice.

It can be seen in Table 2-20 that the relative farm prices of rice and sugar cane show a trend in favour of sugar cane during 1972-1983, while their relative world prices tended to favour rice production during the period. The relative farm prices of rice and maize show no obvious trend in favour of maize, while relative world prices tended to favour rice production during the period. This evidence tends to support the argument that the rapid expansion of competing crops with rice, especially sugar cane, was to a significant extent a result of the rice premium. The premium depressed the farm price of rice and discouraged its expansion, although world prices tended to favour rice production in relation to sugar and maize production. Mongkolsmai (1983, p.46) presents some evidence on the protective coefficients which "show the distinct disincentive against rice production, [however] a number of domestic resource cost studies² has shown that Thailand has the largest comparative

²see Akrasanee, N. and Wattananukit, A., 1976 "Comparative Advantage in Rice Production in Thailand", Food Research Institute Studies, Volume XV, No.2, pp.177-212, and Limskul, K., 1979 Comparative Advantage of the Agricultural Sector in Thailand: A Study of Domestic Resource Cost of Rice, Maize, Cassava and Sugar, M.A. Thesis, Faculty of Economics, Thammasat University, Bangkok

advantage in rice production, particularly in the Central region. Cassava, sugar cane and maize rank second, third and fourth respectively in the degree of comparative advantage in production".

Corden and Richter (1967, p.149) referred to economic growth in Thailand, as represented by the expansion of rubber, maize, kenaf and cassava, as being export-led, and foreign trade, through the growing markets it has provided, as being an 'engine of growth'. Improved infrastructure, especially in road building and other transportation facilities in the 1960s, made new land accessible for the expansion of new crops. But exhaustion of new cultivable land in recent years has become a constraint to the further expansion of new crops. If agricultural exports are to continue to constitute the largest share of exports, and to assume the role of an 'engine of growth' in the Thai economy, increased yields will be necessary for raising agricultural production.

Table 2-10: Area Planted to Principal Crops

(1,000 ha)

Year	Rice	Rubber	Sugar cane	Maize	Cassava
1960	5,922	481	158	286	72
1961	6,179	493	124	307	99
1962	6,587	748	102	328	123
1963	6,597	824	149	418	140
1964	6,540	935	162	552	105
1965	6,554	941	141	577	102
1966	7,433	983	124	653	130
1967	6,658	1,182	150	662	141
1968	7,228	1,212	182	671	171
1969	7,584	1,244	118	680	191
1970	7,494	1,276	138	829	224
1971	7,527	1,308	140	1,019	221
1972	7,139	1,340	181	997	326
1973	8,037	1,372	259	1,148	436
1974	7,651	1,406	310	1,240	480
1975	8,519	1,406	391	1,312	594
1976	8,137	1,460	499	1,285	692
1977	8,554	1,484	567	1,205	847
1978	9,346	1,508	510	1,386	1,165
1979	9,099	1,532	437	1,525	846
1980	9,101	1,538	468	1,434	1,160
1981	9,023	1,579	617	1,567	1,270
1982	8,987	1,600	583	1,679	1,206
1983	9,298	1,603	577	1,688	1,368
1984	8,867		564	1,780	1,405

Source : OAE, Agricultural Statistics of Thailand,
various issues

Table 2-11: Production of Principal Crops

(1,000 tons)

Year	Rice	Rubber	Sugar cane	Maize	Cassava
1960	9,475	172	5,382	544	1,222
1961	9,886	186	3,984	598	1,736
1962	10,992	195	3,154	665	2,077
1963	11,585	198	4,733	858	2,111
1964	11,362	211	5,074	935	1,557
1965	10,978	217	4,480	1,021	1,475
1966	11,947	218	3,829	1,122	1,892
1967	9,625	219	4,526	1,315	2,062
1968	10,248	258	5,879	1,508	2,611
1969	13,410	282	5,102	1,700	3,079
1970	13,570	387	6,586	1,938	3,431
1971	13,744	316	5,926	2,300	3,114
1972	11,669	337	9,513	1,315	4,952
1973	13,886	368	13,339	2,339	5,668
1974	12,447	382	14,592	2,500	6,240
1975	14,092	349	19,910	2,863	8,100
1976	13,674	393	26,094	2,675	10,230
1977	12,335	431	18,941	1,677	11,840
1978	15,206	467	20,560	2,791	16,358
1979	14,646	534	12,827	2,863	11,101
1980	15,405	465	19,854	2,998	16,540
1981	15,758	508	30,200	3,449	17,744
1982	14,774	576	24,407	3,002	17,788
1983	16,943	594	23,869	3,552	18,989
1984	16,609		22,818	4,139	19,985

Source : OAE, Agricultural Statistics of Thailand,
various issues

Table 2-12: Yield of Major Crops

(100 kg/ha)

Year	Rice	¹ Rubber	Sugar cane (¹ 000 tons/ha)	Maize	Cassava
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1960	16.0	4.5	34.1	19.1	170.9
1961	16.0	4.7	32.1	20.1	173.7
1962	16.7	3.5	31.0	20.7	169.2
1963	17.6	3.6	31.7	22.1	150.8
1964	17.4	3.6	31.3	17.2	148.3
1965	16.8	3.7	31.7	18.2	144.8
1966	16.1	3.8	30.7	19.0	145.2
1967	14.4	3.6	30.2	22.0	146.4
1968	14.3	4.2	32.3	24.9	153.1
1969	17.7	3.8	43.2	25.0	161.3
1970	18.1	3.5	47.8	23.8	152.8
1971	18.2	3.4	42.5	22.5	140.6
1972	16.4	3.6	52.5	13.2	151.8
1973	17.2	2.9	51.6	20.4	130.0
1974	16.2	3.8	47.1	20.2	130.0
1975	16.6	3.5	50.9	21.8	136.2
1976	16.8	3.9	52.3	20.8	147.8
1977	14.4	3.9	33.4	13.9	139.8
1978	16.3	4.3	40.3	20.1	140.4
1979	16.1	3.8	29.4	18.8	131.2
1980	16.9	3.8	42.4	20.9	142.6
1981	17.4	4.0	48.9	22.0	139.7
1982	16.4	4.1	41.8	17.9	143.9
1983	18.2	4.2	41.4	21.1	138.8
1984	18.8		41.8	23.2	142.2

Source : OAE, Agricultural Statistics of Thailand,
various issues

¹

Note Averaged by tappable area

Table 2-13: Share of Major Export Crops in Agricultural Exports

(%)

Year	Rice	Rubber	Sugar	Maize	Tapioca Products	Other Agric.	Agric. Exports
1960	33.6	33.7	0.3	7.2	3.8	21.5	100.0
1961	40.8	24.2	0.3	6.8	5.1	22.9	100.0
1962	39.3	25.6	0.7	6.3	5.1	22.9	100.0
1963	41.2	22.9	1.7	10.3	5.3	18.6	100.0
1964	41.4	19.4	2.2	13.1	6.1	17.8	100.0
1965	39.9	18.4	1.3	9.2	6.2	24.9	100.0
1966	34.1	15.8	1.0	13.4	5.5	30.2	100.0
1967	42.1	14.2	0.7	12.9	6.6	23.5	100.0
1968	35.8	17.2	0.2	15.6	7.3	23.8	100.0
1969	26.7	24.1	0.7	16.0	7.9	24.5	100.0
1970	23.0	20.6	1.3	18.0	11.2	26.0	100.0
1971	23.3	15.3	3.7	18.3	9.9	29.4	100.0
1972	28.0	11.8	8.6	13.2	9.8	28.8	100.0
1973	15.9	20.2	5.1	13.1	11.2	34.4	100.0
1974	27.0	13.9	10.1	11.4	10.6	21.9	100.0
1975	16.5	10.3	16.9	16.6	13.6	26.1	100.0
1976	18.6	11.5	14.8	12.1	16.3	26.6	100.0
1977	25.8	11.9	6.3	6.3	14.9	26.7	100.0
1978	18.5	14.2	7.1	7.5	19.3	33.4	100.0
1979	21.6	17.1	6.8	7.7	13.7	33.0	100.0
1980	23.9	15.1	3.7	8.8	18.3	30.1	100.0
1981	25.9	10.6	9.4	8.1	16.1	29.8	100.0
1982	20.9	7.0	12.0	7.6	18.3	34.0	100.0
1983	21.2	12.4	6.7	8.9	16.2	34.6	100.0

Source : Calculated from Tables 2-6 and 2-14

Table 2-14: Export Value of Major Crops

(Millions of Baht)

Year	Rice	Rubber	Sugar	Maize	Tapioca Products	Other Agric.	Agric. Exports
1960	2,570	2,579	27	551	288	1,642	7,657
1961	3,598	2,130	27	599	446	2,017	8,818
1962	3,240	2,111	61	516	423	1,885	8,235
1963	3,424	1,903	138	857	439	1,549	8,310
1964	4,389	2,060	334	1,387	652	1,890	10,612
1965	4,334	1,999	138	1,003	676	2,709	10,860
1966	4,001	1,861	117	1,576	644	3,548	11,747
1967	4,653	1,574	75	1,431	726	2,595	11,054
1968	3,775	1,816	16	1,647	773	2,513	10,540
1969	2,945	2,663	81	1,767	876	2,704	11,036
1970	2,517	2,250	140	1,969	1,223	2,839	10,937
1971	2,910	1,906	467	2,286	1,240	3,661	12,470
1972	4,437	1,862	1,356	2,086	1,547	4,557	15,845
1973	3,594	4,573	1,161	2,969	2,537	7,796	22,629
1974	9,810	5,037	3,678	5,965	3,836	7,964	36,289
1975	5,581	3,467	5,696	5,615	4,594	8,797	33,750
1976	8,603	5,287	6,843	5,598	7,526	12,279	46,136
1977	13,383	6,156	7,458	3,286	7,716	13,821	51,821
1978	10,424	8,022	3,984	4,231	10,889	18,790	56,341
1979	15,592	12,328	4,899	5,567	9,887	23,772	72,046
1980	19,508	12,324	2,993	7,201	14,881	24,548	81,454
1981	26,366	10,832	9,588	8,236	16,432	30,401	101,856
1982	22,510	7,576	12,956	8,231	19,734	36,601	107,607
1983	20,100	11,739	6,325	8,386	15,370	32,786	94,706

Source : OAE, Agricultural Statistics of Thailand,
various issues

Table 2-15: Export Quantity of Major Crops

(1,000 tons)					
Year	Rice	Rubber	Sugar	Maize	Tapioca Products
1960	1,203	170	67	515	270
1961	1,576	185	92	569	443
1962	1,271	194	91	484	401
1963	1,418	187	90	768	240
1964	1,896	217	86	1,147	739
1965	1,895	211	215	831	719
1966	1,508	202	173	1,262	689
1967	1,482	211	77	1,146	781
1968	1,068	252	25	1,558	889
1969	1,023	276	99	1,545	975
1970	1,064	278	168	1,597	1,327
1971	1,581	308	386	1,886	1,123
1972	2,113	318	635	2,019	1,311
1973	849	391	275	1,506	1,836
1974	1,016	363	436	2,260	2,392
1975	906	332	595	2,072	2,384
1976	1,973	373	1,124	2,388	3,720
1977	2,946	401	1,656	1,518	3,954
1978	1,607	524	1,042	1,955	6,287
1979	2,797	520	1,287	1,988	3,961
1980	2,800	454	453	2,175	5,218
1981	3,032	473	1,120	2,547	6,266
1982	3,784	434	2,208	2,801	7,816
1983	3,543	522	1,526	2,646	5,199

Source : OAE, Agricultural Statistics of Thailand,
various issues

Table 2-16: Implicit Export Price of Major
Crop Production

(baht/ton)					
Year	Rice	Rubber Products	Sugar	Maize	Tapioca Products
1960	2,136	15,171	403	1,070	1,067
1961	2,283	11,514	293	1,053	1,007
1962	2,549	10,881	670	1,066	1,055
1963	2,415	10,176	1,533	1,116	1,829
1964	2,315	9,493	3,884	1,209	882
1965	2,287	9,474	642	1,207	940
1966	2,653	9,213	676	1,249	825
1967	3,140	7,460	974	1,249	817
1968	3,535	7,206	640	1,057	793
1969	2,879	9,649	818	1,144	660
1970	2,366	8,094	833	1,233	922
1971	1,829	6,188	1,210	1,212	1,104
1972	2,100	5,855	2,135	1,033	1,180
1973	4,233	11,696	4,222	1,971	1,382
1974	9,656	13,876	8,436	2,639	1,604
1975	6,160	10,443	9,573	2,710	1,927
1976	4,359	14,174	6,088	2,344	2,023
1977	4,543	15,352	4,504	2,165	1,951
1978	6,487	15,309	3,823	2,164	1,732
1979	5,575	23,708	3,807	2,800	2,497
1980	6,967	27,145	6,607	3,311	2,853
1981	8,696	22,901	8,561	3,234	2,625
1982	5,949	17,456	5,868	2,939	2,527
1983	5,673	22,489	4,145	3,169	2,959

