THE CAPITAL-OUTPUT RATIO AND ECONOMIC DEVELOPMENT Studies in Conception and Application, with Special Reference to Planning Experience in the U.A.R.

by

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INTRODUCTION

The capital-output ratio has been widely used by economists and econometricians in model building for policy purposes in both developed and developing countries. Particularly in the developing economies, where planning has been an important feature of economic policy, the projection of output and investment requirements in different sectors is often based on the capital-output ratio.¹

In the First Five-Year Plan of the United Arab Republic (U.A.R.), planners have basically used the incremental capital-output ratio for broad general sectors to derive investment requirements therein. The plan's realizations fell short of the target. This was natural and to be expected in a first effort to plan economic development. However, this raises many important questions. Was the discrepancy between the realization and the target in the First Five-Year Plan due to the very nature of the capital-output ratio tech-
nique itself? To what extent did changing external conditions lead to such discrepancy?

In order to attempt an answer to these questions, it is necessary to be aware of the meaning, limitations and problems of measuring the capital-output ratio. This is the subject matter of Chapter II. Chapter III is devoted to searching the answers to the question raised in the previous paragraph.

The trend of the capital-output ratio is vitally important for the developing countries with scarce capital. This is because the higher is that ratio, the more investment will be needed to achieve a certain rate of growth. In our case: What is the likely trend of the capital-output ratio for U.A.R., and what are its implications for the future development of the country? Specifically, will the country face increasing, or diminishing, problems in the future as far as capital financing is concerned? Chapter IV will attempt to frame an answer to these questions based on both, theoretical argument and empirical evidence.
CHAPTER II

THE CONCEPT OF THE CAPITAL-OUTPUT RATIO
(1) The Meaning of the Capital-Output Ratio:

The capital-output ratio of any industry indicates the amount of capital required to produce one unit of output. Hence, it throws some light on two correlated points: first, the nature of the method of production adopted in the industry, whether it is a capital intensive or a labour intensive method; second, the amount of investment required in the future, assuming that the technique of production and the labour productivity will not change. If a capital intensive method of production is adopted in the industry, then, proportionately more investment will be needed in the future and vice versa. That is why the capital-output ratio is considered an important concept and analytical tool of both economic growth theory and development planning.

Several definitions are found in dealing with the concept of capital-output ratio. As Domar wrote: "Capital coefficient can be defined and disaggregated in so many ways that the fate of a hypothesis may sometimes depend on the particular coefficients used, and what is proved by one set may yet be disproved by another." Actually, capital-output ratio means, in general, the relationship between capi-
tal and output produced by it. The diversity in the definitions is due to the difference in understanding of what should be included under "capital" and under "output".

One of the important differentiations, which is usually made, is between the average and the incremental capital-output ratios. The average capital-output ratio describes the existing structure, while the incremental ratio indicates the changes occurring in it. The average capital coefficient is obtained by dividing the total capital, while the incremental coefficient is estimated by dividing the increase in capital, by the increase in output. Only in the case where capital intensity remains constant, there will be no difference between the average and the marginal capital coefficients. Since we are interested in the behaviour of the capital-output ratio and its usefulness as an analytic tool for planning and projection, the marginal ratio is more significant to us than the average ratio. But we should bear in mind that the marginal ratio is much more sensitive to the cyclical fluctuations in the economy.
than the average ratio. Therefore, the period for which the marginal ratio is estimated, should be sufficiently long and should cover, as far as possible, the entire period of the longest observed cycle. ¹

Another distinction can be made with reference to the items considered under the terms capital and output in the numerator and the denominator respectively. The most useful distinction on this basis has been made between "gross capital coefficient" and "net capital coefficient". Gross capital coefficient refers to the relationship between gross capital and the gross value of output produced by it. Net capital coefficient will be obtained by deducting depreciation from both the numerator and the denominator. But, which ratio is more indicative? In fact, the net ratio is the preferable one. ⁵ With the passage of time, the capital becomes old and will not be as good as the new one. A part of output should be used to restore the existing stock of capital. Hence, depreciation should be deducted from the numerator and the denominator, no matter whether we are dealing with average or incremental capital-output ratio. ⁶
Let us examine the composition of capital. Two items that all economists agree to treat as capital are construction and machinery and equipment. But arguments are raised about whether the term "capital" includes land or not. Here opinions ranged from the absolute exclusion of land and natural resources, being irreproducible, to the other extreme of including both, with some individuals arguing for including only improvements upon these items.

Another debatable item of capital is the producers' and traders' inventories. It is reasonable indeed to include it in the numerator, since it is a part of the working capital. But we should bear in mind that the services of the working capital, other than inventories, are included in the output produced, which is not the case with regard to inventories. Hence, to limit biasness in the capital-output ratio estimates, it is more safe to exclude inventories from the numerator.

We can also differentiate between domestic and national capital-output ratio. The former is the relationship between domestic capital and domestic output in the nu-
merator and denominator respectively. The latter ratio indicates the relationship between national capital and national output. Hence, the net balance of claims against foreign countries is included in the numerator.

The concept of the capital-output ratio may be used with reference to the whole economy, a particular sector, industry or process and may be accordingly termed as "overall capital coefficient," or "process capital coefficient."
Problems of Estimating the Capital-Output Ratio:

When measuring the capital-output ratio, three main problems are faced:
1- Price fluctuations.
2- Changes in capacity utilization (fluctuations of output).
3- Depreciation.

The first problem is the elimination of price fluctuations. In fact, it is misleading to compare capital formation at current prices to national product at current prices. The reason is that the pattern and pace or price changes in the case of output differ from that for the case of capital. Here we face the problem of looking for the convenient price indexes, with which we can deflate capital and output. In general, the availability of a suitable price index for either output or capital is conditioned by the availability of price time-series for detailed commodity classifications within each category. For output, the problem can be easily solved by using either the wholesale price index, if we are dealing with output at factor cost, or
using the consumer price index if we are interested in
the output at market prices. The index number problem
is much more serious with regard to capital, because
of the nonavailability of sufficient data of the dif­
erent items of capital: its prices, its life span, and
its depreciation rate. This renders the adjustments for
price changes in the book value of capital cruder than
that of output. A convenient deflator for capital, is
used by Creamer in his estimate of the capital-output
ratio in 15 industry groups in U.S.A. He derives a
composite price index including the three items of
capital: buildings and lands, machinery and equipments,
and working capital. For the first item, he derives a
constant index weighted by the volume of construction
depreciated over fifty years. For the second item, he
uses a price index of machinery and equipment produced,
and depreciated according to the length of life repor­
ted by the Bureau of Internal Revenue. For the last
item, the working capital, he uses the wholesale price
index. Then, he combines these three indeces into one
composite price index weighted by the relative impor­
tance of the three items in the structure of capital.
The second problem usually faced in estimating the capital-output ratio is how to eliminate the distortion caused in the coefficient by the fluctuations of output. To construct an accurate series of capital-output ratio, we should get annual estimates of the output associated with the "full" utilisation of the existing stock of capital.¹⁵ In this case, the series will not suffer from any upward or downward bias, so far as capacity utilisation is concerned. Any change in the ratio, assuming constant prices in capital and output and constant labour productivity, will be due to the change in the technology adopted. But this is not easy to achieve, since no country, except the U.S.A., has data concerning the "capacity" output. Hence, several methods are used by different economists to eliminate the effect of the fluctuation of output as far as possible. But none of these methods yields completely satisfactory results.¹⁶

¹- One method is simply to note that the series is distorted by the occurrence of recessions and depressions during which capital is under-utilized. In this case,
although we know the coefficient is upward biased, we
do not know the degree of this biasedness. In addition,
the problem is symmetrical. That is, during the "boom"
periods, capital is usually overutilized and the coef­
ficient will experience a downward bias. But, usually,
the economy is vulnerable to the under-utilization of
capital more easily than over-utilization. Thus, the esti­
mate of the capital-output ratio will likely to be more
upward biased over the cycle.

2- Another approach is to measure the capital coef­
ficient for only those years when there are a high le­
vel of full employment and a high degree of full uti­
lization of capital. When this method is applied for
a market economy, we have for any given period, just
a few scattered capital coefficients. In the case of
a period, such as that around the Great Depression,
we do not have an estimation for the coefficient for
several years.

3- A third and more common method is to construct
a single coefficient for a long period, a decade or
or longer, by applying the ratio of the average annual capital stock to the average annual output over the period, or using the ratio of the change in capital to the change in output over the period. Even if we apply this third method, we will not correct for the underutilization of capital associated with a long depression such as the 1930's. However, this seems to be the more suitable method, that can be adopted. And the longer the period one spans to estimate the capital-output ratio, the less will be the effect of the fluctuations in output on the average value of the coefficients over the period, since the downward bias in one year will compensate for the upward bias in another year and so on.

The third problem we meet in calculating the capital-output ratio is the estimation of depreciation charges of different kinds of capital. As we have seen before, the net capital-output ratio is more informative than the gross ratio. Thus, calculating depreciation is of vital importance in order to get the net
values of capital and output. The underlying idea of depreciation is to compensate for the day to day decrease in the productive capacity of capital, so that at the end of its life span, when the capital becomes scrapped, we find the funds sufficient to renew it. This means that the value of depreciation, which we deduct in any year, should equal the value of obsolescence of capital in this year. This condition is not fulfilled in practice, since, as pointed out by Hoffman, the amount of annual obsolescence conforms usually to some kind of normal distribution, while total depreciation charges are normally a linear function of time. In other words, the depreciation charges are usually the same each year, while the number of machines that become worn out annually is much smaller during the earlier years following the purchase of such machines than in the later years. Hoffman concludes that the adoption of the straight line method of depreciation results in the overvaluation of capital stock.  

To judge his conclusion, we may express his idea explicitly by means of the following diagram:
Time is measured along the horizontal axis, with $t$ representing the end of the life-span of capital. Total depreciation charges and obsolescence are measured along the vertical axis. This diagram makes clear two important points related to Hoffman's argument. The first is that he seems to be concerned with the life of capital up to point $C$ only, which is short of its life span, $t$. Now, up to the point $C$, obsolescence...
Exceeds depreciation by the amount OAB, which measures the degree of overvaluation of capital according to Hoffman. But, if we consider the whole life-span of capital, i.e., till point t in Diagram 1, we find that BDT will compensate, at least partially, for the overvaluation of capital measured by OAB. The degree of compensation depends on the amount of the annual depreciation. The higher the latter, the greater is the angle of the depreciation line, D', and the greater will be the compensation, B'tD', for the overvaluation of capital.

