



SECTORAL OUTPUT AND EMPLOYMENT PROJECTIONS FOR THAILAND: 1980-1985

3.1 Introduction

In economic planning, various kinds of models are used to describe the economy and to predict the effects of instrumental variables. There are two theoretical frameworks which economy-wide models are usually built:^{1/} (1) macro economic simultaneous equation models which are estimated by regression analysis of time series data, and (2) input-output models. The two approach are often contrasted in terms of their high degree of disaggregation while regression models must be restricted to macro-economic aggregates. However, this distinction may be over emphasized, for input-output models are often used at a very aggregated level and there are certainly many large simultaneous equation regression models.

Another distinction that is often made is that input-output models do not include policy variables such as exchange rates, taxes or tariffs which are usually included in macro - economic models. Yet the two approach are certainly not independent since the solution of an input-output sectoral model can be aggregated to yield macro-economic forecasts. The two approaches are logically

^{1/} Robertson Sherman, Byung-Nak Song, 'A Dynamic Input-Output Model of the Korean Economy', Princeton, N.J., Princeton University, 1972.

interrelated and, indeed, there are good reasons to make them more closely linked by attempting to incorporate behavioral relations into the input - output model.

The study is aimed at providing projections of output and employment for the various sectors of Thailand under alternative assumptions about the rate of growth of the gross domestic product. This implies a certain pattern of growth of the "key" macro variables-consumption, investment and exports - as well as knowledge of the structure of the Thailand economy and of its output. The projections are made from 1971 for 1980 and 1985.

The methodological framework of this study is input - output analysis. The advantages of the input-output method are that it takes account explicitly of the interrelationships between sectors and it also ensures consistency between the outputs of the various sectors. The input-output model will be combined with the macro-economic variables shows the sectoral contribution to these aggregates.

In order to provide an adequate basis for a meaningful consideration of development programs and policies; macro-economic projections must be complemented by sectoral projections and other key-industries studies. A characteristic feature of sectoral planning is that it brings out explicitly the various competing alternatives and aids in selecting the best in relation to a given set of development objectives. Sectoral planning is useful

also in adapting planning to a comprehensive analysis of the economy in that the linkages among the industries can be traced and the interdependence among various branches economy can be properly examined.

3.2 Main Characteristic of the Economy of Thailand

The development strategy during the First and Second Plans (1961-1971) has given investment priority to the infrastructural services such as the construction of highways, irrigation facilities and power systems leading to the increase in the high growth rate of production at an average rate of about 7 per cent per annum during 1961-1971. The Third Plan (1972-1976) development strategies stressed on income distribution policy and attached greater emphasis on social development. During the Third Plan period, the instability monetary system and the increase of crude oil price brought about inflation and recession to Thai economy which led to the slowdown in the growth rate of GDP in real terms by 6.2 per cent per annum. It is envisaged that the gross domestic product during the Fourth Plan will increase at an average annual growth rate of 7 per cent and aim at creating new jobs to keep pace of the increase in the country's labor force. The aim is to raise up the increase in the number of persons employed to increase from 18.5 million people in 1977 to 20.4 million people in 1981. Subsequently, 2.2 million new jobs will have to



be created during the Fourth Plan period.^{2/}

The most striking feature of Thailand's growth pattern over the past two decades (1960-1979) has been the sustained growth of the agricultural sector. Most of the growth of agricultural production can be explained by the expansion of land under cultivation at about 4 % per annum until the mid 1970s. The availability of additional land to bring into holdings is now rapidly diminishing in most parts of the country. Cash crops, such as maize, cassava, sugar and pineapples, have expanded rapidly and reduced the dependence on rice as the principal crop for sale and export. During the 1970s, production increased faster than domestic demand, and an increasing share of incremental output went into exports. This was a major factor in the rapid export growth during that decade. Growth in the industrial sector throughout the period was based primarily on meeting the demands of the expanding domestic market. In the 1960s, import substitution was the next important source, accounting for about one third of industrial sector growth. Export expansion became the second most important source of industrial growth.

Manufactured exports grew quite rapidly during the 1970s, and their share in total exports is now about 20 % The industrial share in value added now exceeds that of agriculture,

^{2/} National Economic and Social Development Board, 'The Fourth National Economic and Social Development Plan', Office of the Prime Minister.

but its share in employment is about one-tenth that of agriculture. As now land is no longer available, agriculture will be less able to absorb labor force growth, and that burden will fall increasingly on industry,

About 80 % of the labor force are self-employed (own - account or unpaid family workers), and only about 20 % are wage and salary earners-reflecting the predominance of family units in production and employment in the Thai economy, especially agriculture.^{3/}

Value added per worker in agriculture is only a small fraction of that in non - agricultural sectors. As of 1970, compared to about B 30,000 in the M sector and about B 20,000 in the S sector^{4/}. Between 1960 and 1970, the average rate of growth of labor productivity has been over 4 % per year in the non - agricultural sector and 3 % per year in agricultural sector. Therefore, the inter-sectoral differential in valued added per worker has been widening ^{5/}.

^{3/} Self-employed workers in agriculture constituted 75 % of the total labor force in Thailand (1970), compared with 44-48 % in Indonesia, Korea and the Philippines (ILO, Yearbook of Labor Statistics, 1975)

^{4/} Thailand Employment Mission, ' Thailand: Special Report on Employment', World Bank, 1977.

^{5/} An increase in value added per worker in non-agricultural sector mainly depends on an increase in the capital intensive technology. In agriculture, the main reasons seem to be crop diversification, and improved technology (irrigation, fertilizer, etc.)

There is considerable seasonal and regional variations in labor utilization in rural areas. Thailand's agriculture being still predominantly characterized by rainfed monocropping systems with rice as the main crop, seasonal fluctuation in agricultural employment is quite large. In 1974^{6/}, between the lean season (January-March survey period) and the peak planting season (July - September survey period) rural labor force participation rate ^{7/} increased by 15 percentage points for the whole-kingdom, 19 % for the northeast, 15 % for the north, 5 % for the central and 8 % for the northern region ^{8/}.

^{6/} This seasonal variation in labor utilization in rural areas is clearly observed from the Labor Force Survey data from 1974 onwards when the definition of labor force was changed to exclude unpaid family workers working less than 20 hours per week. Since 1974 the Labor Force Survey made important changes in the definition of unemployment and labor force: persons classified as unemployed included those who did not work and were not looking for work because of the belief that no work was available; and those unpaid family workers who worked less than 20 hours **during** the week but wanted to work more; those unpaid family workers who worked less than 20 hours during the week but not want more work were classified as persons not in the labor force.

^{7/} Nonmunicipal labor force as a proportion of total nonmunicipal population of age 11 and above.

^{8/} Thailand Employment Mission, 'Thailand: Special Report on Employment', World Bank, 1977.

3.3 Data Situation

The interest of constructing national input-output tables for Thailand had been in existence for more than two decades. The first was that of Pr. Vichitwong Na Pombhechara who constructed a 3x3 table of 1951.^{9/} The second was done by Dr. Lamduan Maprasert who utilized input coefficients of India's and Nigeria's input - output tables and was able to construct a 11 x 11 table of 1954.^{10/} The third was done by Dr. Warin Wonghanchao who constructed a 74 x 74 inter - industrial relations of the manufacturing sector in 1970.^{11/} By the end of 1974, two preliminary tables of 1971 were constructed by NESDB. One of them had a size of 75 x 75 and the other 33 x 33 which is used in output and employment projections in this study. Subsequently, a smaller table of 14 x 14 was constructed for 1974 by using a 'short cut' method of aggregating input coefficients from the 1971 table with Thailand's national income accounts of 1974. After the Thailand input - output joint project agreement was concluded, a pilot survey was conducted in 1976. The data from the

9/ Vichitwong Na Pombhechara, 'The Potential Value and Application of Input - Output Analysis for Development Planning in Thailand', Journal of the National Research Council', Vol. 2, No. 1, 1961.

10/ Lamduan Maprasert, 'The Domestic Product of Thailand and its Regional Distribution', (Bangkok: Development Document Center National Institute of Development Administration, 1967).