Source : Calculated from Tables 2-14 and 2-15

Table 2-17: Average Growth Rates of Exports of Major Crops

	(% per annum)				
	Rice	Rubber	Sugar cane	Maize	Cassava
<u>A. Export Value</u>					
1960-1970	-0.2	-1.4	17.9	13.6	15.6
1970-1980	22.7	18.5	35.8	13.8	28.4
1980-1983	1.0	-1.6	28.3	5.2	1.1
1960-1983	9.4	6.8	26.8	12.6	18.9
<u>B. Export Quantity</u>					
1960-1970	-1.2	5.1	9.6	12.0	17.3
1970-1980	10.2	5.0	10.4	3.1	14.7
1980-1983	8.2	4.8	49.9	6.8	-0.1
1960-1983	4.8	5.0	14.5	7.4	13.7

Source : calculated from Tables 2-14 and 2-15

Table 2-18: Index of Relative World Prices of Rice and
Major Crop Products

(1970=100)

Year	Rice price to Sugar price	Rice price to Maize price	Rice price to Tapioca products' price
1960	187	104	78
1961	274	113	88
1962	134	125	94
1963	55	113	51
1964	21	100	102
1965	125	99	95
1966	138	111	125
1967	114	131	150
1968	194	174	174
1969	124	131	170
1970	100	100	100
1971	53	79	65
1972	35	106	69
1973	35	112	119
1974	40	191	235
1975	23	118	125
1976	25	97	84
1977	36	109	91
1978	60	156	146
1979	52	104	87
1980	37	110	95
1981	36	140	129
1982	36	105	92
1983	48	93	75

Source : Calculated from Table 2-16

Table 2-19: Farm Price of Major Crops

Year	Rice (baht/ton)	Sugar cane (baht/ton)	Maize (baht/kg)
1972	1,235.80	126.75	0.86
1973	1,955.10	187.34	1.35
1974	2,105.17	275.98	2.06
1975	1,947.84	288.10	1.86
1976	1,844.22	287.78	1.67
1977	2,322.84	287.91	1.64
1978	2,186.97	267.18	1.61
1979	2,609.28	387.31	2.09
1980	3,067.97	635.82	2.43
1981	2,836.10	477.70	2.18
1982	2,849.97	467.00	2.01
1983	2,824.00	342.14	2.40

Source : OAE, Agricultural Statistics of Thailand,
Crop Years 1982/83 and 1983/84

Table 2-20: Relative Price Index of Rice to Sugar cane and Maize
(1972=100)

Year	Sugar cane		Maize	
	Farm price	Export price	Farm price	Export price
1972	100	100	100	100
1973	107	100	101	105
1974	78	114	71	180
1975	69	66	73	111
1976	66	71	77	92
1977	83	103	98	103
1978	84	171	95	147
1979	69	149	87	98
1980	50	106	88	104
1981	61	103	91	132
1982	63	103	99	99
1983	85	137	82	88

Source : Calculated from Table 2-19

CHAPTER 3

ANALYSIS OF STRUCTURAL CHANGES IN THE THAI ECONOMY

A brief review of literature of some of the models used to analyse the economic adjustment to exogenous shocks is presented in section 3.1, followed by a discussion, in section 3.2, on the analytical model used for studying the structural changes in the Thai economy, in a general equilibrium framework. We discuss, in section 3.3, the economic adjustment to certain government policies and exogenous shocks to the economy. Empirical evidence is provided, where possible, to supplement the analysis. And section 3.4 summarizes major conclusions of the analysis.

3.1 Review of Literature on Economic Adjustment to Exogenous Shocks

The main purpose of this study is to analyse the impact of exogenous factors and government policies, in terms of both their direct and indirect impacts on the agricultural sector, in the growth process of the Thai economy.

Analysis of the effects of the industrial protection policy, agricultural pricing policy in Thailand and some exogenous shocks to the economy have been carried out in many studies (see, e.g. Akrasanee (1975), Puapanichya and Sriswasdilek (1981), Akrasanee and Ajanant (1983) and Panayotou (1985)). These studies usually emphasized only the direct effects of government policies and other changes, as they were based on a partial equilibrium approach. But indirect effects caused by the changing interrelationship of various sectors over time may also be important. This study attempts to analyse both the direct and indirect effects of

these major changes on the traditional agricultural sector using a general equilibrium approach.

During the 1970s, there has been a substantial growth of literature on the analysis of economic adjustment to exogenous shocks. The more recent literature has focussed on the general equilibrium effects of a boom in a sector producing traded goods in an open economy. This is usually referred to as 'Booming Sector and Dutch Disease Economics'. Booming Sector models such as those discussed in Corden and Neary (1982) and Corden (1984), have generally been used to analyse the intersectoral effects of a boom industry, such as the discoveries of a new resource in an open economy. The cases usually discussed in the literature include the adverse effects of the discoveries of natural gas in the Netherlands on Dutch manufacturing, the North Sea Oil on British manufacturing and the minerals discoveries in Australia. However the basic analysis is applicable to many kinds of structural changes. The study 'Malaysian Structural Change and Its Impact on Rubber' by Barlow et al. (1985) analyses, in this framework, the impacts of major changes in the Malaysian economy, such as the sudden emergence of the petroleum sector, the sustained expansion of the manufacturing and service sectors and the emergence of the palm oil as the main competing crop in the traditional rubber industry.

3.2 An Analytical Model of Structural Changes in Thailand

Although there has not been an obvious sudden boom in any sector of the Thai economy, there has been a rapid expansion of the manufacturing sector relative to other sectors in the economy during the past 25 years. Part of the manufacturing sector expansion has been induced by foreign capital flows into this sector. Below we analyse, in a general equilibrium framework, some likely effects of this manufacturing boom on the traditional agricultural sector. Other important effects on the Thai

economy have been associated with the vast expansion in cultivable land brought about by the development of a road network, especially during the Vietnam War, changes in the international terms of trade and certain government policies.

The basic model used in our analysis is a variant of the 'core model' discussed in detail in Corden and Neary (1982), and Corden (1982 and 1984). There are 3 sectors in the economy: agricultural and manufacturing sectors producing tradeable goods and a non-tradeable service sector. Tradeables can be imported or exported, while non-tradeables are produced and consumed domestically. With the small country assumption, world prices of tradeables produced in the first two sectors are given. Domestically produced goods are assumed to be perfect substitutes for imports of the corresponding goods produced abroad. We assume that there are 3 factors of production: unskilled labour, which is mobile between sectors; land, which is specific to agriculture; and capital (including skilled labour), which is specific to a particular sector. In this kind of model, the key effects arising from the rapid growth of the manufacturing sector will be as follows.

3.2.1 'Resource pull' effect

The rapid expansion of the manufacturing sector requires extra inputs and will bid up prices of those factors employed in this sector, especially wage rates of unskilled labour which is mobile between sectors; meanwhile, there will be negligible or no effect on the rent paid to land and capital, as manufacturing uses so little land relative to agriculture and capital is specific to manufacturing. The supply curve for the output of agricultural sector will shift upwards due to increased costs, to the extent that it competes for some of the inputs used in manufacturing (*ceteris paribus*), leading to a contraction of the agricultural sector or an expansion at a lower rate than what it would be otherwise. Evidence

given in the previous chapter shows that the share of manufacturing in GDP has increased, whilst the agricultural share in GDP has contracted. With regard to real wages, evidence in Table 3-2 below indicates a rising trend in the real wage index for every region during 1976-1981. The real wage rate in all other parts of Thailand (which produce mainly agricultural products) tended to rise at a much faster rate than the rate in Bangkok and nearby provinces (where most of the manufacturing plants are established) during the period. It seems that the growth of the manufacturing sector in Thailand has put some upward pressure on the real wage rate in all regions.

Table 3-1: Consumer Price Index by Region

(1976 = 100)

Year	Whole Kingdom	Bangkok	Central and East	North	Northeast	South
(weight	100.0	56.05	16.13	10.39	8.87	8.56)
1976	100.0	100.0	100.0	100.0	100.0	100.0
1977	107.6	108.4	107.0	106.7	105.7	106.0
1978	116.1	117.9	113.4	115.0	114.0	113.6
1979	127.6	130.0	125.0	124.1	123.3	125.2
1980	152.7	155.9	150.2	145.5	149.9	148.7
1981	172.1	176.8	167.2	162.8	169.1	164.4
1982	181.1	186.3	175.2	171.5	178.2	173.0
1983	197.9	192.6	181.6	180.0	188.2	178.4

Source: Department of Business Economics, Bangkok

The basic 3 sector model is inadequate to analyse changes within the agricultural sector. However, the general approach can also be used to study changes within this sector. This aspect may be important in the Thai case as there seem to be further adverse effects on the traditional industry in agriculture, such as the rice industry. More diversified new crops have been grown which have competed for land, labour and capital, hence, bidding up the price of factors used in agriculture. (The rapid

Table 3-2: Minimum Wage Rates and The Index in Real Terms

(baht/day)						
Period beginning	Bangkok and nearby Industrial Provinces		Central Plain and South		North and NorthEast	
1973 (Feb.)	12					
1974 (Jan.)	16					
1974 (June)	20		18		16	
1975 (Feb.)	25		18		16	
Fiscal year ¹						
1976	25	(100)	18	(100)	16	(100)
1977	28	(103)	21	(110)	19	(112)
1978	35	(119)	28	(137)	25	(136)
1979	45	(138)	38	(169)	35	(177)
1980	54	(139)	47	(174)	44	(186)
1981	61	(138)	52	(174)	52	(196)

Source: Bank of Thailand, Annual Economic Report,
various issues

Note : Real wage index, in parentheses, is deflated
by the corresponding CPI given in Table 3-1

expansion of cultivable land, in the past, should offset the upward pressure on the real price of land to some extent.) Evidence in Table 2-8 shows that the share of rice production in agriculture has been declining while the production of new crops such as sugar cane, maize and cassava have significantly increased their share in agriculture during the past two decades. The rapid expansion of these new crops have, as already pointed out, been facilitated by external demand, the rapid expansion of cultivable land and the low domestic rice price caused by the rice premium.

¹Beginning October 1

3.2.2 'Income and Spending' effects

The manufacturing boom, in both import substitution and export expansion, generates extra income which will be spent in the economy. Certain groups of people earn more income and tend to increase their spending, leading to increases in demands for tradeable and/or non-tradeable goods.

- (a) If the demand for tradeables rises, imports will increase and there will be a real depreciation of domestic currency, *ceteris paribus*. With the fixed exchange rate policy in Thailand, the baht will be overvalued and net foreign reserves will fall.
- (b) If the demand for non-tradeables increases, their prices will rise, and so will the prices of factors employed in the non-tradeable service sector. The gradual growth of the service sector in the Thai economy also has a 'resource pull' effect which might adversely affect the tradeable sectors through competition for factors. Moreover, if non-tradeables have a large component of imported intermediate content, import payments will rise and there will be a real depreciation of domestic currency. This 'exchange rate' effect is likely to be a smaller degree than the case discussed in (a), in which extra income is spent on tradeables.

A boom in manufacturing also generates extra revenue for the government through increased income tax, business and excise tax, and export tax gained from the increase in manufactured exports. The government may invest the additional revenue in new projects. If the project is of a labour-intensive nature intended, for example, to create more employment and to provide extra income to farmers in rural areas, income and spending effects similar to the ones discussed above will be set in motion. On the other hand, if the project is of a

capital-intensive nature, such as a large scale irrigation project which has a high import content, the exchange rate effect will be set in motion and cause another decline in the net foreign reserves with a fixed exchange rate regime.

Furthermore, the rapid expansion of the manufacturing sector means that more tradeables are produced and there is likely to be a real appreciation of domestic currency or an increase in net foreign reserves with a fixed exchange rate regime. This will have an adverse effect on the local export industries. On the other hand, increased import payments, as a result of rising demand for tradeables, will lead to a real depreciation of domestic currency (other things being equal). The actual outcome of the 'exchange rate' effects depends on the magnitudes of these forces.

The rapid expansion in the manufacturing sector over time, in comparison with the sudden boom in the discoveries of a new resource, means that there will be a much greater degree of the 'resource pull' effect and a much smaller degree of the 'exchange rate' effect in the former case than the latter, due to the greater investment (in relation to return) necessary to expand manufacturing (see the discussion in Forsyth 1985, pp. 2-11).