But, even forgetting about the rest of the life-span of capital for the moment and considering only the capital's life until period C, what Hoffman concludes is only one possibility. Another possibility is well revealed by means of Diagram 2.
According to Hoffman's argument, the rate of obsolescence of capital will be small at the beginning of its life. This allows for the other possibility that depreciation charges may exceed obsolescence over the range OB. This results in an undervaluation of capital, which may compensate for, or even exceed, the overvaluation of capital along BA, where the rate of obsolescence increases. Thus, adopting the straight-line method of depreciation (deducting equal amounts of depreciation each year) will not result usually in an overvaluation of capital as Hoffman concludes.
(3) **Methods of Estimating the Capital-Output Ratio:**

Capital-output ratio indicates, as we have seen before, the amount of capital required to produce one unit of output. It will reflect the nature of technology adopted, only if we relate capital to what is called capacity output. But it is difficult to get capacity output in real life, since the industries do not operate the whole time at full capacity. We find that, under certain conditions (in boom periods), it may be advantageous to run capital continuously at its full capacity, and consequently the total product to which the capital stock is related will be quite large and, thus, the capital-output ratio will be low. Under others (in depression periods), it may be more advantageous to run the equipment at lower than full capacity and the output will be correspondingly low, and consequently the capital-output ratio will be high. Since the estimation of the capacity capital-output ratio is not possible because of the lack of the required data, different methods have been suggested
to estimate the capital-output ratio, given this handicap.

1- One of the methods used in estimating the capital-output ratio, is by using in denominator what is called the "potential output". Potential output is a measure of the optimum level which the economy is capable of achieving without having serious instability with output, employment and prices. In other words, it is the amount of goods and services produced at stable prices, given the best knowledge of technology, the least cost and nearly full employment. It can be measured, according to Knowles, by estimating the total of goods and services in constant prices (real GNP) produced under the assumption of the employment of 96% of the labour force. This is merely the indicator or measure. Using potential output in the denominator and gross investment in the numerator, we obtain the gross incremental capital-output ratio. Subtracting depreciation from the denominator and the numerator, we get the net incremental capital-output ratio. It should be noted that potential output is less than capacity output. Consequently, this potential capital coefficient
will have an upward bias compared with the capacity capital coefficient. But the degree of overstatement is assumed to be theoretically constant.\(^{22}\)

The advantage of this method, is supposed to be that it solves the problem of fluctuations of output, which we mentioned before, by estimating the amount of output, which is as close as possible to the capacity output. But, a question now arises: If it is possible to estimate, whatever the actual output is, the amount of output produced by 96\% of the labour force, why don't we estimate by the same way, the amount of output produced by 100\% of the labor force. Also, why is "potential output" determined by the output produced by 96\%, and not by 100\% of the labour force? Moreover, this method can be adopted only in the developed economies. It implies the availability of sufficient capital to support the employment of 96\% of the labour force. But this is not true in the developing economies, which are plagued with structural unemployment. One of the main problems of these economies is the scarcity of capital, so that -even by working at full capacity-
it may not support 96% of the labour force. In other words, to employ 96% of the labour force, which is the measuring rod for this method, you have to increase the capacity of the economy. The inconvenience of this method in the case of the developing economy can be further revealed by looking at Levy's definition of "potential output". According to him, it is that output produced with "the use of best available technologies, least cost combinations of inputs and rate of utilization of both capital and labour consistent with the prevailing full-employment norms of the the edonomy." Obviously, these qualifications do not apply to the developing countries.

2- A second method for estimating the capital intensity is used by Borukhov. He criticizes the use of the concept of capital-output ratio as a measure of the input of capital in the output produced. He states that capital consumption, properly calculated, under certain conditions, can be a measure of "capital services" in the relevant product. His criticism is built on the fact that capital has a relatively long productive life. There-
fore, it is not correct to consider a piece of capital, which is expected to last many years, as the input to the output produced in one year only. The input of capital is its consumption per unit of time and that will be related to the output in the same unit of time. Thus, to get the input of capital in a certain product, either we relate the value of capital to the output produced over its life time, or we relate the output produced in one year to the consumption of capital in that year.

But how to measure the value of capital consumed in a certain product? Assuming two factors of production, labour and capital, the value of output is distributed between the return to labour, wages, and the return to capital. The share of capital in total revenue includes the recovering of the cost of the piece of capital that was invested, plus a profit or interest. This means that the share of capital in the product produced is not only the usual depreciation charges calculated at the original cost of capital, but it exceeds it by the amount of interest calculated on the
capital consumed. The capital intensity of an industry can thus be measured by comparing the relative share of capital in the value of its output with that share in other industries.25

In fact, this method can be used to measure the input of capital in a certain product, i.e., capital intensity, but it is not useful as an indicator to the amount of capital required to produce one unit of output. This is because of the concept of the indivisibility of capital. Using capital consumption in the numerator, the capital coefficient will be small indicating that with a small amount of investment, we can obtain the required amount of output; and that is not true. Capital-output ratio cannot be calculated by dividing the value of capital consumed by the value of the output produced, since this ratio will not show us the amount of investment required to realize a certain amount of output and, consequently, a certain level of rate of growth.

3—A more common method in estimating the incremental capital-output ratio is by dividing the increase
in capital stock, i.e., investment, by the increase in output. We can get gross or net incremental capital-output ratio, depending on whether we use gross values of capital and output or net values.

Although the changes in prices affect both output and capital, its impact on output is greater. Therefore, to minimize, if not to eliminate, the effect of price changes, we have to express both numerator and denominator in constant prices. But now we face the problem of choosing suitable price indices. This can be solved, as mentioned before, by using the wholesale price index, or the consumer price index to adjust the value of output. To capital, the best index is the Creamer's composite price index. However, the deflator of output is much more important than the deflator of capital, because the rate of change of the prices in the former is greater than in the latter. This was clear in the research that Kuznets has undertaken to measure the capital-output ratio in 23 different countries. He found that the differences between the ratios
of gross domestic capital formation to gross domestic product at constant and current prices are small, and that the trends of the two sets are practically identical. Quoting Kuznets: "We can, therefore, assume for all analytical purposes that the two sets of ratios here would yield the same result; that they are interchangeable; and that they can be referred to as incremental capital-output ratio." However, it is more accurate, of course, to deflate capital with a convenient price index.

This method for estimating the incremental capital-output ratio as the increase in capital over the increase in output and deflating the denominator and the numerator, if possible, with the price indices indicated above, is a simple and suitable one to adopt in any economy. Aside from the output fluctuation problem, which is incurable especially in the developing countries for the lack of data, two shortcomings are found in this method. First, it neglects the effect of labour productivity on the capital-output ratio. This ratio may decline, not because of the change in technology
as it is supposed to indicate, but due to the increase in the labour force and/or its productivity, given the amount of capital in the economy. Although it is difficult to measure the productivity of labour, at least we can adjust the ratio for the labour input by subtracting from the denominator the value of the increase in output attributable to the increase in labour force.  

28 In this sense Leihenstein stated that, if we like to use the capital-output ratio in a meaningful way, we must be aware of the changes that may occur in other factors affecting output concomitant with the increase in the stock of capital. Hence, he differentiated between the net incremental capital-output ratio and the adjusted incremental capital-output ratio. By the former he meant the incremental capital-output ratio calculated on the assumption that the supplies of all other factors are held constant. By the latter he meant the incremental capital-output ratio adjusted to a given increase in the supply of other factors.  

The second shortcoming is that it relates the investment in a certain year to the output produced in
the same year. This can be true only for working capital (e.g., raw materials and semi-finished goods). But for fixed capital, a lag period should be allowed for between the increase in capital and the increase in output induced by it. This lag period differs between projects and even between the sectors of the same economy. Unfortunately, the lack of data makes it difficult to remedy this shortcoming in many countries.

4- The production function provides an alternative method of deriving the capital-output ratio. This method was suggested by Douglas.\textsuperscript{30} It is used for estimating the capital-output ratio for the whole economy or for individual sectors or industries therein. A Cobb-Douglas production function\textsuperscript{+} is one of the most popular types of production functions, both theoretically and empirically.

\begin{equation}
Q = a K^\alpha L^\beta ; \quad \alpha > 0 , \beta > 0 \\
\end{equation}

where $Q = \text{output}; \ K = \text{capital}; \ L = \text{labour}$. 

\textsuperscript{+} It may be written as: 

\begin{equation}
Q = a K^\alpha L^\beta ; \quad \alpha > 0 , \beta > 0 \\
\end{equation}
But there are two points against employing such method. First, the Cobb-Douglas production function assumes that the elasticity of substitution between capital and labour equals unity. Second, the unitary elasticity of substitution implies that the marginal

\[
\frac{\partial Q}{\partial K} = \alpha \cdot K^{\alpha - 1} \cdot L^\beta = \alpha \frac{Q}{K},
\]

\[
\frac{\partial Q}{\partial L} = \beta \cdot K^\alpha \cdot L^{\beta - 1} = \beta \frac{Q}{L}.
\]

Therefore:

\[
\alpha = \frac{\partial Q}{\partial K} \cdot \frac{K}{Q}
\]

\[
\beta = \frac{\partial Q}{\partial L} \cdot \frac{L}{Q}
\]

\[
\frac{\alpha}{\beta} = (\frac{\partial Q}{\partial K} \cdot \frac{K}{Q}) (\frac{\partial L}{\partial Q} \cdot \frac{Q}{L})
\]

\[
= \frac{K}{\partial K} \cdot \frac{\partial L}{\partial L} = K/L \cdot \frac{\partial L}{\partial K}
\]

Thus,

\[
\frac{K}{L} = \frac{\alpha}{\beta} \cdot \frac{\partial K}{\partial L}
\]

Under cost minimization:

\[
(\frac{\partial Q}{\partial L})/w = (\frac{\partial Q}{\partial K})/r ; \text{ or } \frac{\partial K}{\partial L} = \frac{w}{r}
\]

where \( w \) = wage rate, and \( r \) = interest rate.

Therefore:

\[
\frac{K}{L} = \frac{\alpha}{\beta} \cdot \frac{w}{r}
\]

\[
\log (\frac{K}{L}) = \log (\frac{\alpha}{\beta}) - \log (\frac{r}{w})
\]

\[
\frac{\partial (\log (\frac{K}{L}))}{\partial (\log (\frac{r}{w}))} = -1
\]

Or equivalently:

\[
\frac{\partial (\log (\frac{K}{L}))}{\partial (\log (\frac{w}{r}))} = 1.
\]
productivity of any factor can never reach zero.  

A unitary value for the elasticity of substitution is unlikely within the context of the less developed economies, because of the strong rigidity of their economic structure. Also, this form, with always positive marginal productivity for the factors, will not accord to reality in the developing countries, since disguised unemployment is a common feature of most of them, including U.A.R.

+ If the marginal productivity of capital or labour, \( r \) or \( w \), reaches zero, the elasticity of substitution between capital (K) and labour (L):

\[
\frac{\partial (\log (K/L))}{\partial (\log (r/w))}
\]

will be equal to \( \infty \) or zero respectively.
CHAPTER III

THE APPRAISAL OF THE FIVE-YEAR PLAN
In order to evaluate the First Five-Year Plan (1960/61 - 1964/65), we have, first, to review the historical conditions of the economy of the country. The Plan cannot be derived from scratch; it has to consider the economic aspects of the country in which it is supposed to be implemented. Otherwise, it stands on shaky grounds and is vulnerable to drastic failure. Also, depending on the historical background of the country, you can judge, to a certain extent, whether the plan has been too ambitious or not.