11/ Warin Wonghanchao, 'Protection Policies and Intra - regional Trade Flow of Thailand: An Interim Report', Bangkok: ECAFE, 1971)

pilot survey were also utilized in constructing a 33 x 33 'short cut' table of 1975 by NESDB. The joint Project of inter - industrial relations study are now in implementation. A more recent attempt was done by Bowornsri Somboonpanya who constructed the regional input - output table with 2 alternatives.^{12/}

The 33 x 33 input - output table of 1971 has been used for sectoral projections in this paper. The reason for not using the other tables is that the complete results of the input - output table after 1975 are not available during the study.

The expenditure account consists of private and government consumption, gross fixed capital formation, change in inventories, exports and imports. All data except those for exports and imports are available at both current and constant price and were published in the National Income of Thailand ^{13/}: Export and import data were compiled in the Monthly Reports of the Bank of Thailand.^{14/}

The first document containing employment data was

^{12/} Bowornsri Somboonpanya, ' Thailand's Interzonal Input-Output Tables with References to East Thailand'. Bangkok, UNAPDI, 1980

^{13/} National Economic and Social Development Board, 'National Income of Thailand' various issues.

^{14/} Bank of Thailand, 'Monthly Bulletin', various issues.

the Demographic and Economic survey, 1954. The second was the 1960 and 1970 Population Census. From the former source NEDB ^{15/} had made some employment projections for the Second Plan.

Meanwhile, a series of reports on the Labour Force Survey conducted by the National Statistical office, ^{16/} covering all regions, were issued. Labor statistics after 1970 were carried out twice a year. These surveys are available for both January to March (round 1) and for July to September (round 2), which corresponds to the dry and wet season respectively in most areas of the country. Recent changes, after 1973, in the labour force definitions used in these surveys have excluded workers with low hours of work who neither seek additional employment or refrain from doing so because of the belief that work is not available. The employment structure is characterized by the contraction of the labour force in the dry season, with a large decline in participation by females and youngsters, and a shift to off farm employment, and a substantial reduction in **workhour** hours. On the contrary, during the peak agricultural seasons the labour force stretched by drawing youngsters and females from household activities, and workers from non - agricultural employment that is characterized by long work hours. The data on

15/ National Economic Development Board, 'Methodology on Manpower and Employment Projections in the Second Plan of Thailand', Bangkok, 1967

16/ National Statistical Office, 'Labor Force Survey 1971' Office of the Prime Minister.

sectoral employment from 1971 Labour Force Survey is used in this study relevant to the 1971 input - output table.^{17/}

3.4 The Model

This section sets out the macro - economic variable combining with the input-output model which providing the simplest method for sectoral projections into the future, while maintaining consistency among the sectors of the economy.

The variable used are

- Y = Gross domestic product at factor cost.
- Y^{*} = Gross domestic product in market prices.
- Y_w = World income indicator.
- X_j = Value of the output of sector j.
- C_p = Private consumption expenditure (including final imports).
- C_{pj} = Private consumption expenditure of the output of sector j (including final imports).
- C_{gt} = Total government consumption expenditure.
- C_{gj} = Government consumption expenditure of the output of sector j.
- C_g^r = Government consumption expenditure of the output of the residual sector.

^{17/} National Economic and Social Development Board, 'Input-Output Transaction Table of Thailand, 1971', Office of the Prime Minister.

- C_{gk}^r = Government consumption expenditure of the output of k^{th} sub - sector of the residual sector.
- I_{xt} = Gross capital formation (including imports for capital formation).
- I_y = Gross fixed capital formation (including imports for fixed capital formation).
- I_v = Change in inventories (including the contribution of imports).
- I_{yj} = The output of sector j used in fixed capital formation.
- I_y^r = The fixed capital formation in the residual sector, i.e. other than enumerated in j .
- I_{yk}^r = The fixed capital formation in the k^{th} sub - sector of the residual sector.
- I_{vj} = The output of sector j used in inventories.
- E = Total exports.
- E_j = Exports of the output of sector j .
- E_{jk} = Exports of the output of the k^{th} sub - sector of j .
- E^r = Exports of the output of the residual sector.
- E_k^r = Exports of the output of the k^{th} sub-sector of the residual sector.
- M = Total imports.

- M_f = Imports for final demand (consumer goods and capital goods).
- M_r = Total intermediate goods imports.
- M_{fj} = Import for final demand of sector j.
- T_i = Indirect taxes.
- t = Time.

The Model

$$C_{pj} = a_p + b_p Y \dots\dots\dots(1)$$

$$C_{pj}^r = c_{pj} C_{pj} \left(\sum_j c_{pj} = 1 \right) \dots\dots\dots(2)$$

$$C_{gt} = a_{gt} + b_{gt} Y \dots\dots\dots(3)$$

$$C_{gj} = a_g + b_g Y \dots\dots\dots(4)$$

$$C_g = C_{gt} - C_{gj} \dots\dots\dots(5)$$

$$C_{gk}^r = c_{gk} C_g \left(\sum_k c_{gk} = 1 \right) \dots\dots\dots(6)$$

$$Y_t = a_t + b_t \sum_{t=0}^{t-1} I_{xt} \dots\dots\dots(7)$$

$$I_{xt} = I_v + I_y \dots\dots\dots(8)$$

$$I_{yj} = a_y + b_y I_{xt} \dots\dots\dots(9)$$

$$I_y^r = I_y - I_{yj} \dots\dots\dots(10)$$

$$I_{yk}^r = h_k^r I_y^r \left(\sum_k h_k^r = 1 \right) \dots\dots\dots(11)$$

$$I_{vj} = v_j I_v \left(\sum_j v_j = 1 \right) \dots\dots\dots(12)$$

$$E_j = e_j + e_{wj} Y_w \dots\dots\dots(13)$$

$$E_{jk} = e_{jk} E_j \dots\dots\dots(14)$$

$$E^r = E - \sum_j E_j \dots\dots\dots(15)$$

$$E_k^r = e_k^r E^r \left(\sum_k e_k^r = 1 \right) \dots\dots\dots(16)$$

where k refers to a sub-sector within the jth group of sectors.

$$M_{fj} = m_f F_i \dots\dots\dots(17)$$

where $F_i = C_{pi} + C_{gi} + I_{xi} + I_{vi} + E$

$$M_r = m_r X_j \dots\dots\dots(18)$$

$$M = M_r + M_f \dots\dots\dots(19)$$

$$Y^* = Y + T_i \dots\dots\dots(20)$$

$$Y^* = C_p + C_g + I_x + L_v + E - M \dots\dots(21)$$

For any sector i, the balance equation between demand and supply

$$X_i - \sum_j a_{ij} X_j = C_{pi} + C_{gi} + I_{xi} + I_{vi} + E_i - M_{fi} \dots\dots(22a)$$

For all sector, the relation in matrix form becomes

$$X - AX = C_p + C_g + I_x + I_v + E - M_f \dots\dots\dots(22b)$$

$$X = (I-A)^{-1} (C_p + C_g + I_x + I_v + E - M) \dots\dots\dots(23)$$

This, of course, is the basic equation used in the input - output method. In using this model for projections of output, it is necessary to specify the final demand vector which is exogeneously estimated from the equation (1) - (17).

Given the growth rate of GDP at factor cost, the

private and public consumption expenditure are derived from equation (1) to (6). Private consumption expenditure are computed from equation (1) for major group of sectors as a function of the gross domestic product. For sectoral results, the fixed proportion are used to compute sectoral component, as in equation (2). Government consumption expenditure are determined from equation (4) for major sectors as a function of the gross domestic product. For minor sectors, which together constitute the residual component, the fixed proportion from the base period table are used to compute sectoral components.

The major sectoral fixed capital formation are derived from equation (9) which relate sectoral fixed capital formation to gross capital formation. For other sectors, the residual fixed capital formation as defined in equation (11) is distributed with a fixed proportion as in the input - output table of the base period. The stock formation is derived from equation (8) and (12), which is determined by fixed proportion of the base period.

Sectoral exports are derived for major sectors as function of the world demand in equation (13). Minor sectors are determined by fixed proportion of base period, as in equation (14) and (16). Equation (17) gives the value of the import of consumer goods and capital goods (import of final demand) in various sectors by using the import ratio in total final demand from the 1975 input - output table non - competitive and competitive system. It may be noted that the imports of intermediate demand are not shown anywhere in this study,

and that total imports are obtained by adding the value of final demand (imports of consumer goods and capital goods) to the value of intermediate demand, which may be specified exogeneously. Hence, equation (19) gives the total imports.