3.3 Economic Adjustment to Government Policies and Exogenous Shocks

Government policies are controllable but exogenous shocks brought about by changes in world markets, such as the oil price increases or a sudden decline or rise in the world prices of major export commodities of Thailand are not controllable. Given the openness of the Thai economy, changes in relative prices of exports and imports reflected in the country's terms of trade, tend to have significant effects on the economy. Changes in factor endowments and improvements in technology over time usually contribute positively to the growth of the economy. Below we

discuss the impact of certain government policies and changes in the country's terms of trade on the agricultural sector of the Thai economy.

3.3.1 Industrial Protection Policy

The deliberate use of tariff, tax and other protection measures have effectively protected Thai industries during the past 25 years. In the 1960s, a mild tariff was implemented to encourage import-substitution industries, particularly those producing consumer goods. From about 1972, the government industrial policy shifted toward export promotion, but import-substitution industries continued to receive assistance as evident in the higher tariff. The rates of protection have generally been higher for consumer goods than for intermediate and capital goods, as evident from Table 3-3 below.

Substantial government investment during the 1960s in building major highways linking different parts of the country to Bangkok provided some incentives to manufacturing by facilitating the distribution of manufactured goods from industrial plants clustered around Bangkok to other areas; as well as facilitating the transportation of raw materials, especially of agricultural type, produced in other regions of the country for use in the production process in many of these plants. In the 1960s, it was apparent that most government enterprises were run at a loss due to lack of business experience, inefficiency and sometimes corruption, hence, private domestic and foreign industrial enterprises were promoted (see Promsiri 1969, pp.51-52). The private sector has proved to be more efficient and has made substantial contributions to the rapid growth of the manufacturing sector in the Thai economy during the past two decades. Nonetheless, this seems to have been assisted, to a large extent, by strong protection and government infrastructure investment. As Siamwalla (1975a, p.38) has argued:

Very few of the industries can survive without tariff protection, although among these few there are admittedly some

Table 3-3: Average Rates of Protection

(%)

	Nominal Rates of Protection			Effective rates of Protection		
	1971	1974	1978	1971	1974	1978
Processed foods	50.9	5.8	9.0	205.9	-46.4	78.5
Beverages & tobacco	116.5	150.1	69.1	439.2	946.2	4.0
Construction materials	21.8	32.9	12.2	23.4	49.3	91.7
Intermediates I	11.4	0.3	14.8	15.3	-6.7	16.2
Intermediates II	36.1	30.0	19.2	50.3	75.4	55.3
Non-durable consumer goods	44.9	39.8	64.6	57.4	134.6	212.4
Consumer durables	45.0	48.2	57.3	93.2	136.2	495.6
Machinery	10.2	28.0	21.4	7.6	23.7	58.3
Transport equipment	58.8	37.9	80.5	146.5	135.0	417.2
All Industries	n.a.	30.8	27.3	87.2	18.6	70.2
All Industries excl. food, beverages and tobacco	n.a.	n.a.	36.4	44.2	45.9	90.3
Non-import-competing	71.2	34.6	50.8	175.0	39.7	99.6
Import-competing	33.6	24.8	35.7	56.1	44.8	85.9
Exports	-7.4	-6.5	-13.7	-24.3	-39.9	-40.3

Source : IBRD (1980), Industrial Development Strategy in Thailand,
Table 7, referred to in Mongkolsmai (1983)

very important industries, such as textiles, hotels, cement and glass. Even though the share of industry in the GNP expanded, it is doubtful if this result would hold if more realistic prices were used in the calculation of value added.

3.3.2 The Urban-bias in Agricultural Pricing Policy

It is widely believed that low crop yields in Thailand have been the result of the government urban-bias policy which has maintained the prices of farm products at relatively low levels to assist low-income urban consumers. This means that important inputs necessary for higher yields, such as fertilizers and other chemical products, are not adequately applied as farmers cannot afford the high prices for these inputs. The rice premium, discussed earlier at some length, is the most significant policy affecting the relative prices of agricultural products. In addition to the rice premium, a sugar premium was imposed in 1972, when the world price of sugar rose substantially due to a world food shortage in that year. The premium was reversed to become a subsidy when the world price of sugar fell below a certain level. Rubber is another agricultural product which is also subject to export duty, but the amount of rubber export duty is usually low. The point that should be noted about the price policy is that it has been biased against agriculture by keeping domestic prices of most agricultural products below world prices, with the burden borne by producers in terms of lower farm gate prices (see also Mongkolsmai 1983, pp.43-44).

3.3.3 Terms of Trade Effect

An important source of exogenous shocks to the Thai economy has been the international terms of trade. The effects of a changes in terms of trade can be briefly analysed as follows. Consider a deterioration in the terms of trade; i.e. the relative price of importables to exportables rises. Given a fixed exchange rate and a positive current account balance of the economy, this may lead to a deficit and the exchange rate becomes overvalued.

The terms of trade for Thailand has, as already mentioned, shown a declining trend since 1975 as the result of successive increases in its import prices relative to its export prices. Since the economy depends, to a large extent, on imports of energy and capital goods, as is evident in Table 3-5, the rising relative prices of imports and exports implies a larger trade deficit than otherwise. As import payments increase, there will be a depreciation in domestic currency with a floating exchange rate and the prices of tradeable goods will rise. With a fixed exchange rate in Thailand, the baht becomes overvalued and the country's net foreign reserves fall.

Table 3-6 shows that the foreign exchange reserves of Thailand, expressed as the percentage of GDP, have shown a declining trend since 1975. The Thai baht was pegged to the US dollar from about 1955-1978. It was then unpegged from the dollar and tied to a basket of currencies, but that policy was reversed in 1981 linking the baht once more to the dollar (see EIU 1984, p.7). A sequence of devaluations of the baht took place during the early 1980s as part of the government policy to ease balance of payments problems and to promote exports, but the devaluations did not seem to have any discernible effects. Table 3-7 shows that the balance of payments between 1970 and 1983 recorded deficits in both the trade and current account balances during the period. Despite the steady increase in export earnings, imports payments for oil with its rising price and the increasing volume of other imports were greater. The current account, in recent years, benefited to some extent from a flow of remittances from Thai people working in construction and services in Middle East countries. The deficits of both accounts, expressed as the percentage of GDP shown in Table 3-8, have been worsening since about 1977. The most recent devaluation of 14.8 per cent took place in November 1984, leading to an increase in the exchange rate of 27 baht per US dollar compared with 23 baht during 1982-1983, an analysis of the effects of this devaluation

still awaits further evidence. The net capital inflow, accounting for 1.6 per cent of GDP in 1970, increased steadily during the period and was particularly high between 1979 and 1981. It seems that the relatively large capital inflow in those particular years was due to increases in foreign borrowing (see Table 3-9) rather than foreign direct investment. The increased borrowing might have been required to pay for the rising price of imports relative to exports (deterioration in the term of trade) during the period. It should be noted that the capital account, which shows positive capital inflow was, in several years during 1970-1983, not enough to compensate for the higher deficits in the trade and current account balances.

3.4 Major Conclusions

The industrial protection policy, in particular tariff protection, initially helped, in accordance with the infant industry argument, the growth of the manufacturing sector in the Thai economy. It is widely argued that continuing industrial protection has resulted in the rapid development of home-market oriented and inefficient industries. The shift towards an export promotion policy, through various incentives, to correct for bias towards the home-market, however, were broadly confined to manufactured exports. These have adversely affected the traditional agricultural sector mainly through the 'resource pull' effect and the sector has been squeezed. Tax on agricultural exports, which is part of the urban-bias price policy, has caused further adverse effects, particularly by reducing the profits of rice farmers in relation to profits earned in other industries.

There has been an increasing concern, as expressed by the Bank of Thailand (the central bank) and the NESDB (the planning body), on the foreign trade position of the economy, due to the declining trend in the country's terms of trade during the last 10 years. Rising import prices,

relative to export prices for mainly agricultural products, have a direct effect on the traditional sector via the increased costs of imported machinery and fuels, as well as an indirect effect via the increasing relative prices of other consumer goods to agricultural products.

In the next chapter, we attempt to quantitatively assess the impact of some of the changes discussed above on the agricultural sector. This will enable an evaluation of their relative importance, and facilitate the deriving of implications for future policy.

Table 3-4: Imports by Economic Classification

(Millions of Baht)

Year	Consumer goods	Intermediates and Raw materials	Capital goods	Fuels and Lubricants	(Crude Oil)	Others	Total Imports
1970	5,378	6,725	9,731	2,329	1,198	3,206	27,009
1971	4,755	7,764	8,628	2,721	1,941	2,926	26,794
1972	5,725	9,131	9,783	3,115	2,432	3,121	30,875
1973	7,055	13,677	12,826	4,605	3,516	4,021	32,184
1974	8,380	18,370	19,808	12,571	10,382	4,915	64,044
1975	8,855	16,105	22,239	14,233	12,076	5,403	66,835
1976	9,418	20,216	19,405	16,695	13,857	7,143	72,877
1977	11,114	26,921	24,393	20,889	16,448	10,860	94,177
1978	12,942	29,598	31,317	22,851	16,527	12,191	108,899
1979	15,933	43,500	39,902	32,647	23,425	14,179	146,161
1980	19,286	45,312	46,075	58,733	39,304	19,280	188,686
1981	22,985	53,575	56,772	65,100	47,240	18,314	216,746
1982	22,783	48,596	47,778	60,765	45,053	16,694	196,616
1983	29,860	59,513	69,249	57,064	39,975	20,763	236,449

Source : Bank of Thailand, Annual Economic Report, various issues

Note : Fuels including Crude Oil

Table 3-5: Imports by Economic Classification

(%)

Year	Consumer goods	Interme- diates and Raw materials	Capital goods	Fuels and Lubricants	(Crude Oil)	Others	Total Imports
1970	19.9	24.9	34.7	8.6	(4.4)	11.9	100
1971	17.7	29.0	32.2	10.2	(7.2)	10.9	100
1972	18.5	29.6	31.7	10.1	(7.9)	10.1	100
1973	16.7	32.4	30.4	10.9	(8.3)	9.5	100
1974	13.1	28.6	30.9	19.6	(16.2)	7.7	100
1975	13.2	24.1	33.3	21.3	(18.1)	8.1	100
1976	12.9	27.7	26.6	22.9	(19.0)	9.8	100
1977	11.8	28.6	25.9	22.2	(17.5)	11.5	100
1978	11.9	27.2	28.8	21.0	(15.2)	11.1	100
1979	10.9	29.8	27.3	22.3	(16.0)	9.7	100
1980	10.2	24.0	24.4	31.1	(20.8)	10.2	100
1981	10.6	24.7	26.2	30.0	(21.8)	8.4	100
1982	11.6	24.7	24.3	30.9	(22.9)	8.5	100
1983	12.6	25.2	29.3	24.1	(16.9)	8.8	100

Source : Calculated from Table 3-4

Note : Fuels including Crude Oil

Table 3-6: Terms of Trade and Foreign Exchange Reserves

Year	Terms of	Foreign Exchange		Exchange
	trade	Reserves		rate
	(1975=100)	(m. US\$)	(% of GDP)	(baht/US\$)
1970	119	790	12.1	20.80
1971	101	736	10.6	20.80
1972	105	896	11.3	20.80
1973	138	1,132	10.8	20.62
1974	118	1,681	12.6	20.375
1975	100	1,605	10.9	20.379
1976	92	1,725	10.4	20.40
1977	88	1,735	9.0	20.40
1978	88	1,974	8.5	20.336
1979	91	1,794	6.6	20.419
1980	86	1,552	4.6	20.476
1981	75	1,671	4.6	21.82
1982	64	1,513	4.1	23.00
1983	71	1,560	3.9	23.00

Source : Bank of Thailand, Annual Economic Report,
various issues

Table 3-7: Balance of Payments

(Millions of Baht : Minus Sign Indicates Debit)

Year	Trade balance	Net Services	Net Transfer	Current account balance	Net Capital Inflow	SDRs	Errors	Overall Balance
1970	-12,258	6,041	1,012	-5,205	2,221	-	332	-2,652
1971	-10,065	5,404	904	-3,757	1,736	298	1,388	-335
1972	-8,885	6,583	816	-1,486	3,663	321	1,493	+3,991
1973	-10,802	6,836	2,969	-997	2,282	-	-421	+864
1974	-13,856	8,088	5,500	-268	6,708	-	1,572	+8,012
1975	-20,161	6,161	1,632	-12,368	7,755	-	1,755	-2,858
1976	-11,085	1,642	465	8,978	9,263	-	-368	-83
1977	-25,599	2,405	802	-22,392	13,967	-	887	-7,538
1978	-28,540	4,279	816	-23,445	14,858	-	-4,711	-13,298
1979	-47,053	3,239	1,224	-42,591	33,766	494	406	-7,925
1980	-57,984	11,144	4,276	-42,564	50,777	506	-3,540	+5,179
1981	-65,782	6,042	3,691	-56,049	55,130	488	2,962	+2,531
1982	-36,137	8,795	4,204	-23,138	38,345	-	-11,893	+3,314
1983	-89,128	16,724	6,377	-66,027	35,395	-	12,554	-18,078