Hence, Chapter III will include: first, a brief historical review of the Egyptian economy; second, a description of the Five-Year Plan; and, third, an appraisal of the investment program in the plan.
(1) **A Historical Review of the Egyptian Economy:**

Egypt was, and still is, an overwhelmingly agrarian country. Agriculture plays a major, although decreasing, role in output and employment. In the 1930's, agriculture formed 50% of total output.\(^1\) According to available data, this share has decreased from 42% of GNP in 1945 to 28% of GNP in 1960/61.\(^2\) With regard to employment, 70% of the labour force was concentrated in the agricultural sector in 1937. This ratio fell to 61% in 1947 and to 56% in 1960.\(^3\)

Cotton is the main agricultural crop, comprising over 40% of the value of agricultural crops in U.A.R.\(^4\) Wheat, maize and rice form 2/3 of the gross value of all agricultural output other than cotton.\(^5\) Cotton is also the dominating component in Egypt's export: Raw cotton amounted to over 70% of the total export within the period 1937 - 39 to 1957 - 59. Manufactured cotton products, however, ranged only from 4% - 7% of total export value during this period.\(^6\)

Until the turn of the 20\(^{th}\) century, the country was able to feed her growing population. The building of the Delta Barrage (a dam in lower Egypt) during the
last 20 years of the 19th century, raised agricultural yields 70% - 100% as much as before. In the 20th century, the improvements introduced in the agricultural sector have taken the form of intensive methods of cultivation, which have a comparable moderate effect on the increase of agricultural output. On the other hand, the annual compound growth rate of population has increased from an average of 1.1% during the period 1907 - 1937 to 1.8% during the following ten years (1937 - 1947) and to 2.5% within the period 1947 - 1960. This accelerating rate of growth of population compared with the moderate average annual compound growth rate of agriculture - about 1.4% over the period 1945 - 1962 - has made the importation of different food stuffs unavoidable. However, the building of the High Dam in Asswan is supposed to contribute significantly to agricultural output. It will lead to the cultivation of an additional one million feddans+ (about

+ One feddan = 1.038 acres = 4,300.833 square meters.
20% of the present cultivated area) and the conversion of 700,000 feddans in upper Egypt from basin to perennial irrigation. In addition, a hydro-electric station with an aggregate capacity of 2.1 million kw., and a maximum output of 10,000 million kwh. will be set up.  

The industrial sector, by contrast to agriculture, plays a relatively small, although increasing, role in the U.A.R. Economy. Its output has formed 13% of the GNP in 1945 and has increased to about 20 - 21% of GNP in 1959/60. Only 7% - 10% of the labour force has been working in the industrial sector. More attention has been directed to industry since 1930. Early in this year the international convention controlling the customs duties in Egypt expired. The country rushed to take advantage of this situation and raised the tariffs to encourage the establishment of new national industries. In addition, World War II stimulated the demand for local industrial output, because of shortages in imported goods. In 1957, a Five-Year Industrial Plan of LE 221 million was drawn up. The government
was expected to provide 60% of the investment in this Plan and the private sector was assigned an important role in it. In 1960/61 the picture has changed. The industrial Plan was amalgamated in a Five-Year Plan covering the whole economy, and the public sector took a dominant role in its implementation.15

One of the main features of the Egyptian economy is the change in the government's role in economic life. In spite of substantial encouragement given to the private sector, government intervention in the economic life took a number of forms: public works, acreage control in agriculture to provide sufficient food for the growing population, price control of basic foods, and different legislations in the industrial sector.16

The government's encroachment on the private sector started in 1956, after the Suez War. A number of financial institutions were placed under sequestration. In 1957, it was announced that all other financial institutions were to be "Egyptianized" within five years.17
The broad government intervention in the economic life was clear in the "Socialist Acts" announced in July 1961. According to them, the major industrial establishments were nationalized; and in 1961 the government put her hand on 95% of the manufacturing and mining industries. The investment of the public sector amounts to over 75% of all investments in the overall Five-Year Plan.\(^1\) The government's control has spread over the different sectors of the economy. In the foreign trade sector, the government controls the import and export operations, leaving to the private sector only 25% of total exports in 1962. In internal trade, the official aim is to raise the government's share to 25%.\(^2\) Prices of different commodities have been set under government's control. Even the rents of the houses have to be determined by official committees formed especially for this purpose to avoid any chance of exploitation by the house-owners of the public. Transportation and communication are owned by the government. Agriculture is the only area in which the private sector plays the
major role. Government's intervention in this area was reflected in the Agrarian Reforms announced in 1952 and 1961. According to the Agrarian Reforms in 1952 the maximum amount of agricultural lands owned by any individual should not exceed 200 feddans excluding the uncultivated land in process of reclamation. Up to 100 feddans can be transferred to the children. Hence, the maximum amount owned by any family in Egypt should not exceed 300 feddans. This maximum level has been lowered to 100 feddans for the whole family (including the uncultivated land which was exempted before). Compensation was paid in bonds to the landowners. The landholdings of the royal family were confiscated without compensation. The agricultural lands, which have been taken by the government, have been distributed to the farmers working on it with a minimum of two feddans and a maximum of five feddans. The price of the lands is being paid in installments over 20 years. Also, the rent of the landholdings may not exceed seven times the value of land tax.  

The idea behind all the above mentioned legislations
is to achieve an even distribution of income and property to build a socialist society. This trend is reflected, also, in the fundamental change undergone by the income tax rate. In 1949, the income tax rate was 50% on incomes over LE 100,000. In 1961 90% was levied on incomes above LE 10,000.21

Finally, something should be said about the resources of the country. With regard to natural resources, Egypt is not a rich country. Unlike many of the underdeveloped economies, most of U.A.R. natural resources, excluding the desert, are already being used.22 A major part of the population, the human resources of the country, suffer from diseases and illiteracy. About 60% of the population suffer from Bilharzia, a disease which is said to reduce the productivity of the patient by 25% - 50%.23 Illiteracy is another wellknown "disease" which affects the productivity and the performance of the population. Although the illiteracy rate shows a decreasing trend, illiteracy still embodies most of the population. The illiteracy rate has fallen from 92.7%
in 1907 to 85.2% in 1937 and to 70.3% in 1960. However, it is expected to decrease at an accelerating rate due to the increasing effort by the government in providing a free system of education in schools and universities. One of the main reasons which impair the quality of the human resources in U.A.R. is population pressure. Not until the 20th century, did this phenomena emerge in the country as a consequence of a dramatic fall in death rates. As late as the 1860's, Egypt suffered from a shortage of labour. Plans for the immigration of Italians, Chinese and other laboures were seriously considered.  

+ From 1923, education has been free and compulsory between the ages of 7 and 12 years.
(2) **The Five-Year Plan:**

U.A.R. commenced its First Five-Year Plan in 1960/61. The main object was to double the national income in 10 years. In fact, this object was imposed on the National Planning Committee, which was responsible for the Plan. The target of the Plan, as had been originally set by the Planning Committee, was to double the income per capita within 20 years.26

The Five-Year Plan is subdivided into annual plans.27 An investment program is the only policy program included in it. The rest of the plan comprises forecasts and targets based on unspecified policies, that will be determined in the annual budgets.28 The Plan has not been formulated according to a particular or definite model. The planners used the given overall increase in the GNP together with a series of income elasticities for consumer goods, estimated by informed guesses, to determine the consumers' demand in the different sectors. By adding the government's current demand, the planned sectoral outputs have been calculated. Using the pro-
jected sectoral capital-output ratios, derived from the historical data and the experiences of other countries, the planners calculated the investments required in each sector. Total investment requirements amounted to LE 1636 million, one third of which were planned to be financed from abroad. The majority of the investments (about 90%) was intended to be undertaken by public authorities. The selection of projects within each sector was left to the ministries, which were encouraged to chose projects with high value added returns, high employment and high import-saving capacity.

Table 1 shows the planned annual value added, capital coefficient and investments in different sectors:
Table 1
Value added and capital formation by sectors
(at fixed 1959/60 prices)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Projected increase in gross value added LE millions</th>
<th>Projected increase mental capital output ratio</th>
<th>Planned total capital formation during 5-year period LE millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and irrigation (including High Dam)</td>
<td>112</td>
<td>3.4</td>
<td>383</td>
</tr>
<tr>
<td>Industry, electricity and construction</td>
<td>266</td>
<td>2.2</td>
<td>575</td>
</tr>
<tr>
<td>Transportation, communication and storages (including Suez Canal)</td>
<td>20</td>
<td>13.5</td>
<td>269</td>
</tr>
<tr>
<td>Dwellings</td>
<td>11</td>
<td>12.7</td>
<td>140</td>
</tr>
<tr>
<td>Services (including public utilities)</td>
<td>104</td>
<td>1.4</td>
<td>149</td>
</tr>
<tr>
<td>Stock Changes</td>
<td>---</td>
<td>----</td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>513</td>
<td>3.2</td>
<td>1637</td>
</tr>
</tbody>
</table>

+Ibid., p. 297.
To fulfil the target of doubling the national income within 10 years, the plan determined the compound annual rate of growth of GNP by 7\% during the first five years and by 7.4\% during the second five years. As it is clear from Table 2, agriculture and industry were supposed to grow at a high rate in the first five years of the Plan and slacken relatively in the second half, while the service sector was to achieve its higher rate of growth in the Second Plan.
### Table 2

Target Income Levels by Sectors

(LE Million, Constant Prices)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agriculture</strong></td>
<td>512</td>
<td>627</td>
<td>5.1</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>Industry</strong></td>
<td>540</td>
<td>802</td>
<td>14.6</td>
<td>8.2</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>51</td>
<td>75</td>
<td>-0.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Subtotal commodity sectors</td>
<td>1,103</td>
<td>1,504</td>
<td>8.7</td>
<td>6.4</td>
</tr>
<tr>
<td><strong>Trade and finance</strong></td>
<td>162</td>
<td>265</td>
<td>5.0</td>
<td>10.4</td>
</tr>
<tr>
<td><strong>Basic development sectors:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation and Communications</td>
<td>117</td>
<td></td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td>84</td>
<td></td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td><strong>Public utilities</strong></td>
<td>9</td>
<td></td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td><strong>Security, justice, defence</strong></td>
<td>61</td>
<td></td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td><strong>Public administration</strong></td>
<td>45</td>
<td></td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Subtotal, basic develop­ment</td>
<td>316</td>
<td>435</td>
<td>3.9</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Other services:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>67</td>
<td></td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>15</td>
<td></td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Social and religious</td>
<td>6</td>
<td></td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>Culture and recreation</td>
<td>18</td>
<td></td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td><strong>Personal services</strong></td>
<td>108</td>
<td></td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Subtotal, other services</td>
<td>214</td>
<td>360</td>
<td>4.8</td>
<td>11.0</td>
</tr>
<tr>
<td>Subtotal, all services</td>
<td>692</td>
<td>1,060</td>
<td>4.4</td>
<td>8.9</td>
</tr>
<tr>
<td><strong>Ground total</strong></td>
<td>1,795</td>
<td>2,564</td>
<td>7.0</td>
<td>7.4</td>
</tr>
</tbody>
</table>

With regard to employment, it has been planned to expand by one sixth, i.e., 1026 employment opportunities have to be created during the Five-Year Plan. Agriculture absorbs one half of the expansion (555), services about one quarter (256) and industry less than one fifth (204).  