It may be noted that the right - hand side of the expressions in equation (21) includes not only gross domestic product at factor cost but also indirect taxes. Since $Y, C_p, C_g, I_x, I_x, I_v, E$ and M are all determined, T emerges as a residual and takes up the position of the adjuster.

Equation (22a) gives the sectoral balance equations based on the input - output coefficients and the gross output of the various sectors are determined in the conventional way by equation (23).

Labor demand estimate is calculated at the reference period. This estimate is based on projected gross output and output - employee ratios. Required labor force at the reference period is obtained by multiplying the diagonal vector of employee - output ratios times projected gross output for each industry. The employee - output ratios is derived from gross output as estimated in 1971 input - output table and employed persons in 1971 Labor Force Survey. Then we have

$$L_j = l_j X_j \dots \dots \dots (24)$$

L_j = the employed persons in the j - th industry.

l_j = the diagonal vector of employed - output ratios.

The direct and indirect labor requirement for final demand of the j - the industry will be given by

$$L_j = l_j (I - A)^{-1} F_j \dots \dots \dots (25)$$

3.5 Final Demand Projection

The input - output model is obviously complementary to a macro - variable which estimates or gives predictions of final demands because the final demands, once distributed over the various sectors, can be used with the input - output model to predict outputs and inputs.

3.5.1 Consumption Expenditure

The data for private and government consumption expenditure are given in the National Account^{19/} for the period 1960 - 1975. The sectoral breakdown give in this source, however, does not coincide with that given in the 1971 input -output tables. However, the private and government consumption data obtained from the National Account are used and are all reduced to base period 1971 price. All are fitted linearly to GDP. The empirical results are re - arranged on the basis of the 1971 input - output table according

^{19/} National Economic and Social Development Board, 'National Income of Thailand', various issues.

to the NESDB staff working paper ^{20/} and Thailand input - output joint project, 1975 ^{21/}. Other ancillary information is also collected to conform as far as possible to the input - output classification.

Projections of both private and government consumption expenditure consider the growth rates of GDP: 5, 7 and , 9 per cent. Hence, there are three estimates of private and government consumption expenditure for each of the year 1980 and 1985.

The following private consumption expenditure functions are fitted;

Food (C_{pf})

$$C_{pf} = 10,932 + 0.2248 Y \quad : R^2 = 0.997, F = 8052.8, sSEE. = 508.9$$

(0.0025) t = 89.56

Beverages (C_{pb})

$$C_{pb} = -1,878 + 0.0575 Y \quad : R^2 = 0.980, F = 883.7, SEE. = 392.8$$

(0.0019) t = 29.79

Tobacco (C_{pt})

$$C_{pt} = 129.1 + 0.0266 Y \quad : R^2 = 0.971, F = 613.7, SEE. = 218.1$$

(0.001) t = 24.85

Clothing and other personal effects (C_{pc})

$$C_{pc} = -821.5 + 0.0707 Y \quad : R^2 = 0.991, F = 2043.3, SEE. = 317.9$$

(0.0015) t = 45.32

20/ Staff Working Paper, 'Input - Output Transaction Table of Thailand, 1971', National Economic Development Board. (unpublished).

21/ Thailand Input-output Joint Project, 'Report on Special Survey for Thailand's Input-Output Tables,' Bangkok, 1971.

Rent and water charges (C_{pr})

$$C_{pr} = 1708.0 + 0.0189 Y ; : R^2 = 0.976, F = 752.96, SEE = 140.6$$

(0.007) t = 27.39

Fuel and light (C_{pf})

$$C_{pf} = 445.5 + 0.0215 Y : R^2 = 0.970, F = 597.5, SEE. = 178.3$$

(0.009) t = 24.37

Furniture, furnishing and household equipment.

$$C_{pfu} = - 520.1 + 0.0284 Y : R^2 = 0.971, F = 615.9, SEE. = 232.2$$

(0.0011) t = 24.88

Transportation and communication (C_{ptc})

$$C_{ptc} = -455.0 + 0.0562 Y : R^2 = 0.992, F = 2256.5, SEE. = 240.5$$

(0.023) t = 30.3

The following consumption expenditure functions are fitted as follows:

Total government consumption consumption. (C_{gt})

$$C_{gt} = - 1977.36 + 0.1276 Y : R^2 = 0.991, F = 2127.1, SEE. = 562.2$$

(0.0028) t = 46.1

General Administration (C_{gg}).

$$C_{gg} = -428.66 + 0.0378 Y : R^2 = 0.903, F = 168.7, SEE. = 592.4$$

(0.0029) t = 12.9

Defence (C_{gd})

$$C_{gd} = -1187.49 + 0.0422 Y : R^2 = 0.970, F = 600.7, SEE = 349.9$$

(0.0017) t = 24.5

Justice and police

$$C_{gj} = 135.68 + 0.0095 Y : R^2 = 0.981, F = 980.5, SEE = 61.7$$

(0.0003) t = 31.3

Transport and communication facilities. (C_{gc})

$$C_{gc} = -394.4 + 0.0087 Y : R^2 = 0.874, F = 125.2, SEE = 158.7$$

(0.0008) t = 11.1

The sectors where expenditures is small are given as residual sector, and distributed among the remaining sectors on the basis of fixed proportions using the input - output table of 1971.

3.5.2 Gross Capital Formation

Gross capital formation in the economy is the sum of fixed capital formation and inventory capital formation. Fixed capital formation is defined as the gross value of goods adds to the domestic capital stock of the country. It consists of the expenditures by both private industry and government on new assets, such as purchases of durable goods and construction of new buildings and public works. Inventory capital formation or changes in inventory represents the addition in stocks of the products of a given sector, no matter how and where these are held. Therefore, it includes not only the change

in the sector inventories but also the the changes the holdings of other manufacturing sectors and those of trade sector. Inventory investment pertains to goods in process and finished goods and raw materials

The most appropriate method of estimating the gross fixed capital formation for the various sectors would be to treat them as endogeneous variables in the complete input-output system, derive them simultaneously with the solution of sectoral outputs. However, this would require a capital - coefficient matrix, which does not exist for Thailand.

Usually, two types of production functions may be considered for this purpose: the Cobb - Douglas and the Harrod - Domar. While the Cobb-Douglas function explicitly formulates the relationship of capital and labor inputs to total production, it has not been used here, partly on theoretical grounds and partly because of the inadequacy of data. Moreover, the Harrod-Domar model is considered more suitable for long term projections in a developing economy where capital is a limiting factor to economic growth.^{22/}

A linear Harrod-Domar type of production function is fitted, relating the cumulative gross capital formation with gross domestic product at constant prices, on the data for 1960 - 1975 to obtain the following equation.

^{22/} C. Soonthornsima, Economic Planning :Principle and Techniques'
Bangkok , 1972.

A linear Harrod-Domar type of production function is fitted, relating the cumulative gross domestic product at constant prices, on the data for 1960 - 1975 to obtain the following equation.

$$Y_t = 57,905.3 + 0.3279 \sum_{i=1}^{n-1} I_{xt} : R^2 = 0.988, SEE.=5063.1, F=1591.9$$

(0.0082)

In fitting this function, gross capital formation (I_{xt}) is derived from the production function as presented above. Assuming that the proportion of fixed and inventory capital formation in gross capital formation is fixed based on 1971 input - output table, the results of the components of capital formation can be obtained. By plotting the sectoral fixed capital formation (I_{yj}) against the gross capital formation (I_{xt}), the linear of the relation between I_{yj} and I_{xt} are decided.

The results are summarized below:

Construction : $I_{yc} = 3,272 + 0.3272I_{xt} : R^2=0.9078; SEE.=1443.2, F=177.3$
 (0.0246)

Transport : $I_{ytr} = -7.37 + 0.1501 I_{xt} : R^2=0.9888, SEE.=50631, F=1591.9$

On the basis of fixed allocation coefficient, the remainder of the fixed capital formation is distributed among the sectors and the inventory capital formation is disaggregated into each sector. The results of fixed capital formation and inventory formation in each sector are shown in table 3 -3 and 3 - 4

3.5.3 Export

The trade statistics from Bank of Thailand provides the figures for exports of the commodity group ^{23/}. A time series of exports is prepared at constant prices of the base period 1971. The actual movement of exports has changed rapidly for some sectors, while for other sectors there has been little change during the period of analysis. Several hypothesis are used to make projections from the historical behavioral. Estimation of export by historical time series data is done by a careful selection of commodities. Many other forms of functions are tried without much success in regard to goodness of fit

Usually, the world income accounted for the demand side, the gross domestic product is taken as an indicator of capacity as regards supply and also pressure of home demand. It is found, however, only world demand is used as the explanatory variable, as inclusion of gross domestic product led to a negative coefficient for world demand and show very poor fit, which is not acceptable.