Source : Bank of Thailand, Annual Economic Report, various issues

Table 3-8: Balance of Payments as the Percentage of GDP

(%)

Year	Trade balance	Net Services	Net Transfer	Current account balance	Net Capital Inflow	SDRs	Errors	Overall Balance
1970	-9.0	4.4	0.7	-3.8	1.6	-	0.2	-1.9
1971	-7.0	3.7	0.6	-2.6	1.2	0.2	1.0	-0.2
1972	-5.4	4.0	0.5	-0.9	2.2	0.2	0.9	+2.4
1973	-5.0	3.2	1.4	-0.5	1.1	-	-0.2	+0.4
1974	-5.1	3.0	2.0	-0.1	2.5	-	0.6	+3.0
1975	-6.7	2.1	0.5	-4.1	2.6	-	0.6	-1.0
1976	-3.3	0.5	0.1	-2.7	2.7	-	-0.1	-0.02
1977	-6.5	0.6	0.2	-6.0	3.6	-	0.2	-1.9
1978	-6.1	0.9	0.2	-5.0	3.2	-	-1.0	-2.8
1979	-8.5	0.6	0.2	-7.7	6.1	0.1	0.1	-1.4
1980	-8.5	1.6	0.6	-6.2	7.4	0.1	-0.5	+0.8
1981	-8.4	0.8	0.5	-7.1	7.0	0.1	0.4	+0.3
1982	-4.3	1.0	0.5	-2.7	4.5	-	-1.4	+0.4
1983	-9.6	1.8	0.7	-7.1	3.8	-	1.4	-2.0

Source : calculated from Table 3-7

Table 3-9: GDP and Foreign Borrowing 1970-1983

Year	GDP	Foreign Borrowing	
	(market prices)		
	1 (billions of baht)	2 (billions of baht)	3 (% of GDP)
1970	136.1	0.17	0.12
1971	144.6	0.22	0.15
1972	164.6	0.23	0.14
1973	216.5	0.21	0.10
1974	271.4	0.28	0.10
1975	298.8	0.57	0.19
1976	337.6	0.94	0.28
1977	393.0	1.42	0.36
1978	470.0	2.71	0.58
1979	556.2	4.81	0.86
1980	684.9	5.87	0.86
1981	786.2	7.61	0.97
1982	846.1	8.27	0.98
1983	924.3	9.29	1.01

Source : 1 NESDB, National Income of Thailand,
various issue

2 IMF, International Monetary Statistics 1984,
pp.448-49

3 calculated

CHAPTER 4

A COMPUTABLE GENERAL EQUILIBRIUM MODEL FOR THAILAND

The impact of the following changes, which are expected on the basis of the theoretical analysis, are quantitatively analysed in this study:

1. Substantial investment in road building led to an expansion of potentially cultivable land during the 1960s and the early 1970s. To what extent would the agricultural sector and the total output of the economy be affected by the absence of this expansion in the land endowment?
2. What were the effects of relative changes in factor endowments?
3. To what extent was the agricultural sector affected by a decline in the terms of trade?
4. How important was the trade policy impact on the production of tradeables and total output of the economy with regard to:
 - a substantial reduction in the rate of import tariff?
 - a substantial reduction in the rate of export tax, mainly imposed on exports of major crop products?

A simple computable general equilibrium (CGE) model for Thailand is developed in section 4.1 to perform the quantitative analysis. The Thai economy, in general, may be considered a competitive market economy and agents involved are usually responsive to price signals. The virtue of a CGE model for this analysis is that it works through the price mechanism in guiding the allocation of resources by allowing for flexible prices, in contrast to the fixed prices assumption in the traditional input-output models. Model results from the experiments performed on the CGE model are discussed in section 4.2.

4.1 Development of a Simple CGE Model for Thailand

The model employed to examine the impact of the changes listed above is a simple CGE model. Mathematical detail of the CGE model is not discussed here but can be found, for example, in Boadway and Treddenick (1978), or Mendoza et al (1983). The basic data used in the model are drawn, with some adjustments, from the 1975 social accounting matrix (SAM) for Thailand (see NESDB-IBRD, 1982). Tyers (1985) has developed a computer package for a SAM-based general equilibrium model, which he used to estimate effects on the rubber industry in Malaysia arising from the structural changes in the Malaysian economy. We apply this model, using the SAM data for Thailand, to perform the quantitative analysis of this study.

4.1.1 Model Description

From the analysis in the previous chapter, the economy is divided into the major 3 sectors. In the CGE model the agricultural and manufacturing sectors are further disaggregated and the economy is assumed to have six sectors: namely crops, other agriculture, minerals, light industry, heavy industry and services, and to have four separate homogenous factors: capital, labour, land and mineral resources. The latter two factors are used only in the production of crops and the mineral sector respectively. The ratio of income from capital to income from labour for each sector, in 1975, is calculated as follows:

Crops	0.21
Other agriculture	1.90
Minerals	1.41
Light Industry	0.34
Heavy Industry	1.20
Services	0.71

The above ratios indicate that crops and light industry were labour-intensive sectors, while heavy industry, minerals and other agriculture were capital-intensive sectors in the Thai economy. The

service sector was more capital-intensive than the former sectors and less capital-intensive than the latter sectors.

The 6 sectors are aggregates of the 17 activities in the SIAM 2 model (NESDB-IBRD, 1982). A detailed breakdown of these aggregates is given in Appendix III. The original 1975 aggregate SAM for Thailand is presented in Table 4-1. The reference SAM (1975) derived in Table 4-2 does not exactly conform with the aggregate SAM in Table 4-1, due to some adjustments made in order to incorporate the features and assumptions made in the CGE model used in our analysis, see also Tables II.1(a) and (b) in Appendix II, which compare the SIAM 2's SAM figures with the National Accounts of Thailand in 1975.

The CGE model can explore, quantitatively, the impact of changes in factor endowments and of changes in tax and tariff rate. There is no capital account in the model, so it is not a dynamic but a comparative static model. The interrelationships between sectors specified in the model ensure that its solutions, due to changes in certain parameters, are internally feasible and consistent. The solution of each experiment is obtained through a sequence of adjustments in the factor prices (iterative Walrasian adjustments) until an equilibrium is reached and the factor markets are clear.

A very good explanation of a social accounting matrix (SAM) and interpretations of its entries can be found in King (1981). In summary, each row records all income received by an institution, a sector, or other agent assigned to that row; and each column records all expenditures of the agent. By accounting convention, total expenditure of each agent is equal to its income, implying that each column sum is equal to the corresponding row sum. Figure 4-1 represents the schematic SAM used in this study. The reference SAM (Table 4-2) indicates that Thailand, in 1975, was a net exporter of crop and other agricultural products (the entries in rest of the world column on the right hand side of the Table)

and a net importer of the products of minerals, light industry and heavy industry (the entries in rest of the world row on the left hand side of the Table). Elasticities of world excess demand and excess supply for foreign trade are assumed to have large values, consistent with the small country assumption. Total export tax is the entry at the intersection of the institutions row and the rest of the world column; while the total import tariff is the entry at the intersection of the institutions row and the institutions column.

4.1.2 Assumptions

Apart from those features of the CGE model discussed above, the following assumptions are made (these are summarized from Tyers (1985, pp.3-4)):

- Perfect competition in all factor and product markets.
- Factor endowments (capital, labour, land and minerals resources) are exogenously determined.
- Each of the 6 sectors produces one homogenous product which is a perfect substitute for the corresponding traded product.
- A Cobb-Douglas production function is assumed for each sector and intermediate inputs are used in fixed proportions for a given level of output of each sector. Unit elasticities of substitution for primary factors are assumed in this function, intermediate inputs are not substitutable.
- Household, corporations and the government are combined into the aggregate of institutions whose income is derived from selling the factors they own.
- Consumers maximize their utility, for a given level of income, assuming Cobb-Douglas utility functions with unit income and price elasticities of demand.

Table 4.1 CONSOLIDATED SOCIAL ACCOUNTING MATRIX FOR THAILAND

(billions of baht)

Income to :	Expenditure by :						Rest of the World	Totals
	Factors	Institutions	Indirect tax	Capital a/c	Agric.	Mfg. & Minrls.		
Factors					98.79	38.52	130.34	267.62
Institutions	267.62	36.17	31.12					336.87
Indirect Tax					5.99	16.50	8.63	31.12
Capital Account		63.49						75.75
Agriculture		62.04		2.63	48.89	27.92	4.10	171.52
Manufacturing and Minerals		65.74		34.70	12.82	42.39	44.40	215.89
Services		109.21		38.41	1.97	29.12	29.61	223.16
Rest of the World		0.22			3.06	61.46	6.04	70.78
Totals :	267.62	336.87	31.12	75.75	171.52	215.89	223.16	70.78

Source: NESDB-IBRD (1982), calculated from Table I.1(ii), Table III.1(ii) and Table III.7(ii)

Figure 4-1 SCHEMATIC VERSION OF THE SOCIAL ACCOUNTING MATRIX

(Billions of Baht)

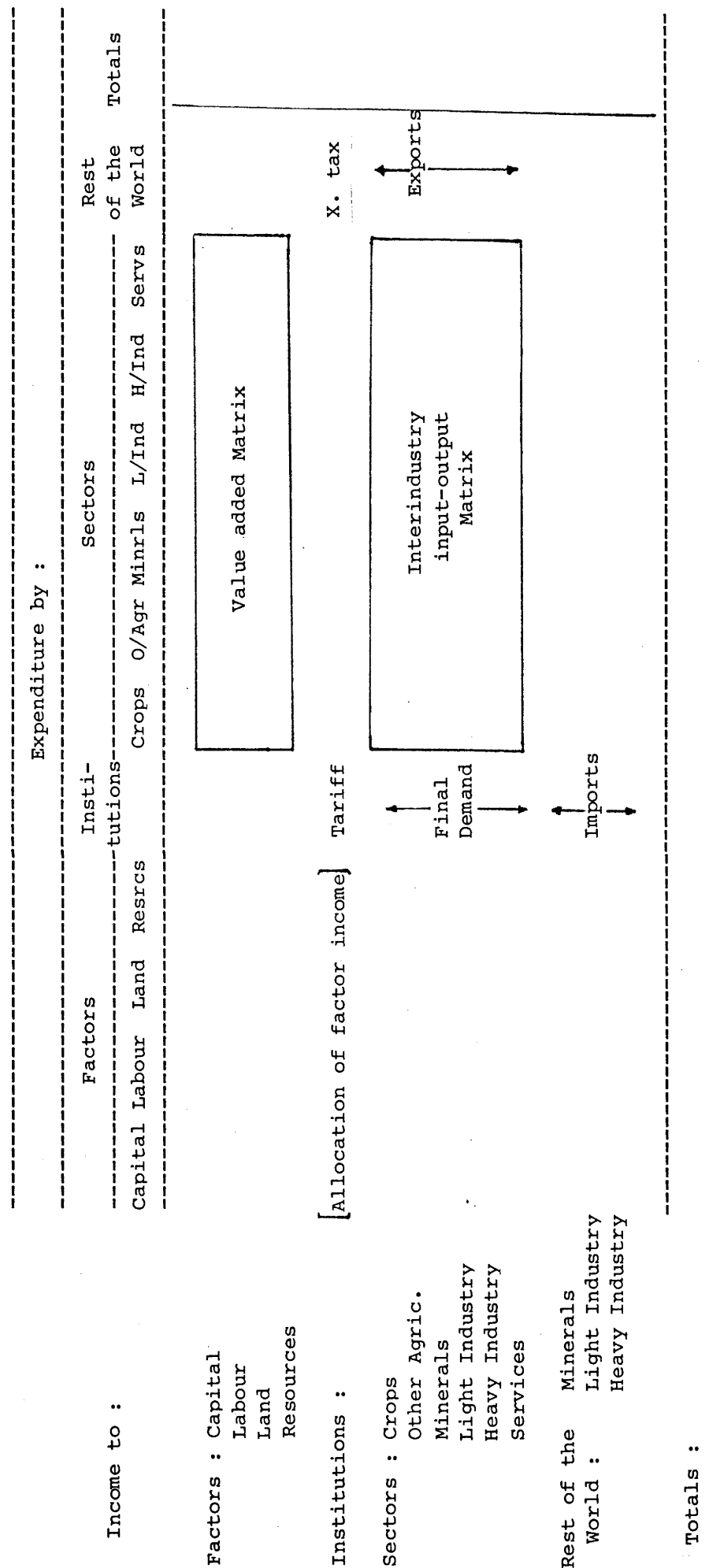


Table 4-2 SOCIAL ACCOUNTING MATRIX FOR THAILAND 1975 :

(Billions of Baht)

Expenditure by :												
Income to :	Factors		Insti- tutions		Sectors				Rest of the		Totals	
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind	Servs		World
Factors : Capital					13.55	14.05	7.70	11.57	14.61	60.12		121.60
Labour					65.52	7.41	5.46	34.02	12.22	84.94		209.57
Land					5.47							5.47
Resources							4.37					4.37
Institutions :	121.60	209.57	5.47	4.37	4.24						1.86	347.11
Sectors : Crops					67.87	43.70	2.55	0	18.67	0	3.59	27.37
Other Agric.					14.81	1.93	0.70	0.42	20.37	0	2.20	0.44
Minerals					4.89	0.02	0.03	2.64	1.15	12.12	4.44	25.29
Light Industry					83.78	0.60	6.26	0.08	16.00	2.99	26.14	135.85
Heavy Industry					31.02	3.96	1.94	0.86	2.72	9.45	19.74	69.69
Services					110.83	29.00	7.93	3.76	31.35	18.30	26.93	228.10
Rest of the												
World :					7.05							29.67
Light Industry					0.42							
Heavy Industry					22.20							
Totals :	121.60	209.57	5.47	4.37	347.11	163.75	40.87	25.29	135.85	69.69	228.10	29.67

- The rates of import tariffs and export taxes on tradeables (agricultural and manufacturing products) are exogenously determined and services are non-tradeable.
- The current account is assumed to be exactly balanced (no surplus or deficit), and the exchange rate is determined endogenously so as to achieve the current account balance.