The savings' ratio would need to rise from 12% of GNP at the base year to 20% of GNP at 1964/65 in order to fulfil the Plan. Domestic savings were expected to exceed investments by LE 40million at the end of the Plan, making it possible for the country to start repaying its external debt. Household's consumption and governmental administration's consumption were supposed to increase by 26% (from LE 975 to LE 1,236.3) and by 24% (from LE 57.9 to LE 72.1) respectively. The export's target was established as a 36% increase by the end of the First Five-Year Plan, while imports were expected to be reduced by 6% of its level at the base year.
(3) Appraisal of the Investment Program in the Plan:

The First Five-Year Plan, as we have seen, consisted of an investment program plus a forecast for the rest of the economy based on the automatic responses of enterprises and households as influenced by future policies. There is much to be said in favour of this kind of procedure. The main argument is that the future contains so many unknowns impossible to forecast five years ahead. Hence, it may seem better to decide specific policies subsequently, when external conditions concerning technical knowledge, foreign trade, climate conditions, etc., are better known or at least easier to forecast.39

But, according to this policy, the system is vulnerable to bottlenecks in production, in the allocation of resources, in the balance of payments, etc. As Zimmerman40 pointed out, the economic development problem has four aspects that should be decided upon:

(a) What rate of investment should give the best results?
(b) How much to invest (long-term structural planning)?
(c) Where to invest (regional planning)?
(d) When to invest (short-term planning)?

What seems to be lacking mostly in the Plan is the fourth aspect: when to invest. The investment program did not define how investment will develop during the Plan.41

The incremental capital-output ratio was an important tool in planning. The required investment for each sector was calculated by using the incremental capital-output ratio, given the planned output. Also, in the selection of the investment projects more weight was given to the return on capital in terms of value added. The "rule of thumb", which seemed to be agreed upon for allocating investment within sectors was that "... investment should be allocated to industries where the capital-output ratio, or the capital-labour ratio is as low as possible."42

In this chapter, several questions will be answered with regard to the appraisal of the investment prog-
ram in the First Five-Year Plan:

A- Was the investment program a feasible one with respect to the available resources?

B- Is it advisable to give such weight to the capital-output ratio in calculating the required investment, as was done in the plan?

C- Is there any relation between the achieved capital-output ratio and the realization of the growth target in the plan?

The main problem encountered in any trial to answer these questions if the relatively limited data sources and the remarkable diversity in the data given by them. Differences in the definitions and in prices used appear to be the major causes of this diversity. Consequently, to obviate as much inconsistency as we can, we shall depend mainly in our analysis on one source of data, trying to derive most of the needed figures from it.
The Feasibility of the Investment Program:

As is clear from Table 1, the total investment required by the Five-Year Plan amounted to LE 1637 million. Foreign capital formation was supposed to form 1/3 of this total investment.44

Disregarding for the moment the actual achievements of the plan, and trying to evaluate the feasibility of the investment program (given the conditions prevailing in 1959/60), two questions arise at the outset; Was the saving rate high enough to provide the domestic share of the capital formation in the program? Was the situation of the balance of payment in U.A.R. at 1959/60 conducive to belief in the feasibility of getting the LE 545.12 million foreign exchange required by the Plan?

In the five-years preceding the Plan, 1956 - 60, the average saving rate was 11.2% of GNP, as is clear in Table 3. Since the investment figures in the Plan absorb: 20% of GNP;45 this means a deficit of 8.8% of GNP will arise if the saving rate was maintained at
Table 3
Savings in U. A. R., 1953-65
(Constant Price, 1958 = 100)

<table>
<thead>
<tr>
<th>Year</th>
<th>Savings (LE Million)</th>
<th>Percentage of Savings in GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>102.04</td>
<td>12</td>
</tr>
<tr>
<td>1954</td>
<td>151.42</td>
<td>15</td>
</tr>
<tr>
<td>1955</td>
<td>155.85</td>
<td>15</td>
</tr>
<tr>
<td>1956</td>
<td>114.94</td>
<td>10</td>
</tr>
<tr>
<td>1957</td>
<td>145.14</td>
<td>12</td>
</tr>
<tr>
<td>1958</td>
<td>114.80</td>
<td>10</td>
</tr>
<tr>
<td>1959</td>
<td>111.30</td>
<td>10</td>
</tr>
<tr>
<td>1960</td>
<td>201.40</td>
<td>14</td>
</tr>
<tr>
<td>1961</td>
<td>272.11</td>
<td>18</td>
</tr>
<tr>
<td>1962</td>
<td>251.86</td>
<td>15</td>
</tr>
<tr>
<td>1963</td>
<td>121.93</td>
<td>7</td>
</tr>
<tr>
<td>1964</td>
<td>169.26</td>
<td>9</td>
</tr>
<tr>
<td>1965</td>
<td>207.16</td>
<td>12</td>
</tr>
</tbody>
</table>

Note: Savings have been calculated as the difference between the deficit in the balance of current payments - after converting them to constant prices using the wholesale price index, Table III in the Appendix to Ch. III - and the investment at constant prices in Table V in the Appendix to Ch. III.
this level. However, the planners did not depend on domestic saving to finance all the investments required in the Plan. Foreign capital financing was deemed necessary for the development process, not only to fill the gap between investment and domestic saving, but also to provide U.A.R. with foreign exchange to buy machines, raw materials, intermediate goods, etc. from abroad. Domestic saving is not helpful in this respect unless it is directed to produce export commodities. This might be a deliberate policy as long as the country's exports can be sold profitably abroad. But this is not the case in U.A.R. Cotton, the main export of the country, is undergoing, at present, a declining trend in the world markets. Thus, increasing cotton production cannot be used as a means of obtaining foreign exchange to finance investment in the growing industrial sector.

Since only 67% of the investments had been planned to be covered by domestic saving, the required level

+ For a fuller elaboration of this point, see pp. 76, 52 in the paper below.
of domestic saving was 13.3% of GNP. Certainly, it looks a feasible target to raise the level of saving from 11.2% of GNP to 13.3%. By contrast, however, the share of investment which to be covered by foreign capital formation seems a very doubtful target. The foreign financing, measured by the total deficits in the balance of current accounts in the five years preceding the Plan, have been LE 213 million. The required foreign capital formation during the Plan period has been LE 545.12 million, i.e. more than double the level of the preceding period.

What seems even more unfeasible than the prospects for attaining LE 545.12 million of foreign exchange, is the surplus in the balance of payment that the planners had expected to appear in 1964/65. The surplus was supposed to be formed not only through a decrease in imports, but also through an increase in exports. The increased output in agriculture together with the import-substitution products in the industrial sector were expected to reduce the imports of foods, consump-
tion and intermediate goods. On the other hand, exports of manufactured goods were expected to increase. Thus, it had been planned that U.A.R. will start to repay its debt in the fifth year of the plan. Undoubtedly, it looks like a very ambitious goal in the foreign trade sector.

Depending on the available conditions in U.A.R. at the beginning of the Five-Year Plan, we can conclude that the investment program seemed feasible with regard to the domestic resources only. A shortage in foreign resources is expected to appear during the implementation of the plan. The trade surplus expected in 1965 seem to be quite unfeasible.
Table 4

Foreign Trade in U. A. R., 1953-55

(LE million, Current Prices)

<table>
<thead>
<tr>
<th>Year</th>
<th>Imports</th>
<th>Exports</th>
<th>Current balance of payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>179.7</td>
<td>142.5</td>
<td>- 37.2</td>
</tr>
<tr>
<td>1954</td>
<td>164.4</td>
<td>143.9</td>
<td>- 20.5</td>
</tr>
<tr>
<td>1955</td>
<td>187.2</td>
<td>145.0</td>
<td>- 41.2</td>
</tr>
<tr>
<td>1956</td>
<td>186.4</td>
<td>142.3</td>
<td>- 44.1</td>
</tr>
<tr>
<td>1957</td>
<td>190.4</td>
<td>171.6</td>
<td>- 18.8</td>
</tr>
<tr>
<td>1958</td>
<td>230.4</td>
<td>163.8</td>
<td>- 66.6</td>
</tr>
<tr>
<td>1959</td>
<td>214.4</td>
<td>154.3</td>
<td>- 60.1</td>
</tr>
<tr>
<td>1960</td>
<td>225.0</td>
<td>191.6</td>
<td>- 23.4</td>
</tr>
<tr>
<td>1961</td>
<td>238.5</td>
<td>161.2</td>
<td>- 77.3</td>
</tr>
<tr>
<td>1962</td>
<td>300.9</td>
<td>157.4</td>
<td>-143.5</td>
</tr>
<tr>
<td>1963</td>
<td>398.3</td>
<td>226.0</td>
<td>-172.3</td>
</tr>
<tr>
<td>1964</td>
<td>414.3</td>
<td>233.6</td>
<td>-180.7</td>
</tr>
<tr>
<td>1965</td>
<td>405.8</td>
<td>262.5</td>
<td>-143.3</td>
</tr>
</tbody>
</table>

The data in Table 3 and Table 4 show the actual resources that have been attained during the Five-Year Plan. The actual domestic resources were LE 1023.32 million compared with the planned figure of LE 1091.88 million. This means that the domestic resources have almost realised the requirement of the Plan. The average rate of saving has increased to 12.2%. Unexpectedly, foreign resources have exceeded the planned level by LE 142.78 million. Actual foreign resources are LE 688.9 million† and the planned had been LE 545.12 million. Consequently, the actual total investments are LE 1712.22 million compared with the planned amount of LE 1637 million.

The financial resources, then, were not a bottleneck in the implementation of the Five-Year Plan.

† Calculated from Table 4 after the conversion into constant price figures using the wholesale price index in Table III in the Appendix to Ch.III.
But the increasing burden on the balance of payment forms a main latent constraint to the development process. As might have been expected, no surplus appeared in 1965. Instead, a deficit of LE 143.3 million has been realized. The heavy burden on the balance of payment can be roughly related to five causes:

First, the unexpected increase in the rate of growth of population, which jumped from 2.3% to 2.8% per annum. This has led to an increase in the consumption of foods and other consumer goods. In spite of the increase in agricultural output, (Table 5), imports of food increased from an average of 25.6% of total imports in the five years preceding the Plan to an average of 26.2% during the Plan period. Imported consumption goods in the first three years of the Plan fell only by 3.7% from its average level in the preceding five years.