Linear functions are fitted to world income for each commodity. In only four cases are acceptable coefficients for the independent variable obtained. These are food, beverages & tobacco, chemical and total export. In these four cases the world income coefficient is positive as follows.

^{23/} Bangkok of Thailand, ' Monthly Bulletin,', various issues.

Food Export (E_f)

$$E_f = -3146.65 + 118.85 Y_w : R^2 = 0.82, F = 73.01, SEE = 1144.9$$

(13.91)

Beverages & Tobacco Export (E_b)

$$E_b = -192.58 + 3.864 Y_w : R^2 = 0.817, F = 71.47, SEE = 38.12$$

(0.457)

Chemical Export (E_c)

$$E_c = -108.86 + 1.726 Y_w : R^2 = 0.713, F = 39.89, SEE = 22.8$$

(0.2733)

Total Export (E_t)

$$E_t = -6065.8 + 233.7 Y_w : R^2 = 0.94, F = 250.7, SEE = 1231.1$$

(14.76)

World income (Y_w)

$$Y_w = 47.66 + 3.7719 t : R^2 = 0.99, F = 1742.4, SEE = 1.99$$

(0.09)

The empirical results are re - arranged on the basis of the 1971 input output table and other ancillary information is also collected to conform far as possible to the input - output classification. The results is shown in table 3 - 5

3.5.4 Import

Imports can be treated in several alternative ways.^{24/}

In each case imports may be separated into competitive and non - competitive types. Of course, such categorization has to be based on detailed study in regard to the nature of the commodity and with respect to a specific time - horizon in mind. No commodity can be termed as non - competitive for all times periods. R. Stone and J.A.C. Brown^{25/} define the import of a commodity as competitive if less than half the supply available is imported. A.R. Khan^{26/}, in an analysis of Pakistan imports, further distinguishes the complementary imports as use - specific and non - use specific and considers the use - specific component as if a technological nature and the non - use - specific component as amenable to import - substitution in a given period of time, though both types are complementary in the initial period.

As mentioned above, import data in input - output tables can be classified in several different ways. One method is to show

^{24/} United Nations, 'Sectoral Output and Employment Projections for the Second Development Decade', Bangkok, 1970

^{25/} R. Stone and J.A.C. Browns, 'A long Term Growth Model for the British Economy,' Europe's Future in Figures, ed, R.C. Geary, 1962.

^{26/} A.R. Khan, 'Treatment of Imports in Multi - Sector Models,' Paper of the Pakistan Institute of Development Economics, Karachi, 1967.



all imports as a "row" of inputs into each sector, in which case all imports are implicitly treated as "complementary". A second method is to show imports as a "column" of offsets to final demand. In this case we are not told what value of imports is used by each industry, but only the commodity classification of imports; and the implication is that all imports are "competitive". A third method is to give a full import matrix, showing how much of each commodity is imported into each industry. And a fourth method is to divide imports into "complementary" imports, which are shown as a "row", and "competitive" imports, which are shown as a "column".

In 1971 and 1975 input - output tables, imports of the non - competitive type are distributed according to their end - use and the inter-industry flows are considered as inputs with fixed input coefficients in each sector essentially similar to the coefficients of other inputs and these import - coefficients are kept outside the coefficients matrix A. The competitive type of imports is treated as a negative column vector offsets to total demand. Estimates of domestic production depend, to some extent, on the size of competitive imports fixed for different sectors.

In the present model, the components of imports have kept as a column with fixed coefficients of the final demand, chiefly because it is felt that import - substitution would be moderate, and, with demand expanding, the relative position of imports would not substantially alter. Proportion of import components of final demand (include imports) in each sector can be found by deriving

from the 1975 input - output table ^{27/}, non - competitive and competitive system. The import component for the final demand in each sector in the future can be found by calculating from the final demand (include imports) projection shown in table 3-6. The results of final demand (less imports) in each sectors are shown in table 3 - 7.

3.6 Sectoral Output Projection

The approach to sectoral projection in this study is input - output analysis. The advantages of the input - output method are that it takes account explicitly of the inter - relationship between sectors and it also ensures consistency between the outputs of the various sectors. The input - output model can also be combined with the macro - variable while estimates such aggregate as GDP, gross investment, consumption, exports, and imports while the input - output model shows the sectoral contributions to these aggregates.

The input - output method has, however, some limitation as well, arising from the assumption of constancy of the input coefficient. Over time, the input - coefficients of the inter - industry transaction matrix are likely to change as a result of the absorption of technical progress in certain sectors of the economy, shifts to already known better production techniques in new lines of production, and the start to new production lines in products which were formerly not produced

27/ National Economic and Social Development Board, 'Input - Output Transaction Table of Thailand, 1975', Office of the Prime Minister.

on the assumption of the constancy of input coefficients usually under estimates the extent to which the development in different sectors diverge over time. It has been found that the significant changes in the input coefficients occur only over a relatively long period of time. For a period, say five to six years, when technical coefficients are likely to remain relatively stable, the input - output method is very useful for making sectoral projections. For long term sectoral projections, one of the possible ways to take account of the possible structural change is to alter certain input coefficients in the transaction matrix. In most of the developing countries of the ECAFE region, the existing statistical base is inadequate to provide sufficient information for making any meaningful changes in the input coefficients. This is true for Thailand and therefore no alteration of input coefficients has been made in the present study.

From the derived future final demand distributed among the various sectors, sectoral output is calculated by using equation (24). The empirical results is given in table 3 - 8. The sectors which will be the important basis of economic activities in terms of projected output are as follows: crops (1), livestock and livestock products (2) food manufacturing (6), chemical and chemical products (16), construction (27), wholesale & retail trade (28), transportation and communication (29), and service (31). The sectors which will be export - oriented are as follows: crops (1), food manufacturing (6), rubber and plastic products (18), and basic metal industries (20).

The sectors which will have to produce substantial outputs to satisfy consumption expenditure demand are as follows : crops (1), food manufacturing (6), beverages and alcoholic drinks (7), textile manufacturing (9) , chemical and chemical products (16), wholesale & retail trade (28), transportation & communication (29), and services (31). Transport equipment (24) and construction sector (27) will be the two important sectors producing output for capital formation. It can be seen that the faster growing sectors are both export - oriented and consumer oriented, i.e. these sectors are rapidly expanding because of rising home and export demand.

Table 3 - 9, short cut from 33 sectors into 8 sectors, shows that the sectors which having higher growth rate of output than the assumed growth rate of GDP are as follows : manufacturing (3), electricity and water supply (5) , commerce (6), transportation and communication (7), and service (8), and the lower are as follows: agriculture, forestry, hunting and fishing (1), mining and quarrying (2) construction, repair and demolition (4).

During the period 1971 - 1980, the growth rate of gross output is expected to be 5.5, 8.0 and 10.4 per cent per annum corresponding to assumed GDP growth rate of 5 , 7 and 9 per cent per annum, while the period 1971 - 1985 the figure is expected to be 5.3 , 7.4 and 9.6 per cent per annum. At any assumed growth rate of GDP, the following sectors expected to grow very rapidly are as follows: electricity, gas, water and sanitary services (5), commerce

(6), transport, storage and communication (7), service (8), and less rapidly are as follows : agriculture, forestry, hunting and fishing (1), mining and quarrying (2) , manufacturing (3), and construction, repair and demolition (4). The nature of the growth clearly shows the increase diversification and deepening of the tertiary sector, with service and infrastructure activities increase more than proportionately, indicating some structural diversity in the near future.

3.7 Sectoral Employment Projection

Sectoral projections constitute an adequate framework for initiating manpower studies because the labor requirement can be associated more easily and directly with output at a sectoral level. Projection of employment, even at the sectoral level, is generally very difficult, as normal sectoral projection themselves merely provide a very highly aggregated picture and a sector may consist of a large number of very different industries which are similar in a very formal sense only. Further, the technique used within such aggregates is merely indicative of a balance growth of all component enterprises in the sector.