4.2 Model Results

To explore the aspects of the changes listed in section 4.1, we proceed from the reference SAM to experiment with some parameter changes between 1975 and 1980. A set of results from these experiments is given in Tables 4-3 through 4-8. These results are expressed in terms of percentage changes in expenditure/income which accrues to the agents listed in the reference SAM in Table 4-2. The change in exchange rate, representing the change in the domestic price of foreign exchange, for each experiment is also given at the end of each table. It should be noted as Tyers (1985, p.5) points out that:

The version of the model on which these results are based does not evaluate the relative prices of products, factors and foreign exchange in terms of any predetermined numeraire. Nonetheless, the set of these prices at which equilibrium is attained are meaningfully interpreted only in relative terms.

Moreover the assumptions made about each factor being homogenous and mobile across sectors as well as the aggregates of sectors are very crucial. Model results should be cautiously interpreted bearing in mind the limitations of the assumptions made in the model.

4.2.1 Reduction in the Land Endowment

In the first experiment (Table 4-3), the land endowment was reduced by about 32 per cent (by assuming the expansion of the cultivated area at an arbitrarily annual rate of 2 per cent during 1960-1975, compared with the actual annual average rate of 4.6 per cent during that period). The adjustments that took place in order to clear the factor markets were:

	quantity change	price change
capital	0	0.2%
labour	0	-0.9%
land	-32%	40.3%
resources	0	3.6%

Had land area expanded more slowly up to 1975, then the crop sector would have been smaller proportion of GNP by 0.6% (see Table 4-9) and the land price in 1975 would have been higher by 40%. The wage would have been lower relative to the prices of both land and capital. Crop production declined by 4% and production of other agriculture, light industry and services, which used crop production as part of their intermediate input, declined somewhat relative to the reference SAM in Table 4-2. Crop exports and total exports declined by about 14%, the total output of the economy fell by only 0.8%, however. This was due, to a certain extent, to the increased output of minerals and heavy industry brought about by the increased inputs employed in these sectors which were released from the other sectors. It thus seems that although agriculture benefited from substantial investment in infrastructure, the growth of the economy would still be maintained if the investment were made elsewhere in the economy, e.g. in the heavy industry sector.

4.2.2 Changes in the Factor Endowments

Table 4-4 gives the results of a change in labour endowment relative to the 1980 figure representing an increase of 24.5%. Factor markets adjusted as follows:

	quantity change	price change
capital	0	13.6%
labour	24.5%	-6.7%
land	0	22.7%
resources	0	-3.1%

The increased labour (other things being equal) resulted in the expansion of the crop sector at a much higher rate than all the other more capital-intensive sectors and the price of labour fell relative to the prices of other factors. With the decreased wage rate, labour would lose while capital and land owners would gain from the relative factor price change. Total output increased by 16%. Crop exports and total exports expanded by more than 50% relative to the reference SAM in Table 4-2.

Proceeding to the experiment in Table 4-5, in which all the factor endowments were increased to the 1980 figures (see Table II.2 in Appendix II) we obtain the following changes in the factor markets:

	quantity change	price change
capital	68.4%	-13.5%
labour	24.5%	10.0%
land	8.6%	7.0%
resources	64.0%	16.7%

Capital accumulated at a higher proportionate rate than the growth of the labour force between 1975 and 1980, leading to a fall in relative prices of capital and labour. Given fixed factor-income proportions in all

sectors of the economy, increased capital endowment relative to labour endowment tended to have adverse effects on the (labour-intensive) crop sector, by absorbing most of the increased labour to be used in combination with the increased capital in the more capital-intensive sectors. The results follow the Rybczynski¹ theorem (see, for example, Staley 1970, pp30-31, Jones 1979, pp. 79-81, Caves and Jones 1973, pp. 113-114); with increased capital relative to labour, the relative cost of producing capital-intensive goods would be lower and its production would expand while production of the labour-intensive sector would decline. Table 4-5 also shows that crop exports and total exports declined substantially relative to the reference SAM. With decreased total exports, total imports fell correspondingly, particularly those of heavy industry and mineral products. The increase in all factor endowments to the 1980 level resulted in an increase in total output of 38.3% and the increase in labour endowment alone led to an increase in total output of 15.7%. A set of experiments, changing one factor endowment at a time to the 1980 level, was performed and the decomposition of the changes in total output due to each factor was obtained as follows:

	quantity change	total output change
capital	68.4%	21.8%
labour	24.5%	15.7%
land	8.6%	0.2%
resources	64.0%	0.8%

The changes in land and resource endowments had little impact on the total output of the economy relative to the changes in capital and labour endowments. Moreover, the change in labour tended to have a larger impact

¹presented in T. N. Rybczynski, "Factor endowment and Relative Commodity Prices", *Economica*, XXII, No.4, November 1955, pp.336-341

on total output than a similar proportionate change in capital. The caveat noted about the results is that changes in the price of foreign exchange varied in these experiments. Further experiment with a 1% change in capital led to a change in total output of 0.3%, implying an incremental capital output ratio (ICOR) of 3.3, i.e. a marginal increase in total output by 1 unit would require an increase in capital by 3.3 unit. This value is close to the average for newly-industrialised middle-income countries (see Naya et al., 1984).

4.2.3 Terms of Trade

Unfortunately the effects of the deterioration in the terms of trade discussed in subsection 3.3.3 could not be analysed here as the model, in its present version, can not handle large changes in some parameters. Substantial changes in the terms of trade would require changes in relative price of imports to exports in such a way that the direction of trade would have to be reversed. For example, with the actual increase in world price of mineral imports, the model would rather export than import its products. Moreover, as oil and other mineral imports were aggregated into one sector, a large proportion of imported oil could not be differentiated from local mineral products in this model. Due to time constraints the appropriate modification to the model was not made.

4.2.4 Trade Policy

Table 4-6 shows the results of an experiment with a 25% reduction in the tariff rates imposed on the imports of the following products:

	original rate	new rate
minerals	2.0%	1.5%
light industry	25.0%	18.8%
heavy industry	18.0%	13.5%

Imports of manufactured products rose substantially (c.f. Table 4-2) while the local manufacturing sector, especially heavy industry, contracted. Mineral imports fell somewhat due, probably, to the contraction of the heavy-industry sector, which had a relatively large imported content (particularly oil imports). Production of crops and other agriculture increased by 8.2% and 0.5% respectively and total exports rose by 35%. Total output increased by 0.4% and the exchange rate adjusted upwards by 1.7% implying a real depreciation, as a result of the tariff reduction.

Table 4-7 shows results of an experiment with a 25% reduction in the rate of export taxes on the following products:

	original rate	new rate
crops	6.7%	5.0%
other agriculture	4.6%	3.5%

On the whole the results obtained in this experiment are in the same direction as the results shown in Table 4-6, but with smaller magnitudes. The crop sector expanded at a lower rate and the manufacturing sector contracted at a lower rate than the corresponding results in Table 4-6. Total exports rose by 12% and total output increased by 0.1%. Table 4-8 shows the results of an experiment with the removal of export taxes, the crop sector expanded and the manufacturing sector contracted at higher rates than the corresponding results in Table 4-6. Total exports rose by 47.6%, total output increased by 0.3%. The exchange rate adjusted downwards as a result of a reduction in or removal of export taxes.

We also experiment, using the same 25% reduced rates of import tariffs and export taxes relative to the 1975 structure, with the 1980 factor endowments, their impact on GNP in comparison with the relevant experiments above are summarized below:

	% change in GNP over initial 1975 figure	
<u>1975 factor endowments plus</u>		
1. -25% import tariff rates	0.4	
2. -25% export tax rates	0.1	
 <u>1980 factor endowments plus</u>		
3. original tax and tariff structure	38.3	
4. -25% import tariff rates	39.0	(0.7)
5. -25% export tax rates	38.6	(0.3)

These results indicate that trade liberalisation would have increased GNP and that a reduction in the rates of import tariff in 1975 would have led to a larger increase in GNP than a similar reduction in the rates of export tax in that year, other things held constant. The increase in GNP would be magnified if similar reduced import and export tax rates were applied in 1980, i.e. the potential loss to the economy of maintaining tariff and tax rates increased over the period. The above results show that GNP in 1980 would have increased by 0.7%, compared to 0.4% in 1975, if the same 25% reduced tariff rates were used, and 0.3% in 1980 compared to 0.1% in 1975 if the same 25% reduced export tax rates were implemented. However it should also be noted that different adjustments of the exchange rate took place in these exercises.

We may conclude that a move towards free trade would have tended to favour the agricultural sector by encouraging the expansion of crop production at the expense of manufacturing, especially heavy industry. The service sector, which is non-tradeable, was not effected to any significant extent by the trade policy. In these experiments, the exchange rate changed in the direction expected. A reduction in import tariff rates tended to have a larger positive effect on GNP than a similar reduction in export tax rates.

Table 4.3 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to a 32% reduction in land endowment)

(%)

Expenditure by :												
Income to :	Factors		Insti- tutions		Sectors			Rest of the		Totals		
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind		Servs	World
Factors : Capital					-3.0	-0.6	3.6	-0.9	6.7	-0.7	0.2	
Labour					-3.0	-0.6	3.6	-0.9	6.7	-0.7	-0.9	
Land					-3.0						-3.0	
Resources							3.6				3.6	
Institutions :	0.2	-0.9	-3.0	3.6	-17.9						-14.3	-0.8
Sectors : Crops					-0.8	0.6		0.7		0.7	-14.4	-3.6
Other Agric.					-0.8	-0.5	2.8	-0.4		-0.4	16.3	-0.5
Minerals					-3.2	-0.1	3.4	0.2	7.5	0.2		3.4
Light Industry					-0.7	-0.6	2.7	-0.4	6.8	-0.4		-0.4
Heavy Industry					14.2	-0.5	2.8	-0.4	6.9	-0.4		6.9
Services					-0.8	-0.7	2.6	-0.6	6.7	-0.6		-0.6
Rest of the					-0.8							-13.9
World :					-19.8							
					-18.5							
Totals :	0.2	-0.9	-3.0	3.6	-0.8	-3.6	-0.5	-0.4	6.9	-0.6	-13.9	

 $\Delta e = 0.5\%$

Table 4.4 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to a 24.5% increase in labour endowment)

	Expenditure by :								(%)
	Factors		Institutions		Sectors			Rest of the World	Totals
	Capital	Labour Land Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind	Servs	
Income to :									
Factors : Capital			22.7	19.8	-3.1	12.6	1.3	15.4	13.6
Labour			22.7	19.8	-3.1	12.6	1.3	15.4	16.1
Land			22.7						22.7
Resources					-3.1				-3.1
Institutions :	13.6	16.1	22.7	-3.1	52.2				15.7
Sectors :									
Crops			15.7	24.0	11.8	13.7		12.9	24.0
Other Agric.			15.7	29.8	16.9	19.0		18.1	16.9
Minerals			-34.7	28.3	15.6	17.7	-0.1	16.8	-3.3
Light Industry			16.0	25.4	13.0	15.0	-2.4	14.2	15.0
Heavy Industry			-16.9	28.5	15.8	17.8	0	17.0	0
Services			15.7	26.8	14.2	16.2	-1.3	15.4	15.4
Rest of the World :									
Minerals			50.0						
Light Industry			-22.6						
Heavy Industry			54.3						
Totals :	13.6	16.1	22.7	-3.1	15.7	15.0	0	15.4	52.2