Second, the output of the import substitution industries had not been produced during the Plan as fast as it was expected, in order to significantly reduce imported consumption goods. Moreover, it can be
noticed that the imports of many of the goods which were produced locally had not fallen due to the great increase in population. These industries, then, can be called import-substitution in the specific sense that if they were not established, the imports would have increased than its previous level.\textsuperscript{53}

Thirdly, the planners, by expecting a surplus in the fifth year of the Plan, had taken for granted that the excess output would be exported. Whether these products would be competitive to their counterparts abroad, and whether there would be a foreign demand for them, are subjects which seemed not to have been discussed among the planners in spite of their vital importance.\textsuperscript{54}

Fourthly, the pricing system used in calculating the cost of production was not suitable to the export goal. Sales and costs should have been calculated at the world prices at which the commodities involved can be traded abroad. This presents the true opportunity costs or
revenues of the activity in question.\textsuperscript{55} This makes it easier to judge whether the produced goods are competitive to their foreign counterparts or not. Consequently, the export's feasibility of any kind of commodity can be decided upon on a more realistic basis.

Finally, the deteriorated terms of trade, that fell from 100.2 in 1961/62 to 87.8 in 1963/64 and to 89.6 in 1964/65, further aggravated the deficit during the Five-Year Plan.\textsuperscript{56}

Depending on the actual investment data during the Five-Year Plan, we can conclude that the "investment program" had been surpassed during the implementation of the plan with respect to domestic as well as foreign resources. In spite of that, the planned sectoral and aggregate target with respect to output had not been completely realized as is clear in Table 5.
Table 5

Actual Achievements of the
Five-Year Plan

<table>
<thead>
<tr>
<th>Sector</th>
<th>Actual increase in output in constant prices (1958 = 100) LE million</th>
<th>realized capital output ratio</th>
<th>Actual allocation of investment in constant prices (1958 = 100) LE million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and irrigation (including High Dam)</td>
<td>116.67</td>
<td>3.2</td>
<td>352.38</td>
</tr>
<tr>
<td>Industry, electricity and construction</td>
<td>151.24</td>
<td>4.7</td>
<td>724.10</td>
</tr>
<tr>
<td>Housing</td>
<td>-8.77</td>
<td>--</td>
<td>197.47</td>
</tr>
<tr>
<td>Transport and Communication (including Suez Canal)</td>
<td>55.42</td>
<td>4.6</td>
<td>300.85</td>
</tr>
<tr>
<td>Other Services</td>
<td>134.89</td>
<td>1.5</td>
<td>196.50</td>
</tr>
<tr>
<td>Total</td>
<td>459.45</td>
<td>3.9</td>
<td>1771.30</td>
</tr>
</tbody>
</table>

Calculated from Tables IV and V in the Appendix to Ch. III.
The reason lies in the underestimation of the capital-output ratio in some critical sectors of the economy. This raises a question which we shall try to answer in the following section: Is it advisable to give great weight to the capital-output ratio in calculating the required investment as was done in the U.A.R. Plan?
B- The Capital-Output Ratio and the Calculation of the required Investment in the Plan:

The incremental capital-output ratio has been used as an important tool in the Five-Year Plan. The planners have used the incremental capital coefficient to determine the investments required in each sector. They have derived the projected sectoral capital-output ratios from the historical data of Egypt and the experiences of the contemporary developing countries.

The question is whether these sources are bases for projecting the sectoral capital-output ratio in the Five-Year Plan. As we know, many things affect the capital-output ratio, e.g. the kind of equipments used, its efficiency, the capacity utilized and the maintenance of capital, etc. Certainly, these factors change with economic development. Can these changes be projected and considered in the calculation of the sectoral capital coefficient in U.A.R.? It might be answered that these factors' changes which are due to the development process are embodied implicitly in
the capital-output ratios of contemporary countries which are ahead of U.A.R. in the development planning, e.g. Yugoslavia and India.

Unfortunately, the sectoral capital coefficients of those countries are not available in the sources available. Also, the data of the sectoral investments in U.A.R. cannot be traced back more than eight years before the Plan. Hence, for lack of data, we shall not discuss the accuracy of the derivation of the projected capital-output ratios from both sources mentioned above. In other words, we shall assume that the planners have really considered the historical capital-output ratios in U.A.R. as well as the ratios of other developing countries. Our judgement, then, on how reliable is this method in planning, will depend on the comparison between the projected and the realized capital coefficients as well as between the planned and the achieved output targets.

The actual incremental capital coefficient in the agricultural sector (including the High Dam) during the Five-Year Plan was 3.2, compared with the plan-
ned ratio 3.4. Although the investments devoted to the agricultural sector have been only LE 352.38 million, i.e. LE 30.62 million less than the planned amount, the output target in this sector, LE 112 million, has been surpassed to LE 116.6 million. This paradox can be explained by the fall in the capital-output ratio to 3.2, which has compensated for the decrease in investment devoted to the sector. In fact, a decrease in the capital coefficient has the same effect as an increase in investment.\textsuperscript{57} That is why the concept of the capital-output ratio is important in the planned economies, especially in those where capital is a scarce factor of production.

Moving to industry, electricity and construction the divergence between the planned and the realized capital-output ratio is remarkably large. The projected capital coefficient in this sector had been 2.2 while the realized ratio is 4.7, i.e. more than twice as much as the planned coefficient. Although the investment allocated to these fields (LE 724.10 million) was 26% higher than
the planned amount (LE 575 million), the output target, LE 266 million has not been achieved. The realized output was LE 151.24 million, i.e. 43% lower than the planned level. The underestimation of the capital-output ratio is, in fact, the cause of this great divergence between the actual and the planned level of output. But, on the other hand, the high capital coefficient realized is the result of different reasons, some of which could not be known to the planners ex ante. The important reasons can be summarized as follows:

1- The nationalization of the industries in 1961 had not been expected and counted upon by the planners. The government, as an unexperienced owner of the industrial sector is, naturally, expected to make mistakes in production and administration. But some mistakes were not estimatable. One of these mistakes which was hardly excusable is the appointment of military officers, who had no experience at all in this field, as managers to many firms. The important role
of the manager in the production process is not well recognized in the public-owned enterprises. This mal-administration has led to a waste of factors of production, and consequently has increased the capital coefficient of the sector. In fact, the transfer of the productive sectors from private ownership to government was expected to have two adverse effects: a rise in the capital-output ratio, owing to less efficient operation causing a slackening in the rate of growth of GNP; a rise in the rate of depreciation of capital owing to less efficient maintenance leading to a further fall in the rate of growth of the net national product, \(^58\) For example, it is known that the costs of building and construction have risen substantially owing to the governmental supervision.\(^59\)

2- Comparing the planned capital coefficient of industry, electricity and construction in the Five-Year Plan (2.2) with that of the preceding seven year period (2.6), we find the former lower than the latter.
It might have been expected that a higher coefficient would be needed. The Five-Year Plan contained mainly consumption goods and food industries, which does not show much change from before in the structure of the industrial sector. But the building of new industries in U.A.R. should have been expected to be accompanied by some waste in resources due to the lack of experiences and skill. Hence, the planners were very ambitious when they projected the capital coefficient in industry, electricity and construction as 2.2.

3- An important factor affecting the capital-output ratio is the gestation period. Unfortunately, the data with regard to this factor is not available in many countries. A gestation period longer than expected will raise the capital coefficient. An unsuccessful attempt has been made to calculate the sectoral gestation period in U.A.R. However, it is expected that some of the projects that have been built during the implementation of the Plan will yield their products after the plan period. These enterprises
with long gestation periods will certainly have raised the capital-output ratio during the Plan period.

4- The idle capacity which has appeared in some projects due to the lack of spare parts, raw materials and intermediate goods, has also contributed to the rise of the capital coefficient in industry, electricity and construction. This rise in the actual capital coefficient has made the output target of this sector not feasible unless more investments are allocated to it. Thus, to fulfil the output target, given the realized capital-output ratio, investment has to rise to LE 1250.0 million, i,e. more than twice as much as the planned figure.

In the service sector, we differentiate between transport and communication, and other services. In the former, the realized capital-output ratio, 4.6, was far below the projected ratio, 13.5. The only explanation given in this respect was the complete underestimation of the increase in Suez Canal traffic. With regard to "other services", the realized capital-
output ratio, 1.5, is almost the same as the projected one, 1.4. The actual investments allocated to transport and communication have been LE 300.83 million, i.e. about 11% more than the planned amount, LE 269 million. Actual output in the same sector was LE 63.42 million, i.e. about 200% more than the output target, LE 20 million. This big jump in the output achieved, in spite of the relatively low increase in investment is due to the low sector capital coefficient realized in transport and communication. The planned investment of "other services", LE 149 million, and its target output, LE 104 million, have been also surpassed. Achieved investment and output were LE 196.50 million and LE 134.89 million respectively.

After reviewing the discrepancies realized between the results achieved and the planned targets, we can conclude that it is not advisable to depend only on the capital coefficient to determine the investment required in each sector and then wait and expect the realization of the output target. The volume of investment by itself is not sufficient to determine the expected
income. The kind of investment, the equipment used, the efficiency in using the machines, the prices of investment commodities, final goods and wages, all must be taken into account to realize the final aim: the increase in the volume of goods and services produced.

The capital-output ratio is a technical relation between investment and output. It can be used to determine the investment required for a projected level of income only if other things remain unchanged. This is especially not possible in a period of economic transformation. Changes in the equipment used, in the techniques applied, in the efficiency of labour, in the maintenance of capital and in the capacity utilization, all of these lead to a change in the capital-output ratio. Thus, the historical capital coefficient cannot be depended upon to forecast the required investment in the future as long as the country is undergoing structural change. Even if it is claimed that the capital-output ratios in the underdeveloped countries which have made progress in the development plan-
ning to embody all these changes, we cannot have faith in the suitability of this ratio to any developing country, e.g. U.A.R. Every country has its own conditions with respect to capital, natural and human resources, efficiency, etc. This makes it impossible to adopt one technique of production in two countries and expect the same degree of success in both.

However, the capital-output ratio is a simple technique in planning. The lack of data and experience make it necessary for the countries that are just starting planning, to begin with rather simple techniques, which can be developed as the years go by. Depending on this argument, the planners in U.A.R. may not be blamed by adopting this simple technique in the First-Five Year Plan. But, they could have made something better out of it, if they have used, in addition to the incremental capital-output ratio, the input-output tables. The discrepancy between the actual and the projected capital coefficient in many cases can be explained as the result of the inconsistency between the different projects. The Plan should
have included a quantitative statement of production in the different fields, and the outlay of this production. The input-output tables are essential because through these tables we can realize whether production tends to meet consumption and investment requirements, or whether there is imbalance between what is produced for investment and for consumption.68

Input-output tables suffer from severe shortcomings in common with the capital-output ratio, e.g., they depend chronically upon fixed technical coefficients. But, a combination of the two techniques, capita-output ratio and input-output tables, might be expected to give a better result than using the capital coefficient technique alone, as it has been done in the Five-Year Plan in U.A.R.
C- The Aggregate Capital-Output Ratio and the Rate of Growth of the Economy:

It is argued, both theoretically and empirically that there is an inverse relationship between the capital-output ratio (incremental) and the rate of growth of the economy. The higher the capital-output ratio of the economy, the lower its rate of growth, given a certain level of investment. The rate of growth of the economy, then, can be accelerated either by increasing investment or by decreasing the aggregate capital coefficient.