At present, the structure of agriculture of Thailand, where subsistence economy and family labor still predominate, is very different from that of industry. Most of farmers work their own fields and do not employ outside laborers, hired labor is

unorganized and localised. Capital investment is low, sometimes comprising only a plough and a pair of bullocks. The labor is mostly family labor and it cannot be retrenched or dispensed with. In such case it is extremely difficult to offer a precise notion of labor requirements, as there is neither a question of retirement in case of loss nor much scope of expansion of the form in case of profit. It will be seen that the peculiarity of agriculture makes it truly difficult to project employment requirements

By using separately derived employment coefficients (equation 25) for the 33 broad sectors, trends in labor requirement can be found. As previously mentioned, the labor requirement estimates for 1980 and 1985 could be well astray. As the table 3 - 10 corresponding to 5 % 7 % and 9 % growth rate of GDP between 1971 - 1980 and 1971 - 1985, the employment in agriculture (sector 1 - 4) could increase respectively by 6 , 9, and 13 million workers in 1980 and 11, 17, and 24 million workers in 1985, in manufacturing (sector 6 - 25) by 0.5 , 0.9, and 1.3 million workers in 1980 and 0.9 , 1.5 , and 2.3 million workers in 1985, in service (sector 31 - 32) by 1.8 , 2.4, and 3.2 million workers in 1980 and 2.6, 4 and 5.6 million workers in 1985. Clearly, the results in agriculture will lead to considerable increases in labor demands. It must be doubted, however, whether the increases will be as great as those estimated. The improvement in labor efficiency would reduce the estimation of the labor requirement. This shows the degree of error that can accumulate in assuming unchanged

direct employment requirements. The labor requirement, particularly of the agriculture sector is grossly over - estimated. The extent of Thailand's arable land is surely limited and not vast enough to give employment to a additional labor force of mentioned above as compared with a basic figure of 12.7 million workers in 1971 and that this over - estimation is accentuated by the existing level of under-employment in agriculture. In conclusion, there are difficulties of interpretation caused by such factor as under - employment (especially in agriculture) and use of unpaid family worker. A major weakness of this method is that no allowances is made for changes in labor productivity. Hence, the estimates of labor requirement are biased on two counts. Firstly, any error in estimating outputs will be reflected in a similar error in estimating labor inputs; and secondly, failing to correct for labor productivity changes will make the labor estimates incorrect.

The labor requirement in agriculture sector (sector 1-4) is adjusted according to the employment projection planning of NESDB that manpower demand in rural area would be increased by 2.0 % per annum in the fourth economic development plan (1977 - 1981) at a given growth rate of GDP 7 % per annum ^{28/}. The adjusted labor requirement estimation will be 12.8 , 15.1 and 17.8 million workers in 1980 and 13.1

28/ National Economic and Social Development Board, 'The Fourth National Economic and Social Development Plan,' Office of the Prime Minister.

Table 3-1 Projection of Sectoral private consumption with assumed growth rate of GDP at 5 per cent 7 per cent and 9 per cent per annum

Sector	1971	5 per cent per annum		7 per cent per annum		9 per cent per annum	
		1980	1985	1980	85	1980	1985
1. Crops	10976	16296	19996	18774	25157	21659	31752
2. Livestocks and livestock products	888	1315	1619	1515	2030	1747	2562
3. Forestry	1738	2307	2890	2697	3703	3150	4742
4. Fisheries	4040	6140	7534	7074	9475	8158	11963
5. Mining and Quarrying	-	-	-	-	-	-	-
6. Food manufacturing	20624	31794	39211	36762	49558	42533	62775
7. Beverages and alcoholic drinks	3132	7092	9386	8629	12586	10413	16673
8. Manufacturing of tobacco	2966	4573	5810	5401	7535	6363	9739
9. Textile manufacturing	2977	6102	7879	7293	10360	8675	13528
10. Wearing apparel except footwear	1338	1329	1715	1587	2255	1889	2944
11. Leather and leather products	171	403	456	422	600	502	783
12. Wood and cork products	-	-	-	-	-	-	-
13. Furniture and fixture	457	1395	1815	1677	2402	2004	3150
14. Paper and paper products	46	137	179	165	236	197	310
15. Printing and publishing	598	1132	1267	1359	1939	1687	2541
16. Chemical and chemical products	3192	6016	6731	7210	10306	8970	13505
17. Petroleum products	777	1055	1323	1234	1695	1442	2171
18. Rubber and plastic products	634	1536	1988	1839	2621	2196	3427
19. Non-metallic mineral products	102	302	394	363	520	494	682

Table 3-1 Projection of sectoral private consumption with assumed growth rate of GDP at 5 per cent 7 per cent and 9 per cent per annum

Unit : Billion bahts

Sector	5 per cent per annum		7 per cent per annum		9 per cent per annum		
	1971	1980	1985	1980	1985	1980	1985
20. Basic metal industries	-	-	-	-	-	-	-
21 Metal products except machinery & transport equipment.	419	1279	1655	15377	2201	1837	2888
22 Machinery except electrical	-	-	-	-	-	-	-
23 Electrical machinery & appliances	197	623	804	749	1072	894	1406
24. Transport equipments	314	648	833	773	1093	917	1424
25. Miscellaneous manufacturing	760	1593	2058	1904	2707	2296	3535
26. Electricity and water supply	850	3447	4148	3917	5128	3448	6378
27. Construction	-	-	-	-	-	-	-
28. Wholesale & retail trade	10972	21526	29079	25310	32260	29176	44874
29. Transportation & communication	8063	14430	21243	17103	26831	20102	31410
30. Banking insurance & real estate	543	814	912	977	1395	1214	1827
31. Services	11100	21214	24229	25439	36300	31433	47549
32. Public administration & defence	-	-	-	-	-	-	-
33 Unallocated	-	-	-	-	-	-	-
Total	87871	154498	195158	181718	251969	213396	324538

Table 3-2 Projection of sectoral government consumption with assumed growth rate of GDP at 5 per cent 7 per cent and 9 per cent per annum.

Unit: million bahts

Sector	1971	5 per cent per annum		7 per cent per annum		9 per cent per annum	
		1980	1985	1980	1985	1980	1985
1. Crops	-	-	-	-	-	-	-
2. Livestocks and livestock products	-	-	-	-	-	-	-
3. Forestry	-	-	-	-	-	-	-
4. Fisheries	-	-	-	-	-	-	-
5. Mining and Quarrying	-	-	-	-	-	-	-
6. Food manufacturing	103	284	364	338	476	373	615
7. Beverages and alcoholic drinks	-	-	-	-	-	-	-
8. Manufacturing of tobacco	-	-	-	-	-	-	-
9. Textile manufacturing	-	-	-	-	-	-	-
10. Wearing apparel except footwear	56	156	199	185	261	205	337
11. Leather and leather products	-	-	-	-	-	-	-
12. Wood and cork products	-	-	-	-	-	-	-
13. Furniture and fixture	-	-	-	-	-	-	-
14. Paper and paper products	77	215	275	256	361	283	465
15. Printing and publishing	30	221	282	262	370	290	478
16. Chemical and chemical products	120	332	426	395	557	437	719
17. Petroleum products	598	1664	2131	1977	2788	2186	3599
18. Rubber and plastic products	-	-	-	-	-	-	-
19. Non-metallic mineral products	-	-	-	-	-	-	-

Table 3-2 (continued)

Unit: million bahts

Sector	5 per cent per annum		7 per cent per annum		9 per cent per annum		
	1971	1980	1985	1980	1985	1980	1985
20. Basic metal industries	-	-	-	-	-	-	-
21. Metal products except machinery & transport equipment	23	63	81	75	106	89	136
22. Machinery except electrical	-	-	-	-	-	-	-
23. Electrical machinery & appliances	16	44	56	52	74	58	95
24. Transport equipment	38	105	135	125	176	138	228
25. Miscellaneous manufacturing	398	1023	1310	1215	1714	1344	2213
26. Electricity and water supply	80	223	286	266	374	293	486
27. Construction	-	-	-	-	-	-	-
28. Wholesale & retail trade	353	1006	1287	1192	1681	1312	2167
29. Transportation & Communication	290	1566	2107	1929	2863	2950	3828
30. Banking, insurance & real estate	5	-	-	-	-	-	-
31. Service	404	1125	1441	1337	1885	1478	2434
32. Public administration & defence	6692	18621	24176	22342	31903	26662	41881
33. Unallocated	-	-	-	-	-	-	-
Total	9309	26648	34556	31946	45589	38098	59684