Table 4.5 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to an increase in factor endowments to 1980 level)

(%)

Expenditure by :									
Income to :	Factors		Institutions		Sectors			Rest of the World	
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrcls	L/Ind	H/Ind
Factors : Capital					16.2	32.0	91.4	43.9	86.4
Labour					16.2	32.0	91.4	43.9	86.4
Land					16.2				
Resources							91.4		
Institutions :	45.6	36.9	16.2	91.4	-80.2				
Sectors : Crops					38.3	14.2	45.8	44.4	46.0
Other Agric.					38.3	6.8	36.4	85.1	36.5
Minerals					142.7	10.2	40.7	39.3	93.5
Light Industry					38.5	11.4	42.3	93.1	95.8
Heavy Industry					141.6	8.3	38.3	87.6	90.2
Services					38.3	9.7	40.1	90.1	92.7
Rest of the World :									
Minerals					-32.6				
Light Industry					2.5				
Heavy Industry					-84.0				
Totals :	45.6	36.9	16.2	91.4	38.3	14.2	36.4	90.9	90.2
								40.9	40.2
									-70.6

$\Delta e = 1.3\%$

Table 4.6 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to a 25% reduction in import tariff rate)

(%)

Expenditure by :

Income to :	Factors		Insti- tutions		Sectors			Rest of the World		Totals		
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind		Servs	
Factors : Capital	-2.1	1.0	8.5	1.8	17.3	8.5	0	1.8	-0.5	-22.4	-0.9	-2.1
Labour						8.5	0	1.8	-0.5	-22.4	-0.9	1.0
Land						8.5	0					8.5
Resources								1.8				1.8
Institutions :												0.4
Sectors : Crops						8.2	1.7		-0.2		0	8.2
Other Agric.						6.9	0.5	1.4	-1.3		-1.2	0.5
Minerals						7.3	0.9	1.7	-0.9	-22.1	-0.8	1.7
Light Industry						7.5	1.1	1.9	-0.8	-21.9	-0.6	-0.8
Heavy Industry						7.1	0.6	1.5	-1.2	-22.2	-1.0	-22.2
Services						7.2	0.8	1.7	-1.0	-22.1	-0.8	-0.8
Rest of the Minerals												
World : Light Industry												35.2
Heavy Industry												
Totals :	-2.1	1.0	8.5	1.8	0.4	8.2	0.5	1.7	-0.8	-22.2	-0.8	35.2

$\Delta e = -1.7\%$

Table 4.7 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to a 25% reduction in export tax rate)

(%)

Expenditure by :										
Income to :	Factors		Insti- tutions		Sectors			Rest of the World		Totals
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind	Servs
Factors : Capital					3.5	-0.1	-3.8	-0.1	-7.1	-0.2
Labour					3.5	-0.1	-3.8	-0.1	-7.1	-0.2
Land					3.5					
Resources							-3.8			
Institutions :	-0.8	0.5	3.5	-3.8	16.2				-15.1	0.1
Sectors : Crops					0.1	0.5		0.1		0.1
Other Agric.					0.1	0	-2.8	-0.4		-0.4
Minerals					4.0	-0.7	-3.5	-1.2	-7.7	-1.1
Light Industry					-0.1	0.2	-2.6	-0.2	-6.8	-0.1
Heavy Industry					-13.8	-0.1	-2.9	-0.5	-7.1	-0.5
Services					0.1	0.1	-2.7	-0.3	-6.9	-0.2
Rest of the Minerals					-2.5					
World : Light Industry					27.3					
Heavy Industry					16.6					
Totals :	-0.8	0.5	3.5	-3.8	0.1	3.3	0	-3.5	-0.2	-0.2
										12.2

$\Delta e = - 0.9\%$

Table 4.8 SOCIAL ACCOUNTING MATRIX FOR THAILAND (% changes due to the removal of export tax)

(%)

Expenditure by :												
Income to :	Factors		Insti- tutions		Sectors			Rest of the		Totals		
	Capital	Labour	Land	Resrcs	Crops	O/Agr	Minrls	L/Ind	H/Ind		Servs	World
Factors : Capital					14.1	-0.6	-14.2	-0.5	-28.0	-0.9	-3.3	
Labour					14.1	-0.6	-14.2	-0.5	-28.0	-0.9	1.9	
Land											14.1	
Resources					14.1		-14.2				-14.2	
Institutions :	-3.3	1.9	14.1	-14.2	63.6						0.3	
Sectors : Crops				0.3	13.4	2.1		0.1		0.4	13.4	
Other Agric.				0.3	11.1	0.1	-10.9	-1.9		-1.5	0.1	
Minerals				17.1	8.0	-2.8	-13.4	-4.7	-29.9	-4.3	-13.4	
Light Industry				-0.4	12.2	1.0	-10.0	-1.0	-27.2	-0.6	-1.0	
Heavy Industry				-54.3	10.7	-0.3	-11.3	-2.3	-28.2	-1.9	-28.2	
Services				0.3	11.7	0.6	-10.4	-1.4	-27.5	-1.0	-1.0	
Rest of the				-11.1								
World :				109.5							47.6	
				65.0								
Totals :	-3.3	1.9	14.1	-14.2	0.3	13.4	0.1	-13.4	-1.0	-28.2	47.6	

$\Delta e = -3.4\%$

4.3 Summary and conclusions

The valued added share in GNP of the results of the experiments discussed above are summarized in Table 4-9. A reduction in land endowment [(2) c.f. (1)] did not have any discernible effects on the structure of the economy. The increase in the capital endowment [(3) c.f. (1)] adversely affected the agricultural sector and assisted in the expansion of the manufacturing sector while the increased labour [(4) c.f. (1)] resulted in the opposite. A move toward free trade, either by a reduction in tariffs or export taxes, [(5), (6) and (7) c.f. (1)] would have favourable effects on the agricultural sector and adverse effects on the manufacturing factor. The share of the non-tradeable service sector was almost unaffected by any of the parameter changes experimented in this study.

When all the factor endowments are changed to the 1980 level [(8) c.f. (1)] agriculture's share in total output declined by 4.7%, accounting for most of the change that actually took place during 1975-1980 [(12) c.f. (11)]. The deterioration in the terms of trade during the period would have further negative impact on agriculture. However, the reduction in export taxes during the period would, to some extent, offset the adverse effect on agriculture caused by the changes in factor endowments and the terms of trade.

It should be emphasized that the comparison of the quantitative comparison above are subject to limitations and assumptions made in the model, such as that of full employment, the homogeneity of each factor and its perfect mobility across sectors. The factor endowments are exogenously determined in this model, however, some changes could be induced by certain government policies. While the model in its present version illustrates the potential value of this approach, its use in exploring real world problems in a dynamic economy like Thailand requires substantial modifications.

Table 4-9: Structure of the economy induced by certain changes

(%)						
Parameter Changes	Agric.	Minrls	L/Ind	H/Ind	Servs	Total
(a)						
(1) 1975 Reference	31.1	5.1	13.4	7.9	42.5	100.0
MODEL EXPERIMENTS:						
<u>Factor Endowment</u>						
(2) land -32%	30.5	5.4	13.3	8.4	42.4	100.0
(3) capital +68%	25.2	6.8	14.0	11.6	42.4	100.0
(4) labour +24%	32.9	4.3	13.1	7.0	42.7	100.0
<u>Government Policy</u>						
(5) -25% M. tariff	33.2	5.2	13.3	6.1	42.2	100.0
(6) -25% X. tax	32.0	4.9	13.4	7.3	42.4	100.0
(7) no X. tax	34.5	4.4	13.3	5.7	42.1	100.0
<u>Factor Endowments and Government Policy</u>						
(8) 1980 F.E.	26.4 (-4.7)	7.0	13.7	10.5	42.4	100.0
(9) 1980 F.E. plus -25% M. tariff	28.0 (-3.1)	7.0	13.7	9.1	42.2	100.0
(10) 1980 F.E. plus -25% X. tax	27.1 (-4.0)	6.8	13.7	10.0	42.4	100.0
Structure of GDP (National Income Account)						
Year	Agric. (b)	Non-agric.			GDP	
(11) 1975	30.4	69.6			100.0	
(12) 1980	24.9 (-5.5)	75.1 (+5.5)			100.0	

Note : 1. (a) and (b) are slightly different due to the inclusion of crop-related industries such as rice and other grains milling in agriculture instead of manufacturing in the former, this slight modification is part of the data adjustment made in the CGE model.

2. F.E. = Factor Endowments, M. = imports, X. = exports

3. Figures in parentheses represent the percentage changes of the corresponding value added share in total income between 1975 and 1980.

CHAPTER 5

CONCLUSIONS

This study examines the impact of exogenous shocks, including major government policies, on the agricultural sector of the Thai economy. During the past 25 years, the rapid expansion of the manufacturing sector, partly induced by a strong industrial protection policy, led to higher real wages and affected the agricultural sector adversely. The building of infrastructure, especially road building, opened up new land for cultivation and the area planted to new crops, in particular sugar cane, maize and cassava, expanded very rapidly. This was mainly in response to foreign-market demand. The area planted to rice, a traditional crop in Thailand, expanded only moderately in relation to these new crops, partly because of the rice premium which lowered its profitability for rice farmers. The international terms of trade have deteriorated in recent years due to an increase in relative prices of imports compared to exports. This had adverse effects on the economy and, in particular, the agricultural sector. Some of the policy implications derived from the results of this study are summarised in section 5.1 and the limitations of the study are noted in section 5.2.

5.1 Policy Implications

Some of the policy implications regarding the issues of structural change in the Thai economy examined in this study are summarized below:

1. Further expansion in the cultivable land may no longer be possible. But its expansion in the past seems to have been

important in lowering or maintaining the relative prices of land and labour. Increased crop production in the future may depend on raising crop yields. With the limitations inherent in the CGE model used in this study, changes within the crop sector have not been analysed, however, the evidence provided earlier indicates that the rapid expansion of sugar cane in the past was a response to favourable farm prices relative to rice, despite the higher export price of rice relative to sugar during the same period. This was mainly the effect of the rice premium. The removal or a substantial reduction in export taxes should result in more favourable farm prices for major crops, and this should assist in raising yields.

2. Increased capital is generally expected to have a larger impact on the GNP than increased labour in developing countries. The experiment on the CGE model results in the opposite outcome. This may be partly due to the full employment assumptions made in the model. In recent years, real wage rates in the Thai economy have risen relative to real interest rates (the price of capital) and this may be one of the major reasons for the growing mechanization in the Thai agriculture. The results obtained from the model are thus consistent with the direction of the relative price changes observed. This may imply that the comparative advantage of labour-intensive industries in the Thai economy may have been lessened in recent years because of rising real labour costs. The ICOR, estimated at 3.3 in 1975, is close to the average for newly-industrialised middle-income countries. A dynamic model where capital accumulation is endogenous would be more appropriate to address this issue.

3. Liberalization of the trade regime, i.e. the removal of import tariffs and export taxes, would have beneficial effects on the agricultural sector and lead to a contraction of the manufacturing sector. Past government policies have held back the growth in agriculture.

4. The service sector is not likely to be affected to any significant degree by changes in trade policy.

5.2 Limitations of the Study

The study is a first step in analysing, within a general equilibrium framework, the impact of government policies and exogenous shocks on the agricultural sector of the Thai economy. Rigorous analysis should be carried out using a more sophisticated model. This requires substantially greater work, but this study illustrates the possibilities of using a CGE model for this kind of analysis. As Dervis et al (1982, p.2) have pointed out:

Although theoretical reasoning and the insights gained from simplified abstract models must provide the starting point, more elaborate and "realistic" analysis is also required. Intelligent policy debate and policy formulation requires knowledge of the quantitative significance of the various mechanisms analyzed by theory. Furthermore, indirect effects of policies may escape intuition and thus the attention of theorists, whereas empirical modeling can reveal their presence and importance.

Given the severe time constraints, the model used in this study could not be modified to address a series of major issues with a great deal of realism. Many of the limiting assumptions of the model have been referred to in the discussion. In particular, the process of capital accumulation and growth is poorly handled by this type of model. However, the comparative static analysis, particularly relating to issues of government policies (such as trade policies) can be valuable guides to policy making once the model is appropriately adjusted. This remains a task for future research.