The capital-output ratio for the whole economy depends not only on mechanization, technical progress, etc., but also on the sectoral structure of the national economy and the rate of its development. Therefore, the economic analyst should distinguish between the capital-output ratio involved in the production of specific products and the capital-output ratio that applies to the national economy as a whole. The latter's dyna-
mics are determined not only by changes in the capital-output ratios related to separate products, but by the share of these products in the total output of the national economy as well. This means that if more weight is given to the sectors with the high capital coefficient, the aggregate capital-output ratio is expected to be high. On the contrary, if the sectors with low capital coefficients have the greater share in the anticipated increase in output, the aggregate coefficient is expected to be low.

According to the Plan, more weight has been given to industry, electricity and construction. This can be shown by examining the share of investments directed to this sector with respect to total planned investments, and the product expected from it compared with the total output anticipated during the Five-Year Plan. About 35% of the planned total investments were directed towards this sector. Its anticipated contribution was about 52% of the total increase in output. The agricultural sector comes next with respect to its
importance in the Five-Year Plan. Its contribution was planned to be 22% of the increase in output. According to this sectoral structure of the economy, the projected aggregate capital-output ratio was 3.2 (Table 1).

During the implementation of the Plan, the sectors' weights, measured by shares in the actual increase in output, have changed. Industry, electricity and construction, together with the agricultural sector have contributed only 58% of the increase in output compared with 74% in the planned figures. The services sector which was planned to contribute with 24% of the total increase, its share rose to 46% of the actual increase, in total output. The aggregate capital-output ratio realized during the Five-Year Plan was 3.9. Although this is already greater than the planned ratio, it would have been much more higher if the

+ 33% for industry, electricity and construction, and
25% for agriculture (calculated from Table 5).

++Calculated from Table 1.
weights given by the planners to the different sectors have not been changed during the implementation of the Plan. The change in the sectoral shares with respect to total output in favour of the services sector has mitigated the effect of the high capital-output ratio realized in industry, electricity and construction on the aggregate capital coefficient. The significant fall in the realized capital-output ratio in the services sector has compensated for the rise in the capital coefficient achieved in industry, electricity and construction. Otherwise, the aggregate capital-output ratio would have jumped higher than 3.9.

The average actual annual rate of growth of GNP during the Five-Year Plab was 5.8%. To raise it to the average planned growth rate of 7.2%, either the level of investment would have had to increase to 28% of GNP, or the aggregate capital-output ratio would have had to fall to 2.8.

+ Derived from Table IV in the Appendix to Ch. III.
The possibility of raising the investment level to 28% of GNP seems unfeasible in the present time because of the low saving ratio in U.A.R. and the already heavy burden on the balance of payment.

It might be said that the aggregate capital-output ratio can be decreased by allocating investments in favour of services and agriculture, the sectors with the lower capital coefficients. This seems to be not an advisable policy to a country seeking structural change and economic development. The expansion of productivity in the services sector is a prerequisite and a concomitant to economic development. Industrialisation and economic progress, in general, postulate improvement in the quality and quantity of many services, e.g. financial services, education, health services, transport and communication, etc. In fact, the development of the goods producing sectors has to be accompanied by the growth in the services sector; a slackening of the latter might reduce the rate of growth of the former. On the other hand, in the case where the goods producing sector is underdeveloped, the services sector is likely to be limited. In fact, the ab-
sorptive and productive capacity of the services sector does likely depend on the degree of development and progress in the country concerned. This can be proved if we compare the number and quality of banks and insurance companies, health, education, etc. in the developed countries with their counterparts in the developing ones. The services sector is larger in the former than in the latter. Thus, giving more weight to the services sector in U.A.R. without making sufficient improvements in the goods producing sectors, is likely not a solution in our case.

With regard to the agricultural sector, the problem is quite different. U.A.R. was, and still is, an agricultural country with respect to both, output and employment. This has its disadvantage with regard to the low income per capita, since the majority of the productive population are working in the agricultural sector, where productivity is relatively low. The

+ The most recent available data is for 1959. According to it, the weekly money wage rate in manufacturing is 2185 milliemes and 700 milliemes in agriculture. See Mead, op. cit., p.116.
disadvantage with regard to output can be summarized in the unfavourable structure of the foreign trade of the country. Cotton, the main export of U.A.R., cannot be depended upon, at present, as a good source of foreign exchange, as some may suggest. The synthetic fibres, which are improving day after day, are used now on a wide scale, as a substitute to cotton in production. Also, the appearance of Sudan in the recent years, as a competitor to U.A.R. in producing the long staple cotton, has narrowed the world markets of the Egyptian cotton.\textsuperscript{72} In addition, there are rather heavy fluctuation in the value of cotton, from year to year, partly because of crop fluctuations, but also because of the well-known price instability of raw material markets.\textsuperscript{73} In fact, export diversification and import substitution make the country less dependent on traditional export commodity. Foreign trade will decline compared to national income, and this in itself will make the country's economy less sensitive to fluctuations in foreign trade and crop conditions.\textsuperscript{74} That is why the planners have given more weight to the industrial sector in the Five-Year Plan.
Industrialisation is the traditional and still the most sought-after path of economic development. Many of the developing countries, which have started on their way towards economic development, have taken this path, e.g. Yugoslavia and India. But, as long as we accept industrialisation as a rational path to economic development, we have to expect a rise in the aggregate capital-output ratio of the country. Thus the rise of the aggregate capital coefficient in U.A.R. from 2.8 in the five-year period preceding the Plan to 3.9 during the implementation of the Plan is a normal phenomenon.

The important question is: What is the trend of the capital-output ratio during the subsequent development process? In other words, when the structural transformation period is over, will the capital coefficient have a continuing upward trend, or will it tend to decline? As we know, a decrease in the capital-output ratio has the same effect as an increase in investment,

+ Derived from Tables IV and V in the Appendix to Ch. III.
and vice versa. Thus, the trend of the capital coefficient has a special importance to developing countries, such as the U.A.R., which suffer from the scarcity of capital. An upward trend in the capital coefficient indicates that more difficulties have to be expected as the development process proceeds. The time-path of economic development will be longer and the sacrifices and efforts required will be greater. On the other hand, if the trend of the coefficient is downward, the development process looks more promising, since the path becomes easier (at least in this one respect) as the time passes.

Chapter IV will be devoted, therefore, to discussing the theoretical and empirical aspects of the trend of the capital-output ratio during the development process in general, and its implications with regard to the expected rate of growth of U.A.R. in particular over the future period.
Calculation of the Capital-Output Ratio in U.A.R.: 

It is well known that some projects have longer gestation period than others. This should be considered in the calculation of the capital coefficient, if accuracy is required. Since this data is lacking in U.A.R., as is also the case in many other countries, we have tried to find a rough picture of the sectoral gestation period by calculating the correlation coefficient between investment and output in each sector, assuming four suppositions: (a) no gestation period; (b) gestation period of one year; (c) gestation period of two years; (d) gestation period of three years. The result is shown in Table I.
Table I

The Correlation Coefficient between Investment and the increase in output by sectors, 1954-1966

<table>
<thead>
<tr>
<th></th>
<th>Industry</th>
<th>Agriculture</th>
<th>Housing</th>
<th>Transport &amp; Communication</th>
<th>Other Services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No lag</td>
<td>0.1644</td>
<td>0.4855</td>
<td>0.4386</td>
<td>0.4022</td>
<td>0.1086</td>
<td>0.5837</td>
</tr>
<tr>
<td>1-year lag</td>
<td>0.0377</td>
<td>0.2334</td>
<td>0.1289</td>
<td>0.4026</td>
<td>-0.329</td>
<td>0.2691</td>
</tr>
<tr>
<td>2-year lag</td>
<td>-0.057</td>
<td>0.3390</td>
<td>0.1289</td>
<td>0.5082</td>
<td>0.1470</td>
<td>0.2712</td>
</tr>
<tr>
<td>3-year lag</td>
<td>-0.578</td>
<td>0.6254</td>
<td>-0.153</td>
<td>0.1453</td>
<td>-0.153</td>
<td>0.4198</td>
</tr>
</tbody>
</table>
As it is clear from Table I, the correlation coefficients, in general, are so low that we cannot depend upon them to derive convincing results. Hence, this trial fails to give us a reliable answer about the gestation period in different sectors. It fails to show us the length of the sectoral lag period, if any, between investment and the increase in output related to it.

A handy and realistic way to calculate the actual incremental capital-output ratio during the Five-Year Plan is to relate the ratio of gross investments during the planning period, excluding land and stock changes, to the increase in gross value added from the base year to the final year of the plan. This way has been used in calculating the realized sectoral capital-output ratios in Table 5. The same method has been used by Gianaris in his calculation of the incremental capital-output ratio with regard to a cross-section of developed and developing countries.
In fact, both of the series of output and investment suffer from statistical weaknesses. This makes them less reliable in the calculation of the incremental capital coefficient on a year to year basis than at a certain period taken as unity.

+ This can be shown by the diversities of these two sets of data when derived from different sources.
Table II

Consumer Price Index in U. A. R.  
\((1958 = 100)\)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Items</td>
<td>93</td>
<td>98</td>
<td>94</td>
<td>94</td>
<td>96</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Food</td>
<td>83</td>
<td>91</td>
<td>92</td>
<td>93</td>
<td>95</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Items</td>
<td>100</td>
<td>101</td>
<td>101</td>
<td>98</td>
<td>99</td>
<td>103</td>
<td>118</td>
</tr>
<tr>
<td>Food</td>
<td>101</td>
<td>102</td>
<td>103</td>
<td>103</td>
<td>105</td>
<td>111</td>
<td>139</td>
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</tbody>
</table>


Table III

Wholesale Price Index in U. A. R.  
\((1958 = 100)\)

<table>
<thead>
<tr>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
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<tr>
<td>General</td>
<td>79</td>
<td>85</td>
<td>83</td>
<td>84</td>
<td>93</td>
<td>101</td>
<td>100</td>
</tr>
<tr>
<td>Buildings</td>
<td>--</td>
<td>--</td>
<td>84</td>
<td>89</td>
<td>99</td>
<td>103</td>
<td>100</td>
</tr>
<tr>
<td>Textiles</td>
<td>70</td>
<td>92</td>
<td>90</td>
<td>93</td>
<td>95</td>
<td>103</td>
<td>100</td>
</tr>
<tr>
<td>General</td>
<td>100</td>
<td>100</td>
<td>102</td>
<td>101</td>
<td>100</td>
<td>105</td>
<td>113</td>
</tr>
<tr>
<td>Buildings</td>
<td>98</td>
<td>101</td>
<td>103</td>
<td>105</td>
<td>104</td>
<td>106</td>
<td>115</td>
</tr>
<tr>
<td>Textiles</td>
<td>98</td>
<td>98</td>
<td>96</td>
<td>96</td>
<td>103</td>
<td>105</td>
<td>110</td>
</tr>
</tbody>
</table>

