

## **1. Background**

The National Balance Sheet Section of the Economic Analysis and Projection Division has compiled a series of capital stock of Thailand for the first time covering the period of 1970 - 1996. Data are regularly revised and published in consistent with the latest national income statistics published by the National Accounts Division. With these two sets of data, capital stock and national income data, it is also possible that the National Economic and Social Development Board (NESDB) can provide the estimation of total factor productivity (TFP), capital output ratio (COR) and capital productivity for the same period as an annual indicator.

## **2. Definition**

Following the SNA concept, capital stock refers to the total value of fixed assets at the end period of time. The stock of capital is measured by adding the initial investment from the beginning year by an incremental acquisition of the next year and subtracted by their retirement values from the production process in subsequent years.

## **3. Methodology**

### *3.1 Methodology of Capital Stock Measurement*

The indirect method using perpetual inventory method (PIM) which is widely adopted due to its cost effectiveness has been used to estimate capital stock series. The calculation requires basic data of gross fixed capital formation obtained from national income accounts data. Therefore, the results obtained from PIM calculation will be consistent with other national income statistics.

### *3.2 Basic Concept of PIM*

The basic concept of perpetual inventory method is to accumulate gross fixed capital formation from the first year to the current year minus the value of capital retirement. The result is called gross capital stock. To derive net capital stock, the accumulated depreciation over the same period has to be subtracted from total value of gross capital stock. This is equivalent to the net capital stock in the previous year plus gross investment in the current year minus annual depreciation.

## **4. Results**

### *4.1 Capital Stock of Thailand in 1970 - 1996*

Gross capital stock of Thailand has increased continuously over time, particularly during the period of 6th and 7th National Economic and Social Development Plans with average growth rates of 9.7 percent and 11.7 percent per annum respectively.

The structure of gross capital stock classified by institutions during the period 1970 - 1996 indicated that the largest position of gross capital stock was held by private sector. However, capital accumulation in public sector has increasingly taken a bigger share. At the end of the 2nd Plan, the ratio of gross capital stock between public and private sectors was 15 : 85. The ratio was changed to 23 : 77 at the end of the 7th Plan as a result of increasing public investment in infrastructures.

By asset types, the ratio of gross capital stock in terms of construction and machinery increased from 51 : 49 at the end of the 2nd Plan to 58 : 42 at the end of the 7th Plan. This is owing to faster rate of expansion in construction investment than that of machinery investment.

In terms of economic activities, at the end of the 7th Plan, the ownership of dwelling sector has the highest share of gross capital stock accounted for 23.9 percent of the total. For the same period, transportation & communication, manufacturing, services and agricultural sectors have accounted for 17.5, 16.9, 11.1 and 6.7 percent of total gross capital stock respectively.

#### 4.2 Total Factor Productivity (TFP)

The contribution of two major production factors, i.e. labor and land, to the economic growth has declined since 1972. Meanwhile, contribution of capital has increasingly taken an important role, especially during the period of the 6th and 7th Plan. Regarding the average growth rate of 8.0 percent during the 7th Plan, 7.7 percent were contributed by capital accumulation.

Total factor productivity (TFP) which represents technological progress and other factors than capital, labor and land has declined overtime. During the 7th Plan, the average annual growth of TFP was minus 0.05 percent of the GDP growth.

The average annual growth of TFP can be compared with a study by Thailand Development Research Institute (TDRI), which has calculated broader concept of imputed wages and salaries to include own-account workers instead of using the wages provided by national income statistics in a narrow concept. In this case, the average annual growth of TFP calculated by TDRI was much higher than the average annual growth of TFP calculated by NESDB.

The average growth of Thailand's TFP markedly declined as compared to G-7 countries whose TFPs improve over time. During the period of 1979 - 1995, Thailand's average annual growth of TFP was equal to that of Italy whereas the average annual TFP growth of United Kingdom was the highest. In addition, the comparison between Thailand and Asian countries by Marti, C. indicated that Thailand's average annual TFP growth was lower than that of Singapore over the period of 1970 - 1985. However, Thailand's TFP was still higher than those of Indonesia, Malaysia and Philippines.

#### Comparison of TFP Calculated by NESDB and TDRI

	Avg. GDP growth	Labor	Land	Capital	TFP
<b>1. NESDB (Unadjusted)</b>	7.89 100.00	0.82 10.41	0.07 0.86	5.40 68.39	1.60 20.33
<b>2. TDRI (Adjusted)<sup>1</sup></b>	7.94 100.00	2.17 27.31	0.07 0.85	3.53 44.51	2.18 27.39
<b>3. ส่วนต่าง (1 – 2)</b>	-0.05	-1.35	0.00	1.87	-0.58

Note: 1/ Labor quality was adjusted. The result is obtained from table 4.11, p.49, Productivity in Thailand.

#### 4.3 Capital Output Ratio (COR)

Capital output ratio is measured in terms of the ratio between capital stock (K) and output (Y) of which gross domestic product (GDP) has been used as a proxy. The ratio refers to a number of unit's value of capital required to generate 1 unit of GDP.

This study shows that COR has a decreasing trend, from 3.3 at the end of the 3rd Plan to 3.0 at the end of the 6th Plan and increased slightly to 3.5 at the end of the 7th Plan. The high ratio reflected the crisis in real estate in the late of the 7th Plan that delayed construction both in public and private sectors' projects has led to an unnecessary accumulation of capital stock in unproductive sectors. Among activities, the COR of ownership of dwelling sector was the highest during the period of the 3rd Plan to the 7th Plan, followed by electric and water supply and transportation respectively.

Capital productivity, the inverted COR, refers to a number of unit's value of GDP generated by one unit of capital. According to this study, at the end of the 7th Plan, capital productivity was equal to 0.3. This means that one unit of capital can generate less than one unit of GDP. Regarding capital productivity by economic activities, banking and insurance was the most productive sector as it can generate 1.5 unit of GDP with one unit of capital. The second productive sectors are construction and manufacturing.

#### Total Factor Productivity and Capital Productivity

Year	Avg. GDP growth	Labor	Land	Capital	TFP	K/Y*	Y/K*	ICOR*
1972 – 76	6.53	0.68	0.31	3.06	2.49	3.34	0.30	1.4
1977 – 81	7.23	1.52	0.26	4.60	0.85	3.05	0.33	3.2
1982 – 86	5.37	0.54	0.05	4.36	0.43	3.13	0.32	2.9
1987 – 91	10.94	0.87	0.00	7.26	2.82	2.96	0.34	4.2
1992 – 96	7.95	0.33	0.02	7.65	-0.05	3.51	0.29	6.7

\* In the last year of the Plan.

## 5. Further Study Issues

5.1 This report shows that total factor productivity (TFP) is rather low with a declining trend. However, this TFP does not include the improvement of quality of inputs, e.g. quality of labors, sex, working hour's etc. Therefore, further detailed study of quality of inputs should be considered.

5.2 Compensation of employment, or wages and salaries estimated by the national income is underestimated because own account workers and unpaid family workers are included in unincorporated enterprises. If this portion of labor income can be separated and reallocated to actual labor income, the TFP should be able to reflect the true technical progress.

5.3 Capital output ratio shows that economic development strategy during the 7th Plan period has emphasized a high capital intensive policy. In spite of investment expanded markedly, some real sectors have invested in fixed assets inefficiently particularly in the real estate and construction sectors. Although most of sectors have been using capital increasingly, but some used it inefficiently, for example, in the ownership of dwellings sector. This implies that capital

utilization in Thailand was rather inefficient. In other word, Thailand has over-invested in fixed assets while produced less national income.