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APPENDIX I

Table I.1 GDP at Constant 1972 Prices, by Industrial Origin

Year	Agri.	Mining	Mfg.	Cons.	Elec.	Trans.	Trade	Bank	Housing	(Billions of Baht)		
										Public	Serv.	GDP
										Adm.		
1960	28.2	0.9	8.4	3.3	0.2	4.8	11.1	1.3	2.1	3.2	6.6	70.1
1961	29.1	0.9	9.2	3.5	0.3	4.9	11.9	1.5	2.1	3.3	7.0	73.9
1962	31.3	1.1	10.3	4.0	0.3	5.3	12.5	1.8	2.2	3.5	7.5	79.8
1963	34.1	1.1	11.3	4.4	0.3	5.5	13.7	1.9	2.2	3.8	8.0	86.5
1964	34.6	1.3	12.3	5.1	0.4	6.1	15.3	2.2	2.3	3.9	8.6	92.3
1965	35.9	1.7	14.2	5.7	0.5	6.4	16.2	2.6	2.4	4.3	9.6	99.5
1966	40.9	2.0	15.9	6.9	0.7	6.9	17.9	3.2	2.5	4.4	10.5	111.7
1967	39.8	2.2	17.9	8.2	0.9	7.6	21.2	3.7	2.6	4.8	11.4	120.4
1968	43.7	2.5	19.2	8.6	1.3	7.9	22.5	4.2	2.7	5.4	12.6	130.6
1969	47.0	2.6	21.8	8.7	1.4	8.4	23.8	5.0	2.8	5.9	13.5	140.9
1970	48.3	2.6	23.3	8.7	1.6	9.2	26.5	5.8	3.0	6.5	14.5	150.1
1971	50.5	2.9	25.2	7.7	1.9	9.4	27.2	6.6	3.1	7.0	15.7	157.1
1972	50.0	2.9	27.9	7.2	2.3	10.5	29.9	6.9	3.2	7.2	16.8	164.6
1973	56.2	2.7	31.6	7.2	2.6	11.3	31.4	7.6	3.3	7.7	18.6	180.1
1974	57.0	2.9	34.4	7.5	2.8	12.1	34.2	8.9	3.5	7.9	18.8	190.0
1975	62.1	2.5	36.8	8.5	3.2	13.4	35.8	9.6	3.6	8.4	19.7	203.5
1976	65.9	2.9	42.5	10.0	3.6	13.4	38.8	10.2	3.7	8.9	21.3	221.2
1977	65.5	3.5	48.1	12.0	4.1	14.5	41.2	11.6	3.8	9.6	23.3	237.2
1978	72.5	4.1	52.5	13.6	4.5	16.2	43.7	13.4	4.1	10.2	26.4	261.1
1979	71.4	4.5	57.8	14.5	5.2	17.7	45.5	15.6	4.3	11.6	28.8	276.9
1980	72.8	4.8	60.6	16.6	5.6	18.8	48.2	17.4	4.5	12.4	31.2	292.9
1981	77.7	4.6	64.5	15.5	6.3	20.2	51.1	19.2	4.7	13.2	34.2	311.3
1982	78.5	4.4	67.3	15.1	6.8	21.7	52.8	21.4	4.9	13.8	37.3	324.0
1983	81.4	4.4	72.3	15.9	7.3	23.3	55.1	24.2	5.2	14.5	39.3	342.9
1984	84.3	5.2	76.9	16.7	8.1	24.9	58.0	26.9	5.4	15.3	41.9	363.6

Source : NESDB

Table I.2 GDP at Constant 1972 Prices, by Agr. Subsector

(Billions of Baht)

Year	Crops	Live- Stock	Fish- eries	For- estry	Agr.	Non-agr.	GDP
1960	21.9	3.6	0.8	1.9	28.2	41.9	70.1
1961	22.5	3.7	0.9	2.0	29.1	44.8	73.9
1962	24.4	3.8	1.1	2.0	31.3	48.5	79.8
1963	26.6	3.9	1.4	2.2	34.1	52.4	86.5
1964	26.6	4.0	1.7	2.3	34.6	57.7	92.3
1965	27.3	4.1	1.9	2.6	35.9	63.6	99.5
1966	32.0	4.3	2.2	2.4	40.9	70.8	111.7
1967	29.5	4.8	2.9	2.6	39.8	80.6	120.4
1968	32.2	4.8	3.8	2.9	43.7	86.9	130.6
1969	34.5	5.0	4.6	2.9	47.0	93.9	140.9
1970	35.5	5.0	5.0	2.8	48.3	101.8	150.1
1971	36.9	5.6	5.0	3.0	50.5	106.6	157.1
1972	36.0	5.9	5.2	2.9	50.0	114.6	164.6
1973	41.7	6.3	5.3	2.9	56.2	123.9	180.1
1974	41.8	6.7	5.3	3.2	57.0	133.0	190.0
1975	45.6	7.4	5.7	3.3	62.1	141.4	203.5
1976	49.0	7.6	5.9	3.4	65.9	155.3	221.2
1977	46.8	8.1	7.5	3.1	65.5	171.7	237.2
1978	53.6	8.5	7.4	3.0	72.5	188.6	261.1
1979	51.8	8.9	7.3	3.4	71.4	205.5	276.9
1980	54.2	9.0	6.3	3.3	72.8	220.1	292.9
1981	58.5	9.5	6.8	2.9	77.7	233.6	311.3
1982	59.9	9.9	6.0	2.7	78.5	245.5	324.0
1983	61.9	10.3	6.6	2.6	81.4	261.5	342.9
1984	63.6	10.7	7.0	3.0	84.3	279.3	363.6

Source : NESDB

Table I.3 GDP at Constant 1972 Prices, by Crops

(Billions of Baht)

Year	Rice	Rubber	Sugar cane	Maize	Cassava	Other crops	All Crops
1960	12.3	0.7	0.8	0.5	0.4	7.2	21.9
1961	12.8	0.8	0.6	0.6	0.6	7.1	22.5
1962	14.6	0.8	0.5	0.6	0.7	7.2	24.4
1963	15.8	0.8	0.7	0.8	0.8	7.7	26.6
1964	15.1	0.9	0.7	0.9	0.6	8.4	26.6
1965	14.5	0.9	0.6	1.0	0.5	9.8	27.3
1966	17.6	0.9	0.5	1.2	0.7	11.1	32.0
1967	14.6	0.9	0.6	1.3	0.6	11.5	29.5
1968	16.2	1.1	0.6	1.4	0.7	12.2	32.2
1969	17.5	1.2	0.7	1.7	0.7	12.7	34.5
1970	17.6	1.3	1.1	1.9	1.1	12.5	35.5
1971	17.7	1.4	1.0	2.4	1.3	13.1	36.9
1972	15.4	1.5	1.6	1.3	1.6	14.6	36.0
1973	18.3	1.7	2.1	2.4	2.3	14.9	41.7
1974	17.6	1.7	2.3	2.7	2.2	15.3	41.8
1975	19.8	1.6	3.0	2.9	2.5	15.9	45.6
1976	19.5	1.8	4.1	2.7	3.6	17.3	49.0
1977	18.2	1.9	2.8	1.7	4.4	17.8	46.8
1978	21.4	2.1	3.2	2.9	5.3	18.7	53.6
1979	21.6	2.5	1.9	2.9	3.9	19.0	51.8
1980	21.0	2.2	3.0	3.1	5.8	19.1	54.2
1981	22.6	2.3	3.8	3.6	6.7	19.5	58.5
1982	22.1	2.6	6.7	2.8	6.1	19.6	59.9
1983	23.9	2.8	4.6	3.5	6.6	20.5	61.9
1984	23.8	2.9	5.0	4.0	7.1	20.8	63.6

Source : NESDB

Table I.4 GDP, GNP, NNP and per capita GNP at
current market prices

(millions of baht)

Year	1			2	Per Capita GNP (baht)
	Current Market Prices				
	GDP	GNP	NNP		
1960	53,984	53,885	46,448	26.39	2,042
1961	58,970	58,877	50,453	27.21	2,164
1962	63,793	63,695	54,333	28.05	2,271
1963	68,079	68,038	57,496	28.92	2,353
1964	74,667	74,589	62,203	29.82	2,501
1965	84,303	84,292	70,321	30.74	2,742
1966	101,375	101,366	80,050	32.00	3,168
1967	108,294	108,462	89,594	33.00	3,287
1968	116,774	117,046	95,345	34.04	3,438
1969	128,566	128,792	104,504	35.11	3,668
1970	136,060	136,439	110,390	36.22	3,767
1971	144,607	144,637	116,869	37.38	3,869
1972	164,626	164,299	133,676	38.58	4,259
1973	216,543	216,119	178,622	39.69	5,445
1974	271,368	272,166	222,128	40.78	6,674
1975	298,816	298,597	246,464	41.87	7,132
1976	337,635	336,374	278,895	42.96	7,830
1977	393,030	391,016	318,690	44.04	8,879
1978	469,952	464,550	378,389	45.10	10,300
1979	556,240	546,449	443,659	46.14	11,843
1980	684,930	672,440	550,327	46.46	14,475
1981	786,166	764,379	625,241	47.49	16,096
1982	846,136	819,760	670,207	48.49	16,906
1983	924,254	898,884	724,551	49.46	18,174
1984	991,752	960,405	767,165	50.40	19,056

Sources : 1. NESDB

2. United Nations, Demographic Yearbook,
1968, 1975 and 1983

Note : GNP = GDP + net factor income payment from
the rest of the World

NNP = GNP - Indirect tax less subsidy
- Provision for the consumption of
fixed capital

Table I.5 GDP, GNP, and per capita GNP at
constant 1972 prices

(millions of baht)

Year	Constant 1972 prices		Mid-year Population (millions) (baht)	Per capita GNP (baht)
	GDP	GNP		
1960	70,139	68,192	26.39	2,584
1961	73,856	71,802	27.21	2,639
1962	79,838	77,591	28.05	2,766
1963	86,544	84,153	28.92	2,910
1964	92,256	89,660	29.82	3,007
1965	99,544	96,789	30.74	3,149
1966	111,688	108,576	32.00	3,393
1967	120,389	114,612	33.00	3,473
1968	130,598	124,272	34.04	3,651
1969	140,941	136,677	35.11	4,007
1970	150,092	146,425	36.22	4,043
1971	157,088	157,927	37.38	4,225
1972	164,626	164,299	38.58	4,259
1973	180,146	179,751	39.69	4,529
1974	189,950	190,631	40.78	4,675
1975	203,514	203,339	41.87	4,856
1976	221,225	220,205	42.96	5,126
1977	237,173	235,598	44.04	5,350
1978	261,097	257,043	45.10	5,699
1979	276,907	269,897	46.14	5,849
1980	292,852	284,573	46.46	6,126
1981	311,270	298,284	47.49	6,281
1982	324,032	309,122	48.49	6,375
1983	342,946	328,886	49.46	6,649
1984	363,563	346,515	50.40	6,875

Source : NESDB

Table I.6 External Transactions and GNP in Current Prices

(Millions of Baht)

1				
Year	Exports	Imports	X.+ M.	GNP

1960	8,422	9,622	18,044	53,885
1961	9,717	10,287	20,004	58,877
1962	9,255	11,504	20,759	63,695
1963	9,420	12,803	22,223	68,038
1964	11,986	14,253	26,239	74,589
1965	12,641	16,185	28,826	84,292
1966	13,798	25,347	39,145	101,366
1967	13,798	22,187	35,985	108,462
1968	12,987	24,103	37,090	117,046
1969	14,101	26,891	40,992	128,792
1970	14,250	27,009	41,259	136,439
1971	16,683	26,794	43,477	144,637
1972	21,616	30,875	52,491	164,299
1973	31,146	42,184	73,330	216,119
1974	49,164	64,044	113,208	272,166
1975	47,504	66,835	114,339	298,597
1976	60,189	72,877	133,066	336,374
1977	70,398	94,177	164,575	391,016
1978	81,252	108,899	190,151	464,550
1979	106,336	146,161	252,497	546,449
1980	130,436	193,618	324,024	672,440
1981	148,962	219,026	367,988	764,379
1982	156,269	197,170	353,439	819,760
1983	142,086	217,417	359,503	898,884

Source : Department of Customs and NESDB

1

Note : domestic products only, not include re-exports

Table I.7 Private Consumption Expenditure by
Commodity Group

	(millions of baht)			
	1960	1970	1980	1984 (est'd)
Food	26,314	44,822	67,210	78,816
Beverages	1,859	5,648	17,540	20,437
Tabacco	1,821	3,415	8,161	8,595
Clothing & personal effects	3,907	8,847	17,935	20,803
Rent & water charges	2,931	4,357	6,777	8,678
Fuel & light	1,895	3,711	6,028	7,514
Furniture & household equip.	928	3,490	8,098	10,597
Household operation	939	2,206	4,041	4,893
Health expenses	2,778	5,691	14,347	20,347
Transp. & Communication	3,155	7,202	15,710	20,926
Recreation & Entertainment	3,256	8,134	21,114	25,936
Miscellaneous services	679	1,425	2,860	4,156
Priv. domestic consumption	50,462	98,948	189,821	231,698
Expenditure of residents abroad	265	1,267	5,095	7,634
Less : Expenditure of non- residents in the country	-144	-2,237	-9,275	-14,717
Total	50,583	97,978	185,641	224,615

Source : NESDB

Table I.8 Prices and Interest

Year	WPI (1980 = 100, period average) ^a	CPI	Discount Rate (%) (End of Period)
1960	27.8	31.5	5.0
1961	30.1	33.9	5.0
1962	32.0	35.1	8.0
1963	30.0	35.1	8.0
1964	28.2	34.8	8.0
1965	29.0	34.9	7.0
1966	33.2	36.3	7.0
1967	35.7	37.9	7.0
1968	34.0	38.6	7.0
1969	35.2	39.5	11.0
1970	35.0	39.5	9.0
1971	35.1	39.6	9.0
1972	37.8	41.6	8.0
1973	46.5	48.0	10.0
1974	60.0	59.7	11.0
1975	62.2	62.9	10.0
1976	64.6	65.5	9.0
1977	69.7	70.4	9.0
1978	74.9	76.0	12.5
1979	83.3	83.5	12.5
1980	100.0	100.0	13.5
1981	109.5	112.7	14.5
1982	110.5	118.6	12.5
1983	112.8	123.0	13.0

Source : Bank of Thailand, Quarterly bulletin
various issues.