Table IV

GNP at Constant Market Prices
(1958 = 100)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Year</th>
<th>Agriculture &amp; Irrigation (including High Dam)</th>
<th>Industry, Electricity and Construction</th>
<th>Housing</th>
<th>Transport and Communication</th>
<th>Other Services</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1953</td>
<td>267.34</td>
<td>168.36</td>
<td>57.14</td>
<td>56.12</td>
<td>312.30</td>
<td>864.26</td>
</tr>
<tr>
<td></td>
<td>1954</td>
<td>320.21</td>
<td>193.61</td>
<td>55.95</td>
<td>51.70</td>
<td>337.23</td>
<td>978.61</td>
</tr>
<tr>
<td></td>
<td>1955</td>
<td>331.91</td>
<td>208.50</td>
<td>59.14</td>
<td>55.95</td>
<td>351.07</td>
<td>1025.57</td>
</tr>
<tr>
<td></td>
<td>1956</td>
<td>389.58</td>
<td>228.12</td>
<td>69.79</td>
<td>60.41</td>
<td>363.54</td>
<td>1111.47</td>
</tr>
<tr>
<td></td>
<td>1957</td>
<td>381.00</td>
<td>250.00</td>
<td>68.00</td>
<td>65.00</td>
<td>352.00</td>
<td>1126.00</td>
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<tr>
<td></td>
<td>1958</td>
<td>354.00</td>
<td>278.00</td>
<td>70.00</td>
<td>72.00</td>
<td>373.00</td>
<td>1157.00</td>
</tr>
<tr>
<td></td>
<td>1959</td>
<td>407.00</td>
<td>312.00</td>
<td>73.00</td>
<td>92.00</td>
<td>407.00</td>
<td>1289.00</td>
</tr>
<tr>
<td></td>
<td>1960</td>
<td>399.00</td>
<td>340.53</td>
<td>73.26</td>
<td>100.99</td>
<td>436.53</td>
<td>1350.46</td>
</tr>
<tr>
<td></td>
<td>1961</td>
<td>436.53</td>
<td>384.15</td>
<td>77.22</td>
<td>112.87</td>
<td>529.70</td>
<td>1540.57</td>
</tr>
<tr>
<td></td>
<td>1962</td>
<td>478.57</td>
<td>484.69</td>
<td>79.59</td>
<td>125.53</td>
<td>497.95</td>
<td>1567.33</td>
</tr>
<tr>
<td></td>
<td>1963</td>
<td>479.79</td>
<td>512.71</td>
<td>79.49</td>
<td>157.77</td>
<td>527.38</td>
<td>1757.14</td>
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<tr>
<td></td>
<td>1964</td>
<td>565.14</td>
<td>523.49</td>
<td>72.71</td>
<td>170.87</td>
<td>585.24</td>
<td>1917.45</td>
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<td></td>
<td>1965</td>
<td>515.57</td>
<td>491.77</td>
<td>64.49</td>
<td>156.51</td>
<td>551.52</td>
<td>1800.06</td>
</tr>
</tbody>
</table>

Sources: (1) D. C. Mead, Growth and Structural Change in the Egyptian Economy, p. 283.
(2) U. N.; Yearbook of National Accounts Statistics, 1958
Notes:


To convert the GDP at factor cost into GNP at market prices to form a consistent time series of the production in U.A.R., mathematical manipulation has been used. Comparing the data of the common years, 1962 and 1963, in both sources, we get a rough relationship between the national product at current market prices and the domestic product at factor cost in each sector. These sectoral relationships have been used to convert the data of the period 1963 - 65 in source (2), into gross national product at market prices. Thus, we get one consistent time series of U.A.R. including the GNP at current market prices from 1953 - 1965.

Using the consumption price index in Table II, we calculate the data in Table IV.
Table V

Investment at Constant Prices
(1958 = 100)

LE million

<table>
<thead>
<tr>
<th>Sector Year</th>
<th>Agriculture &amp; Irrigation (including High Dam)</th>
<th>Industry, Electricity and Construction</th>
<th>Housing</th>
<th>Transport and Communication</th>
<th>Other Services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>17.41</td>
<td>48.47</td>
<td>54.11</td>
<td>22.58</td>
<td>13.17</td>
<td>155.74</td>
</tr>
<tr>
<td>1954</td>
<td>18.43</td>
<td>54.81</td>
<td>60.24</td>
<td>28.43</td>
<td>14.21</td>
<td>176.12</td>
</tr>
<tr>
<td>1955</td>
<td>21.42</td>
<td>75.95</td>
<td>61.90</td>
<td>29.15</td>
<td>15.42</td>
<td>204.85</td>
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<tr>
<td>1956</td>
<td>21.60</td>
<td>50.32</td>
<td>53.76</td>
<td>20.95</td>
<td>15.70</td>
<td>162.34</td>
</tr>
<tr>
<td>1957</td>
<td>21.38</td>
<td>50.49</td>
<td>47.52</td>
<td>28.21</td>
<td>16.14</td>
<td>163.74</td>
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<td>1958</td>
<td>25.30</td>
<td>54.90</td>
<td>40.00</td>
<td>33.00</td>
<td>18.20</td>
<td>181.40</td>
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<td>144.82</td>
<td>39.49</td>
<td>60.17</td>
<td>39.30</td>
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<td>40.95</td>
<td>35.43</td>
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<tr>
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<td>67.16</td>
<td>149.18</td>
<td>42.03</td>
<td>46.99</td>
<td>28.60</td>
<td>333.96</td>
</tr>
</tbody>
</table>
Notes and Sources:

Table V is calculated by applying the wholesale price index in Table III to the investment data at current prices derived from the following Sources:


Investments in 1963 are not available. Therefore, in Table V, investment in each sector for this year, 1963, is calculated by averaging over the period 1961 - 65, excluding 1963.

Unfortunately, we could not use Creamer's method+ in deflating the investment series in U.A.R. because of the lack of the required data—respect to working capital, as well as the volume and depreciation of buildings and machines and equipment in the country.

+ See p. 9 in Chapter II above.
CHAPTER IV

THE CAPITAL-OUTPUT RATIO AND THE DEVELOPMENT PROCESS
In this Chapter, we shall try to evaluate some broad generalizations dealing with the difference between capital-output ratios in the developed and underdeveloped economies. The first hypothesis is that capital-output ratios are greater in the developed countries than in the underdeveloped ones. By contrast, the second hypothesis argues that the capital-output ratios are lower in the developed economies than in the underdeveloped ones. Consequently, the first argument is in favour of an upward trend in the capital-output ratio during the development process, while the second is in favour of a downward trend. The appraisal of these two contradictory views will be attempted theoretically and empirically, using a sample of developed as well as underdeveloped countries.

The empirical evaluation will be based on the fact that each of the two hypotheses has its arguments based on certain factors that are considered to have an important effect on the capital-output ratio. We shall try to pick up from both aspects these factors,
that are measurable and treat them as independent variables. The dependent variable will be the gross incremental capital-output ratio. There are two alternative sources of data on these variables. The one is time series; the other is cross-section data. In the first, we trace the development of the capital-output ratio for one country over an extended period of time. Evidently, this calls for data for a sufficiently long period to characterize the different stages of development of that country. In the second approach, we need data for a spectrum of countries wide enough to designate different stages of development.

The second approach is more appealing, since we are concerned with relating the differential in the capital coefficient to the difference in the level of development, other things being equal (i.e., if we take a group of countries they might be argued to have more "equal opportunities" in terms of the possibilities of trading, importing technology, etc., than is true in the case of one country only over time).† Now, the

† This is not to deny that contemporaneous countries do not, in fact, have "equal opportunities" due to resource differences, trading and tariff arrangements, etc.
question is whether there is a significant difference between the level of the capital-output ratio in developed countries and its level in the underdeveloped ones. We shall not dwell on the problem of the distinction between "developed" and "underdeveloped" countries. Rather, a pragmatic approach will be followed, taking as a basis for classification the level of per capita income. Regression analysis will be used to assess the relative importance of each of the factors chosen with respect to the capital coefficient in the different groups of countries.

Let us, first, review the theoretical basis of the two aspects, then move on to the statistical part: the evaluation of coefficients of the independent variables.
A- Hypothesis: "Capital Coefficients are greater in the Developed Countries."

This view argues that the capital coefficient increases with the development process. In fact, an underdeveloped economy is in most cases characterised by a large quantity of labour relative to the capital stock and a low propensity to save out of a given income; while a developed economy has a large capital stock relative to the available labour force and a high propensity to save out of a given income. We shall expect, therefore, that the real wage rate will be lower and the rate of interest will be higher in underdeveloped countries than in the developed ones. Under these conditions, all industries in the underdeveloped countries would be using methods of production, which are more labour intensive than in a developed economy. In other words, the capital-output ratio of each industry in an underdeveloped economy should be smaller, than the capital-output ratio of the corresponding industry in a developed economy."
This aspect is supported also, to some extent, by Harvey Leibenstein. He states that as an economy develops, the wage rate will rise and as a consequence, there will be a tendency to substitute capital for labour. The result is that in those industries where factor substitution is possible, the methods of production will be less labour-intensive than in the less-developed stage, and capital-output ratios will rise with development.

Shifts between agriculture and industry have also an influence on the overall capital-output ratio of the economy. Agriculture requires more labour and less capital, consequently, the capital-output ratio in the agricultural sector is low. On the contrary, industry needs less labour and more capital, and subsequently, the capital coefficient in the industrial sector is high. Hence, the capital-output ratio in the developed countries is expected to be higher than in the underdeveloped ones, since usually the industrial sector is relativetly greater in the former than in the latter.
Hypothesis: "Capital Coefficients are greater in the Underdeveloped Countries."

One of these arguments is supported by Colin Clark. He argues that, as per capita income grows, the composition of output shifts away from the primary towards the tertiary industries, where the capital-output ratios are low. There may be some significant exceptions to this general view. For example, in the case of medical services, the capital-output ratio is quite high compared with the capital-output ratio in some secondary industries. Furthermore, some more advanced countries have higher capital-output ratios than some seemingly less advanced countries. This view requires the investigation of the industrial sector in each of the developed and underdeveloped countries and the measurement of the capital-output ratio in each type of manufacturing. This cannot be achieved easily for the lack of data. However, it is beyond the scope of this paper.

Other discussions that agree with this trend are
based on the facility with which indivisibilities of certain capital goods can be overcome as output increases. We find that the level of output is higher in the developed countries than in the underdeveloped ones, since the income per capita is greater in the former than in the latter. The overcoming of indivisibilities of capital will lead to a fall of the capital coefficients. According to this argument, the higher the income per capita, the higher the output produced, the greater the possibility of overcoming the indivisibility of capital and the less the capital-output ratio will be. Since the indivisibility of capital cannot be measured to evaluate directly its relative significance to the capital-output ratio, it may help to take the income per capita as a substitute, considering the direct relationship between the level of income per capita and the overcoming of the indivisibility of capital.