Table 3-3 Projection of sectoral gross fixed capital formation with assumed growth rate of GDP at 5 per cent 7 per cent and 9 per cent annum Unit.: million bahts

Sector	5 per cent per annum			7 per cent per annum		9 per cent per annum	
	1971	1980	1985	1980	1985	1980	1985
1.Crops	-	-	-	-	-	-	-
2.Livestocks and livestock products	-	-	-	-	-	-	-
3.Forestry	-	-	-	-	-	-	-
4.Fisheries	-	-	-	-	-	-	-
5.Mining and Quarrying	-	-	-	-	-	-	-
6.Food manufacturing	-	-	-	-	-	-	-
7.Beverages and alcoholic drinks	-	-	-	-	-	-	-
8.Manufacturing of tobacco	-	-	-	-	-	-	-
9.Textile manufacturing	-	-	-	-	-	-	-
10.Wearing apparel except footwear	-	-	-	-	-	-	-
11.Leaner and leather products	-	-	-	-	-	-	-
12.Wood and cork products	-	-	-	-	-	-	-
13.Furniture and fixture	-	-	-	-	-	-	-
14.Paper and paper products	-	-	-	-	-	-	-
15.Printing and publishing	-	-	-	-	-	-	-
16.Chemical and chemical products	-	-	-	-	-	-	-
17.Petroleum products	-	-	-	-	-	-	-
18.Rubber and plastic products	-	-	-	-	-	-	-
19.Non-metallic mineral products	-	-	-	-	-	-	-

Tble 3-3 (Continued)

sector	1971	5 per cent per annum		7 per cent per annum		9 per cent per annum	
		1980	1985	1980	1985	1980	1985
20. Basic metal industries	-	-	-	-	-	-	-
21. Metal products except machinery & transport equipment	-	-	-	-	-	-	-
22. Machinery except electrical	820	960	1374	1848	2693	2937	4643
23. Electrical machinery & appliances	651	760	1088	1462	2132	2325	3675
24. Transport equipments	2835	4855	6546	8480	11936	12932	19902
25. Miscellaneous manufacturing	-	-	-	-	-	-	-
26. Electricity and water supply	-	-	-	-	-	-	-
27. Construction	15411	13871	17556	21771	29304	31476	46669
28. Wholesale & retail trade	1393	1631	2334	3138	4574	4988	7886
29. Transportation & communication	226	264	378	508	740	808	1276
30. Banking, insurance & real estate	-	-	-	-	-	-	-
31. Services	-	-	-	-	-	-	-
32. Public administration & defence	-	-	-	-	-	-	-
33. Unallocated	-	-	-	-	-	-	-
Total	21336	22341	29276	37207	51379	55466	84051

Table 3-4 Projection of sectoral changing instock with assumed growth rate of GDP

at 5 per cent 7 per cent and 9 per cent per annum

Unit : million bahts

Sector	1971	5 per cent per annum		7 per cent per annum		9 per cent per annum	
		1980	1985	1980	1985	1980	1985
1.Crops	190	223	319	428	624	681	1077
2.Livestocks and livestock products	300	351	502	675	985	1074	1698
3.Forestry	252	295	422	568	828	902	1427
4.Fisheries	-	-	-	-	-	-	-
5.Mining and Quarrying	678	795	1138	1530	2330	2432	3844
6.Food manufacturing	1105	1297	1856	2494	3637	3966	6269
7.Beverages and alcoholic drinks	-	-	-	-	-	-	-
8.Manufacturing of tobacco	360	422	604	812	1184	1291	2041
9.Textile manufacturing	428	502	718	965	1406	1534	2425
10.Wearing apparel except footwear	191	223	319	428	625	681	1077
11.Leaner and leather products	341	400	573	770	1123	1224	1935
12.Wood and cork products	578	678	970	1304	1901	2073	3277
13.Furniture and fixture	97	44	63	84	123	134	211
14.Paper and paper products	-	-	-	-	-	-	-
15.Printing and publishing	-	-	-	-	-	-	-
16.Chemical and chemical products	823	966	1382	1858	2709	2955	4671
17.Petroleum products	-	-	-	-	-	-	-
18.Rubber and plastic products	-119	-139	-199	-268	-391	-426	-673
19.Non-metallic mineral products	220	258	369	497	724	789	1248

Table 3-4 (continued)

Unit: million bahts

Sector	5 per cent per annum		7 per cent per annum		9 percent per annum		
	1971	1980	1985	1980	1985	1980	1985
20. Basic metal industries	530	622	890	1196	1743	1901	3005
21. Metal products except machinery transport equipment.	74	86	123	166	241	263	416
22. Machinery except electrical	402	473	677	910	1327	1447	2287
23. Electrical machinery Appliances	402	240	343	462	673	734	1161
24. Transport equipment	461	541	774	1041	1518	1655	1616
25. Miscellaneous manufacturing	163	190	272	365	533	581	918
26. Electricity and water supply	-	-	-	-	-	-	-
27. Construction	-	-	-	-	-	-	-
28. Wholesale & retail trade	1190	1313	1876	2519	3653	4016	6341
29. Transportation & communication	231	272	389	522	762	830	1313
30. Banking, insurance & real estate	-	-	-	-	-	-	-
31. Services	-	-	-	-	-	-	-
32. Public administration & defence	-	-	-	-	-	-	-
33. Unallocated	-9315	-	-	-	-	-	-
Total	-759	10052	14380	19332	28182	30737	48584

Table 3-5 Projection of sectoral export with assumed growth rate of GDP at 5 per cent
7 per cent and 9 per cent per annum

Unit: million bahts

Sector	5 per cent per annum		7 per cent per annum		9 per cent per annum		
	1971	1980	1985	1980	1985	1980	1985
1. Crops	2433	2973	3838	2973	3838	2973	3838
2. Livestocks and livestock products	192	232	272	232	272	232	272
3. Forestry	94	62	73	62	73	62	73
4. Fisheries	10	27	31	27	31	27	31
5. Mining and Quarrying	742	1080	1202	1080	1202	1080	1202
6. Food manufacturing	4522	5477	6434	5477	6434	5477	6434
7. Beverages and alcoholic drinks	4	6	7	6	7	6	7
8. Manufacturing of tobacco	207	321	392	321	392	321	392
9. Textile manufacturing	264	1739	2046	1739	2046	1739	2046
10. Wearing apparel except footwear	51	96	120	96	120	96	120
II. Leather and leather products	56	74	83	74	83	74	83
12. Wood and cork products	204	408	454	408	454	408	454
13. Furniture and fixture	-	-	-	-	-	-	-
14. Paper and paper products	10	22	25	22	25	22	25
15. Printing and publishing	6	34	134	34	134	34	134
16. Chemical and chemical products	27	122	152	122	152	122	152
17. Petroleum products	116	173	194	173	194	173	194
18. Rubber and plastic products	1550	1991	2215	1991	2215	1991	2215
19. Non-metallic mineral products	102	30	38	30	38	30	38

Table 3-5 (continued)

Unit: million bahts

Sector	1971	5 per cent per annum		7 per cent per annum		9 percent per annum	
		1980	1985	1980	1985	1980	1985
20, Basic metal industries	1380	2585	3240	2585	3240	2585	3240
21, Metal products except machinery & transport equipment.	23	22	28	22	28	22	28
22, Machinery except electrical	8	46	53	46	53	46	53
23, Electrical machinery Sapplainces	16	28	31	28	31	28	31
24, Transport equipments	3	67	78	67	78	67	78
25, Miscellaneous manufacturing	209	1605	1669	1605	1669	1605	1669
26, Electricity and water supply	-	-	-	-	-	-	-
27, Construction	-	-	-	-	-	-	-
28, Wholesale&retail trade	3684	5380	6019	5380	6019	5380	6019
29, Transportation&communication	563	746	925	746	925	746	925
30, Banking, insurance&real estate	-	-	-	-	-	-	-
31 Services	-	-	-	-	-	-	-
32, Public administration&defence	-	-	-	-	-	-	-
33, Unallocated	-	-	-	-	-	-	-
Total	16476	25346	29753	25346	29753	25346	29753