Table II.1(a) SIAM 2 Aggregated Social Accounting Matrix for Thailand 1975

(millions of baht)

	Institutions			Consolidated		Totals
	Factors	Household	Companies	Government	Capital	
					Activities	Row
Factors						
Households	219,147	21,449	210		267,697	-78 267,619
Companies	47,785	1,972	3,452			1,323 242,129
Government	687	3,639	5,444			647 41,536
Consolidated Capital a/c						
Commodities						
Activities						
Row						
Totals :	267,619	242,129	53,209	41,536	75,747	267,697 70,784

Source: NESDB-IBRD (1982), Table I.1(ii)

Table II.1(b) National Account of Thailand 1975

	(millions of baht)				
	Factors	Institutions Household Companies Governemnt	Consolidated Capital	Commodities Activities	Row Totals
Factors					
Households	239,124	1,472	210	267,697	-219 267,478
Companies	25,852	1,972	3,452		1,323 242,129
Governemnt	2,502	3,639	3,629	31,119	647 41,536
Consolidated Capital a/c					
	30,442	26,175	6,877		12,253 75,747
Commodities	205,887	30,963	75,747		57,014 369,611
Activities				267,697	267,697
Row		189	34	70,795	71,018
Totals :	267,478	242,129	31,276	267,697	71,018

Source: NESDB-IBRD (1982), Table I.1(ii)

Table II.2 Estimates of Factor Endowments, 1975 and 1980

	(1) Capital Stock (billion of baht)	(2) Labour force (in millions)	(3) Land (millions ha)	(4) Mineral index
1975	94.68	18.26	16.32	100
1980	159.40	22.73	17.72	164

- Source :
1. Capital stock in 1975 is the estimate in the SIAM 2 model (NESDB-IBRD, 1982) and the 1980 figure is obtained by assuming the same percentage change as the change in gross fixed capital formation (in constant prices) during the period (see Table II.3)
 2. ADB, Key Indications of DMCs of ADB, April 1984, pp.300-301
 3. calculated from OAE, Agricultural Statistics of Thailand, Crop Year 1983/84, Ministry of Agriculture and Co-Cooperatives, Table 111. Land Utilization by Region, 1975-1982, pp.186-187 (see Table II.4)
 4. This is a proxy, calculated from the value added of mining sector's product at constant 1972 prices. Due to a fall in the rising trend of the value of mineral products in 1975 c.f. 1974 and 1976 values, an adjustment is made and the above index actually represents the change from 1974-1980 which is the same as that from 1976-1980.

Table II.3 Gross Fixed Capital Formation

(millions of baht)

Year	Gross fixed Capital Formation			Gross fixed Capital Formation		
	(current prices)	%		(1972 prices)	%	
1960	53,984	7,555	(14.0)	70,139	10,772	(15.4)
1961	58,970	8,315	(14.1)	73,856	11,472	(15.5)
1962	63,793	10,093	(15.8)	79,838	13,640	(17.1)
1963	68,079	12,085	(17.8)	86,544	16,245	(18.8)
1964	74,667	14,519	(19.4)	92,256	19,916	(21.6)
1965	84,303	15,986	(19.0)	99,544	21,649	(21.7)
1966	101,375	20,364	(20.1)	111,688	26,455	(23.7)
1967	108,294	24,927	(23.0)	120,389	32,508	(27.0)
1968	116,774	27,477	(23.5)	130,598	35,405	(27.1)
1969	128,566	30,744	(23.9)	140,941	39,809	(28.2)
1970	136,060	32,726	(24.1)	150,092	39,951	(26.6)
1971	144,607	32,772	(22.7)	157,088	39,335	(25.0)
1972	164,626	34,607	(21.0)	164,626	34,607	(21.0)
1973	216,543	44,244	(20.4)	180,146	37,904	(21.0)
1974	271,368	59,109	(21.8)	189,950	42,140	(22.2)
1975	298,816	66,128	(22.1)	203,514	42,411	(20.8)
1976	337,635	73,272	(21.7)	221,225	45,119	(20.4)
1977	393,030	98,632	(25.1)	237,173	59,832	(25.2)
1978	469,952	116,650	(24.8)	261,097	64,184	(24.6)
1979	556,240	144,356	(26.0)	276,907	69,225	(25.0)
1980	684,930	177,099	(25.9)	292,852	71,432	(24.4)
1981	786,166	189,067	(24.0)	311,270	72,556	(23.3)
1982	846,136	179,898	(21.3)	324,032	64,732	(20.0)
1983	924,254	205,992	(22.3)	342,946	71,649	(20.9)
1984	991,752	223,492	(22.5)	363,563	72,631	(20.0)

Source : NESDB

Note : figures in parentheses are expressed as the percentage of GDP

Table II.4 Land Holding for Agriculture

(millions ha.)

Year	Housing area	Paddy land	Other crops land	Grass land	Idle land	Others	Total farm land
1960		6.21	2.05		0.84		10.02
1961		6.30	2.35		0.85		10.56
1962		6.37	2.58		0.81		11.04
1963		6.45	2.87		0.80		11.13
1964		6.54	3.17		0.79		12.19
1965		6.65	3.53		0.79		12.78
1966	n.a.	7.01	3.58	n.a.	0.74		13.14
1967		7.49	3.58		0.71		13.53
1968		8.05	3.61		0.69		13.98
1969		8.68	3.66		0.67		14.49
1970		9.39	3.71		0.66		15.08
1971	.42	10.16	3.81		0.65		15.90
1972	.41	10.48	4.09		0.62		16.57
1973	.41	10.75	4.49		0.60		17.50
1974	.41	10.89	4.64		0.54		17.67
1975	.45	11.40	4.92	0.08	0.73	0.38	17.95
1976	.44	11.41	5.12	0.07	0.66	0.41	18.10
1977	.43	11.44	5.40	0.05	0.50	0.39	18.21
1978	.42	11.72	5.53	0.06	0.47	0.44	18.63
1979	.40	11.66	5.86	0.08	0.48	0.34	18.82
1980	.40	11.77	5.95	0.08	0.49	0.34	19.04
1981	.40	11.76	6.26	0.12	0.54	0.33	19.41
1982	.41	11.72	6.64	0.12	0.62	0.26	19.77

Source : Office of Agricultural Economics, Bangkok

Note : break in series from 1975 because estimates
of earlier years have not been revised in
accordance with more recent data

APPENDIX III

Sector No.	Sector	Correspondence with Codes in Basic Input-Output Table of Thailand 1975
1	Crops	Paddy 001, Maize 002, other Cereals 003, Casava 004, Other Root Crops, Beans and Nuts 006, Vegetables 007, Fruits 008, Sugar Cane 009, Coconut 010, Oil Palm 011, Kenaf & Jute 012, Other Crops for Textile & Matings 013, Tobacco 014, Coffee & Tea 015, Rubber 016, Other Agricultural Products 017, Rice Milling 049, Tapioca Milling 050, Maize Milling 051, Flour and Other Grain milling 052, Sugar 055, Tobacco Processing 065, Tobacco Products 066, Rubber Sheets & Block Rubber 095
2	Other Agriculture	Cattle & Buffalo 018, Swine 019, Other Livestock 020, Poultry Products 022, Silkworm 023, Agriculture Services 024, Logging 025, Other Forest Products 027, Ocean & Coastal Fishing 028, Inland Fishing 029
3	Minerals & Energy	Charcoal & Firewood 026, Coal & Lignite 030, Petroleum & Natural Gas 031, Iron Ore 032, Tin Ore 033, Tungsten Ore 034, Other Non-Ferrous Metal Ore 035, Fluorite 036, Chemical Fertilizer 037, Salt 038, Limestone 039, Stone Quarrying 040, Other Mining & Quarrying 041, Non Ferrous Metal 107,
4	Light Industry	Slaughtering 042, Canning & Preservation of Meat 043, Dairy Products 044, Canning & Preservation of Vegetables 045, Canning & Preservation of Fish & Other Sea Foods 046, Coconut & Palm Oil 047, Animal Oil, Animal Fat, Vegetable Oil & By Products 048, Bakery Products 053, Noodles & Similar Products 054, Confectionary 056, Ice 057, Monosodium Glutamate 058, Coffee & Tea 059, Other Food Products 060, Animal Feed 061, Distilling & Spirits

Blending 062, Breweries 063, Soft Drinks & Carbonated Water 064, Spinning 067, Weaving 068, Textile Bleaching & Finishing 069, Made Up Textile Goods 070, Knitting 071, Wearing Apparel 072, Carpets & Rugs 073, Jute Mill Products 074, Tanneries & Leather Finishing 075, Leather Products 076, Footwear, Except of Rubber 077, Sawmills 078, Wood & Cork Products 079, Wood Furniture & Fixtures 080, Pulp, Paper & Paper-board 081, Paper & Paper-board Products 082, Printing & Publishing 083, Basic Industrial Chemicals 084, Fertilizers & Pesticides 085, Synthetic Resins, Plastics & Artificial Fiber Material, Excluding Glass 086, Paints, Varnishes & Lequers 087, Drugs & Medicines 088, Soap & Cleaning Preparations 089, Cosmetics 090, Matches 091, Other Chemical Products 092, Tyres & Tubes 096, Other Rubber Products 097, Plastic Ware 098, Ceramics & Earthenware 099, Glass & Glass Products 100, Structural Clay Products 101, Cement 102, Concrete & Cement Products 103, Other Non-Metallic Products 104, Scientific Equipment 129, Photographic & Clocks 131, Jewelry & Related Articles 132, Recreational & Athletic Equipment 133, Other Manufactured Goods 134

5 Heavy Industry

Petroleum Refineries 093, Other Petroleum Products 094, Secondary Steel 105, Iron & Steel Products 106, Cutlery & Hand Tools 108, Metal Furnitures & Fixtures 109, Structural Metal Products 111, Engines & Turbines 112, Agricultural Machinery 113, Wood & Metal Working Machines 114, Special Industrial Machinery 115, Office & Household Machinery & Appliances 116, Electrical Industrial Machinery & Appliances 117, Radio, Television & Communication Equipment and Apparatus 118, Household Electrical Appliances 119, Insulated Wire & Cable 120, Electric Accumulators & Batteries 121, Other Electrical Apparatus & Supplies 122, Ship Building & Repairing 123, Railroad Equipment 124, Motor Vehicles 125, Motorcycles & Bicycles 126, Repair of Vehicles 127, Aircraft 128

6 Services

Electricity 135, Gas 136, Water Works & Supplies 137, Residential Building Construction 138, Non-Residential Building & Construction 139, Public Works for Agriculture & Forestry 140,

Construction & Electric Plants 142,
Construction & Communication Facilities
143, Other Construction 144, Wholesale
Trade 145, Retail Trade 146, Restaurants
& Drinking Places 147, Hotels & Places
of Lodging 148, Railways 149, Road
Passenger Transport 150, Road Freight
Transport 151, Land Transport Services
152, Ocean Transport 153, Coastal &
Inland Water Transport 154, Water
Transport Services 155, Air Transport
156, Other Services 157, Storage &
Warehousing 158, Post & Telecommunica-
tions 159, Banking Services 160, Life
Insurance Services 161, Other Insurance
Services 162, Real Estate 163, Business
Services 164, Administration 165, Sani-
tary & Similar Services 166, Education
167, Research 168, Hospitals 169,
Business & Labour Associations 170,
Other Community Services 171, Motion
Picture Production 172, Movie Theatres
173, Radio, Television and Related
Services 174, Amusement and Recreation
176, Repairs Not Elsewhere Classified
177, Personal Services 178, Other
Services Not Elsewhere Classified 179