Table 3-6 Projection of sectoral imports with assumed growth rate of GDP at 5 per cent, 7 per cent and 9 per cent per annum

Sector	5 per cent per annum		7 per cent per annum		9 per cent per annum	
	1980	1985	1980	1985	1980	1985
1. Crops	180	215	198	270	225	326
2. Livestocks and livestock products	35	44	45	61	56	84
3. Forestry	-	-	-	-	-	-
4. Fisheries	-	-	-	-	-	-
5. Mining and Quarrying	-	-	-	-	-	-
6. Food manufacturing	738	909	856	1142	995	1346
7. Beverages and alcoholic drinks	227	301	276	403	333	534
8. Manufacturing of tobacco	9	11	10	15	13	19
9. Textile manufacturing	562	717	674	931	805	1213
10. Wearing apparel except footwear	35	46	45	63	56	87
11. Leather and leather products	29	36	41	59	59	91
12. Wood and cork products	6	8	9	12	13	20
13. Furniture and fixture	37	49	46	66	56	87
14. Paper and paper products	94	94	111	156	126	201
15. Printing and publishing	29	35	34	51	42	66
16. Chemical and chemical products	1507	1761	1943	2780	2529	3859
17. Petroleum products	113	143	132	183	149	233
18. Rubber and plastic products	128	151	134	168	142	187
19. Non-metallic mineral products	73	100	111	160	163	245

Table 3-6 (continued)

Unit: million bahts

Sector	5 percent per annum		7 percent per annum		9 percent per annum	
	1980	1985	1980	1985	1980	1985
20, Basic metal industries	293	378	346	456	410	571
21, Metal products except machinery and transport equipment.	47	61	58	83	72	112
22, Machinery except electrical	1272	1809	2411	3502	3810	6004
23, Electrical machinery & appliances	979	1342	1591	2301	2334	3679
24, Transport equipments	3140	4226	5296	7476	7935	12248
25, Miscellaneous manufacturing	1648	1984	1902	2475	2177	3115
26, Electricity and water supply	-	-	-	-	-	-
27, Construction	-	-	-	-	-	-
28, Wholesale & retail trade	-	-	-	-	-	-
29, Transportation & communication	-	-	-	-	-	-
30, Banking, insurance & real estate	-	-	-	-	-	-
31, Services	-	-	-	-	-	-
32, Public administration & defence	-	-	-	-	-	-
33, Unallocated	-	-	-	-	-	-
Total	11181	14420	16259	22819	22500	34327

Table 3-7 Projection of sectoral final demand with assumed growth rate of GDP at 5 per cent, 7 per cent and 9 per cent per annum

Unit: million bahts

Sector	5 percent per annum		7 percent per annum		9 percent per annum		
	1971	1980	1985	1980	1985	1980	1985
1. Crops	13599	19312	23944	21977	29349	-25088	36341
2. Livestocks and livestock products	1380	1863	2349	2377	3226	2997	4448
3. Forestry	2084	2664	3385	3338	4604	4114	6242
4. Fisheries	4050	6167	7565	7101	9510	8185	11994
5. Mining and Quarrying	1420	1875	2340	2610	3432	3512	5046
6. Food manufacturing	26355	38114	46956	44215	58963	51354	69615
7. Beverages and alcoholic drinks	3135	6871	9092	8359	12190	10086	16146
8. Manufacturing of tobacco	3532	5307	6795	6524	9096	7962	12153
9. Textile manufacturing	3669	7781	9926	9323	12881	11143	16786
10. Wearing apparel except footwear	1636	1769	2307	2251	3198	2815	4391
11. Leather and leather products	568	848	1076	1225	1747	1741	2710
12. Wood and cork products	782	1080	1416	1703	2343	2468	3711
13. Furniture and fixture	495	1402	1827	1715	2459	2082	3274
14. Paper and paper products	134	280	385	332	466	376	599
15. Printing and publishing	683	1358	1648	1621	2392	1969	3087
16. Chemical and chemical products	4162	5929	6930	7650	10944	9955	15188
17. Petroleum products	1491	2779	3505	3252	4494	3652	5731
18. Rubber and plastic products	2065	3260	3853	3428	4277	3529	4782
19. Non-metallic mineral products	424	517	701	779	1122	1150	1723

Table 3-7 (continued)

Unit: million bahts

Sector	5 per cent per annum			7 per cent per annum		9 per cent per annum	
	1971	1980	1985	1980	1985	1980	1985
20. Basic metal industries	1911	2914	3752	3435	4527	4076	5674
21. Metal products except machinery & transport equipment	536	1403	1836	1742	2493	2139	3356
22. Machinery except electrical	1230	207	295	393	571	620	970
23. Electrical machinery & appliances	1081	716	980	1162	1681	1705	2689
24. Transport equipments	3651	3076	4140	5190	7325	7774	12000
25. Miscellaneous Manufacturing	1500	2763	3325	3187	4148	3649	5220
26. Electricity and water supply	930	3670	4434	4183	5502	4741	6871
27. Construction	15411	13871	17566	21771	29304	31476	46669
28. Wholesale & retail trade	17509	30856	40595	37539	48187	44872	67287
29. Transportation & communication	9372	17278	25042	20808	32121	25236	38752
30. Banking, insurance & real estate	548	814	912	977	1395	1214	1827
31. Services	11504	22339	25670	26776	38185	32911	49983
32. Public administration & defence	6692	18631	24176	22342	31903	26662	41881
33. Unallocated	9315	-	-	-	-	-	-
34. Total	134224	227704	288709	279290	384053	341543	507051



Table 3-8 Projection of sectoral output with assumed growth rate of GDP at 5 per cent, 7 percent and 9 per cent per annum

Unit: million bahts

Sector	5 percent per annum		7 percent per annum		9 percent per annum		
	1971	1980	1985	1980	1985	1980	1985
1. Crops	30871	45858	56840	53033	71153	61656	87224
2. Livestock and livestock products	9227	13485	16695	15970	21436	18915	26327
3. Forestry	4077	5002	6345	6694	9202	8722	13122
4. Fisheries	5907	8927	10958	10326	13832	11957	17218
5. Mining and Quarrying	4362	5420	6853	7411	9886	9856	14279
6. Food manufacturing	32811	48503	59895	56631	75809	665153	90559
7. Beverages and alcoholic drinks	3146	6893	9115	8385	12225	10119	16193
8. Manufacturing of tobacco	4036	6076	7762	7457	10408	9101	13889
9. Textile manufacturing	6783	14549	18559	17664	24473	21323	32150
10. Wearing apparel except footwear	1983	3687	4744	4517	6485	5719	8709
11. Leather and leather products	1705	7147	9037	9026	12578	11447	17105
12. Wood and cork products	5624	6084	7814	9199	10347	12979	19408
13. Furniture and fixture	809	2067	2674	2533	3566	3083	4759
14. Paper and paper products	574	1082	1416	1329	1854	1611	2452
15. Printing and publishing	928	2165	2690	2621	3780	3193	4909
16. Chemical and chemical products	1029	15608	18961	19227	26820	23846	35469
17. Petroleum products	5911	10027	12827	12167	16903	14599	21854
18. Rubber and plastic products	3199	5594	6930	6263	8318	6983	9926
19. Non-metallic mineral products	3266	3936	4703	5326	7370	7447	11187

Table 3-8 (continued)

Unit: million bahts

Sector	5 percent per annum		7 per cent per annum		9 per cent per annum		
	1971	1980	1985	1980	1985	1980	1985
20. Basic metal industries	2867	4009	5137	4988	6629	6194	8802
21. Metal products except machinery transport equipments	835	1936	2503	2381	3420	2910	4467
22. Machinery except electrical	1805	1042	1360	1443	1979	1884	2819
23. Electrical machinery & appliances	2017	4365	5539	5345	7495	6655	9896
24. Transport equipments	4835	5088	6860	7606	10794	10689	16915
25. Miscellaneous manufacturing	1755	3594	4385	4218	5582	4919	7125
26. Electricity and water supply	2323	6316	7787	7483	10027	8820	12915
27. Construction	15431	14018	17625	21831	30978	31543	46770
28. Wholesale & retail trade	25133	42862	55736	52210	67958	62742	93142
29. Transportation & communication	12618	22298	31360	26993	40571	33063	49715
30. Banking, insurance & real estate	6635	10953	13726	13521	18807	16668	24744
31. Services	14635	31779	37533	38290	53954	47008	70960
32. Public administration & defence	6692	18621	24176	22342	31903	26662	41881
33. Unallocated	3535	-	-	-	-	-	-
Total	236463	378691	478555	464410	636542	568466	836890

Table 3-9 Projection of sectoral output with assumed growth rate of GDP at 5 per cent, 7 per cent and 9 per cent per annum.

Sector	Unit: million bahts						
	1971	5 percent per annum		7 per cent per annum		9 per cent per annum	
		1980	1985	1980	1985	1980	1985
1. Agriculture Forestry, Hunting and Fishing (1-4)	50082	73272 (4.3)	90843 (4.3)	86023 (6.2)	115623 (6.1)	101250 (8.1)	143891 (7.8)
2. Mining and Quarrying (5)	4362	5420 (2.4)	6853 (3.3)	7411 (6.1)	9886 (6.0)	9856 (9.6)	14279 (8.8)
3. Manufacturing (6-25)	95018	153152 (5.4)	192911 (5.2)	188306 (7.9)	256935 (7.4)	230854 (10.4)	338593 (9.5)
4. Construction, Repair and Demolition (27)	15431	14018 (-1.0)	17625 (1.0)	21831 (3.9)	30978 (5.1)	31543 (8.3)	46770 (8.2)
5. Electricity, Gas, Water and Sanitary Services. (26)	2323	6316 (11.7)	7787 (9.0)	7483 (13.9)	10027 (11.0)	8820 (16.0)	12915 (13.0)
6. Commerce. (28 & 30)	31768	53815 (6.0)	69462 (5.7)	65731 (8.4)	80765 (7.4)	79410 (10.7)	117886 (9.8)
7. Transport, Storage and Communication (29)	12618	22298 (6.5)	31360 (6.7)	26993 (8.8)	40571 (8.7)	33063 (11.3)	46715 (10.3)
8. Services. (31 - 32)	21327	50400 (10.0)	61709 (7.9)	60632 (12.3)	85857 (10.5)	73670 (14.8)	112841 (12.6)
All Sectors	232929	378691 (5.5)	478555 (5.3)	464410 (8.0)	636542 (7.4)	568466 (10.4)	836890 (9.6)

Table 3-10 Projection of sectoral employment with assumed growth rate of GDP at 5 per cent, 7 per cent and 9 per cent per annum.
Unite: million bahte

Sector	5 per cent per annum		7 per cent per annum		9 per cent per annum	
	1980	1985	1980	1985	1980	1985
1. Agriculture, Forestry, Hunting and Fishing. (1-4)	12858	13101	15098	16670	17781	20793
2. Mining and Quarrying (5)	48	61	66	89	88	128
3. Manufacturing (6-25)	1356	1717	1705	2130	2130	3161
4. Construction, Repair and Demolition. (27)	205	258	319	461	461	684
5. Electricity, Gas, Water and Sanitary Services. (26)	56	69	66	89	78	115
6. Commerce. (28&30)	2144	2775	2616	3434	3154	4682
7. Transport, Storage and Communication. (29)	401	564	485	730	595	894
8. Services. (31-32)	3070	3839	3689	5240	4455	6884
All Sectors	20139	22385	24047	29028	28742	37342

16.7 and 20.8 million workers in 1985 corresponding to GDP growth rates of 5 %, 7 % and 9 % per annum.

According to table 3 - 10, the non - agricultural sectors absorbing the large amount of workers are as follows: Manufacturing (6 - 25), commerce (28 - 30), and service (31 - 32).

Manufacturing is dominated by food (6), textile (9), and wood and cork products (12), while commerce is totally dominated by wholesale & retail trade (28) which providing employment twenty times the banking, insurance and real estate (30) can absorb. In service sector, the sub - sectors, public administration & defence (32) and service (31) can relatively absorb labor in approximately equal proportion.

The employment growth rate of each sector can be found and are used to project regional labor demand by shift and share analysis in the following chapter.

3.8 Economic Implication

In many industries there appear to be various conflicts between employment, output and growth objectives so that the composition of output or the product - mix and the choice of technique cannot be determined solely by the employment criterion. The composition of output in Thailand has to be determined by export prospects, by the size of national market, by the pattern of domestic

demand, and by the need to produce capital are intermediate goods and to encourage industries with strategic 'linkage' effects in order to sustain and accelerate development.

~~Successful~~ development depends on a substantial increase of manufacturing employment and production. However, the direct contribution to employment creation from the development of manufacturing industries is fairly limited. Linkages of manufacturing industries with domestic production of raw materials and intermediates are still weak.

Considering the elements in each row in table 3 - 11, the role of each sector as a producer of outputs is shown. The total available output of primary sector of 1 unit, 0.59 unit is used for intermediate use for further production and 0.41 unit is used for final use. The output of primary sector for intermediate use of 0.59 unit, 0.07 unit is used by itself, 0.50 unit is used for secondary sector and 0.02 unit is for tertiary sector, showing the close dependence of secondary sector on primary sector. Similarly, the output of secondary sector of 1 unit, 0.39 unit is used for intermediate use of 0.39 unit, 0.11 unit is used for primary sector, 0.14 unit is used by itself and 0.14 unit is used for tertiary sector, showing the weakness structure of economic activities in manufacturing leading to limited linkage.

Considering the elements in each column, in table 3 - 12, the role of each sector as a purchaser of inputs is shown. Reading down this column, in order to produce total output of primary and tertiary sector of 1 unit, they have to purchase of intermediate material goods and services of 0.35 unit and total primary input of 0.65 unit in the form of wages, taxes, depreciation, profit and other value added. While the secondary sector shows a better linkage of production structure than the two mentioned sector using the intermediate input of 0.55 unit and primary input of 0.45 unit.

Natural gas and its by - product industries are certain strategic, growth oriented industries which have important 'linkage' effects, encouraging other industries to come into existence to supply materials, components and to make use of the original industry's final products.

Table 3 - 12 shows that the total intermediate inputs required in order to produce output of secondary sector of 100 unit, 65 units of domestic input are purchased and 35 unit are imported. The composition of imports strongly suggests that output and employment can be achieved only by further producing the import coefficient of the strategic intermediate and capital goods sectors. However, some sectors require use - specific imports which cannot be easily substituted by domestic production. Looking at the future, there appears to be considerable scope for strengthening the links between domestic source of supply of raw materials and intermediate products on one

Table 3 - 11 Derived input - output transaction table of Thailand. 1971

Output Input	Primary Sector	Secondary Sector	Tertiary Sector	Total Intermediate demand	Final demand	Total output
Primary Sector (1 - 5)	3703.4 (0.07) (0.07)	27095.6 (0.50) (0.28)	1112.1 (0.02) (0.02)	31911.1 (0.59)	22533.6 (0.41)	54444
Secondary Sector (6 - 25)	9710.2 (0.11) (0.18)	1039.5 (0.14) (0.14)	13227.2 (0.14) (0.16)	35976.9 (0.39)	59034.7 (0.61)	95015.6
Tertiary Sector (26 - 33)	5453.3 (0.07) (0.10)	12753.7 (0.15) (0.13)	16144.3 (0.18) (0.18)	34351.3 (0.40)	52651.4 (0.60)	87002.7
Total Intermediate Input	18866.9 (0.35)	52888.8 (0.55)	30483.6 (0.35)			
Total Primary Input	35577.1 (0.65)	42126.8 (0.45)	56519.1 (0.65)			
Total Input	54444	95015.6	87002.7			

Source : NESDB

hand, and processing or manufacturing establishments, oriented to export markets as well as domestic demand on the other hand.

Table 3 - 12 Percentage of domestic and import input of total intermediate input.

Output Input	Primary S. (1 - 5)	Secondary S. (6 - 25)	Tertiary S. (26 - 33)
Primary S. (1 - 5)	24 (-)	34 (-)	12 (-)
Secondary S. (6-25)	57 (2)	12 (35)	38 (12)
Tertiary S. (26-33)	17 (-)	19 (-)	38 (-)
Domestic input	98	65	98
Import input	(2)	(35)	(12)
Intermediate input	100	100	100

Source : Derived from 1975 input - output table, NESDB.