Another factor which affects the capital coefficients is the utilisation of capital goods in production.
The more efficient the workers and managers in using the capital goods, the more product they produce and, consequently, the lower the capital coefficients are. But undermaintenance of capital goods and inefficiency in using them are common characteristics in the industries of the underdeveloped economies. On the contrary, in the developed countries, more attention is paid to this fact which, in turn, leads to lower capital coefficients in these countries than in the underdeveloped ones.6

This view is compatible with the argument that puts a considerable importance on what is called "human investment". Increasing per capita expenditures on education and on the learning of specific skills are among the concomitants of per capita income growth. As the labour force is gradually improved in this manner, the value added by labour per unit of output increases accordingly. Consequently, the same quantity of labour, without any increase in capital, yields a greater output. Hence, as economic development proceeds, labour
skills improve, economies of scale are experienced at particular stages of growth, and technical knowledge advances. Consequently, the continuing increase in capital per head may be associated with a non-rising, or even falling, capital-output ratio.\(^7\)

One important independent variable should be added to our equation: the rate of growth of GDP. It has been observed that the capital-output ratios are closely but inversely related to the rate of growth. The higher the rate of growth, the higher the output produced, given the stock of capital, the lower the capital-output ratio, and vice versa.\(^8\)
(2) Statistical Analysis:

Our dependent variable in the equation will be the incremental (and not the average) capital output ratio, since this is what counts in the development process. Therefore, the equation will be:

\[ \frac{C}{O} = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + u_r \]  

(1)

where: 

- \( X_1 \) = Rate of growth of GDP (Gross Domestic Product).
- \( X_2 \) = Per Capita GDP (in U.S.A. $).
- \( X_3 \) = Industry's share of GDP.
- \( X_4 \) = Cost of labour (wage/week) in U.S.A. $.
- \( X_5 \) = Percentage expenditure on education.
- \( C/O \) = Incremental capital-output ratio.
- \( u_r \) = Error term, where \( r \) denotes the number of observations.

An important point should be added here: the economic variables are interdependent between each other. The capital-output ratio, in fact, affects many of the above mentioned variables as well as being affected
by them. For example, a high capital-output ratio is likely to raise the physical productivity of labour and, consequently, the wage rate of the labour force. Moreover, the high capital coefficient, by raising productivity and output, may increase the GDP per capita. In fact, $X_1, \ldots, X_5$ in equation (1), have been chosen as independent variables on the basis of the two hypotheses discussed before.+

To evaluate the importance of the independent variables with respect to capital-output ratio ($C/O$) in equation (1), we shall proceed in two steps:

First step: We chose two groups of the underdeveloped and developed countries respectively. Each one includes 10 countries. The first group includes countries with income per capita ranging from $130 - $800 (all in U.S.A. dollars). The second group includes countries with income per capita ranging from $1000 - $3000.

+ See pp. 88, 89 above.
By regressing $C/O$ on each of the independent variables $(X_1, \ldots, X_5)$ in equation (1), we got the following two equations:

\[
C/O = 1.0782 - 0.0467X_1 + 0.6148X_2 + 0.0306X_3 \\
(1.9399) \quad (0.2655) \quad (0.4646) \quad (0.1024) \\
+ 0.1087X_4 + 0.5017X_5 + u_r \quad (0.1123) \quad (0.4689) \quad R^2=0.3887 \quad (2)
\]

\[
C/O = 0.3025 + 0.0818X_1 - 0.5022X_2 + 0.0914X_3 \\
(3.3286) \quad (0.1774) \quad (6.4421) \quad (0.0579) \\
+ 0.5375X_4 - 0.0707X_5 + u_r \quad R^2=0.7697 \quad (3) \\
(0.0125) \quad (0.1456)
\]

Equation (2) is for the underdeveloped countries and (3) for the developed ones. In the first equation, the coefficients of $X_2$ and $X_5$ are the only statistically significant ones, judging by their standard errors. In the second equation, only the coefficients of $X_3$ and $X_4$ are statistically significant. We shall not analyse these results because it is unsatisfactory, since the matrix of the correlation coefficients reveals multicollinearity between some of the independent variables.
If we investigate the independent variables carefully, we find that it is not unexpected that multicollinearity should exist between the rate of growth of GDP ($X_1$) and the per capita GDP ($X_2$). $X_1$ can be a substitute for $X_2$ as an indicator of the stage of the country in the development process. Knowing that the average rate of growth of population in the underdeveloped countries is greater than in the developed ones, the same rate of growth of GDP in both groups indicates that the increase in per capita GDP ($X_2$) in the latter is greater than in the former. Also, there are multicollinearities between $X_5$, $X_1$ and $X_3$. The reason for this is that the higher the rate of growth of GDP, the higher the expected expenditure on education. Also, the higher the industrial share of GDP, normally the higher the level of the income per capita (because the rate of wages in industrial sector is usually higher than in the agricultural one) and consequently the more will be spent on education. Hence, by dropping $X_2$ and $X_5$ the theoretical basis of the equation (1) will not be seriously affected. This is what is done in the second step.
Second step: Our general equation becomes:

\[ C/O = a_0 + a_1 X_1 + a_3 X_3 + a_4 X_4 + u_r \]  

Another reason, why the results of the equations (2) and (3) are unsatisfactory, is the wide range between the income per capita in each group. Therefore in this step, we split the two groups into three groups: The first group includes six underdeveloped countries with per capita income ranging from $130 - $233 (U.S.A. $), the second group includes six "semideveloped" countries with per capita income ranging from $430 - $1155, and the third includes six developed countries with per capita income from $1500 - $1800. U.S.A. and Canada excluded from the last group, because their income per capita is much higher in comparison to the other developed countries.

By regressing the C/O on each of the three independent variables included in equation (4), we obtained:

\[ C/O = 1.7303 - 0.4568X_1 + 0.1899X_3 + 0.0766X_4 + u_r \]  

\[ R^2 = 0.9496 \]  

\[ C/O = 1.8629 + 0.1435X_1 + 0.1025X_3 + 0.1277X_4 + u_r \]  

\[ R^2 = 0.1616 \]
Equation (5) is for the underdeveloped countries, (6) for the "semi-developed" ones and (7) for the developed countries. We shall ignore equation (6) because of the very low value for $R^2$.

Now let us try to analyse the relative importance of the variables in the other two equations and compare the result with the theoretical basis we reviewed before.

(a) The coefficient of $X_1$ is statistically significant in equation (5) only (with regard to the value of the standard error). The negative coefficient of $X_1$ implies an inverse relationship between $X_1$ and $C/O$, which conforms to the theoretical hypothesis: the higher the rate of growth, the lower the capital-output ratio, and vice versa. The coefficient of $X_1$ is statistically insignificant in equation (7).

(b) The coefficient of $X_3$, the industry's share in GDP, is statistically significant in the two equations. It indicates that $X_3$ has a positive relationship with the $C/O$, which is compatible with the theoretical hy-
hypothesis that: the higher the industry's share of GDP, the higher the capital-output ratio, since industry uses more capital-intensive methods of production than agriculture, for example.

Comparing equations (5) and (7), we find that the coefficient of $X_3$ is greater in the case of the underdeveloped countries group than in the case of the developed countries group. If this differential is real, it suggests that industry's share in GDP exerts more positive influence on the capital-output ratio in the underdeveloped countries group than in the developed countries. (The coefficient in the former group is almost 44% higher than the latter). But this is counteracted by a much higher value for the share of industrial product in GDP in the developed countries' group. (In the developed countries' group industry's share in GDP is nearly double that of the underdeveloped countries group).+

+ Calculated from the Table in the Appendix to Ch.IV.
(c) The cost of labour, $X_4$, proved to have a significant positive effect on the capital-output ratio. It is also clear from comparing the coefficient of $X_4$ in equations (5) & (7) that the effect of the cost of labour on the capital-output ratio increases with the development process. This can be explained by the fact that structural rigidity decreases as the development process proceeds. The economy will be more able to adjust to the changes in the relative costs of capital and labour through factor substitution. Moreover, in view of the fact that the underdeveloped countries import their technology, their chance is relatively smaller of effecting factor substitution in conformity with factor endowment.

After discussing the empirical findings, the question is: Can we say anything about the relative magnitude of the capital-output ratio in the developed and underdeveloped countries? Or, put another way, what happens to the capital-output ratio through the
development process—does it decrease or increase or remain constant? In order to work our way to an answer, the empirical findings will be matched with the theoretical arguments.

The growth rate will be excluded from the list of independent variables because of the inconclusiveness of its effect on the capital-output ratio. We are then left with the industry's share in GDP, \( X_3 \), and the cost of labour, \( X_4 \). Among the theoretical arguments presented in favour of an increasing capital coefficient with development, two aspects were discussed. First, the increase in the cost of labour, that accompanies the economic development, induces factor substitution in favour of capital, through development. The expectation, then, is that capital-output ratio will increase with rising relative cost. The positive coefficient of \( X_4 \) confirms this theoretical speculation.

It was also pointed out in these theoretical arguments that structural change, during development process, in favour of industry will be expected to
result in a higher capital coefficient with development. In other words, it is expected that this structural change, measured, say, in terms of the industry's share in GDP, will be positively related to the capital-output ratio. This is what our findings regarding the coefficient of $X_3$ reveals.

We may, then, derive the answer that the capital-output ratio is expected to increase with development. Our statistical results conform with the hypothesis that the capital coefficient is higher in the developed countries than in the underdeveloped ones. The statistical results also conform with the sectoral and overall incremental capital-output ratios of a sample of developed and developing countries, calculated by Gianaris. He has pointed out that in the majority of sectors, developing countries have lower incremental capital-output ratios than developed countries. The overall capital-output ratio is, also, generally higher in the developed countries than the developing ones.

However, this does not mean that the empirical work
done in this respect supports the first hypothesis (that the capital-output ratio is higher in the developed countries than the developing ones). The opposite result (a capital-output ratio higher in the developing than the developed countries: the second hypothesis), has been supported by the empirical work of Kuznets, Bhatt, and Abbas. However, the following analysis will be based on the first hypothesis, since this is what our statistical results have tended to confirm.

A few words of warning are due. They relate to the reliability of the conclusions reached here. These conclusions have to be taken with great care for three reasons: First, the sample size is too small to allow drawing really general conclusions. Secondly, it is expected that the errors of measurement will be relatively large, especially in the case of the underdeveloped countries. Thirdly, though we have tried to minimize the effect of multicollinearity, it cannot be claimed that it has been done away with completely. We know enough of its distorting effects on the results.
(3) The Implication of the Rising Trend of the Capital-Output Ratio with respect to the expected Rate of Growth in U.A.R.:

Applying the above mentioned result - that the capital-output ratio will increase with the development process—i.e., the case of U.A.R., we find that the development path does not look optimistic. As the time passes, the rate of investment required for development should be increased to sustain the same rate of growth of the economy. Now, the question is whether it is feasible to increase the rate of investment of the country to the extent needed to raise, or even to sustain, the rate of growth of the economy in the future, given the rising trend of the capital-output ratio. To answer this question we should discuss the feasible capacity of two sources: first, foreign exchange; second, domestic savings.

First, foreign exchange can be derived from two sources: (a) Earning a surplus in the balance of cur-
rent payment; (b) Obtaining grants and loans from other countries.

(a) A surplus can be achieved through increasing exports and/or decreasing imports. The feasibility of the realization of surplus in the balance of payment in the future is, however, a debatable subject in the U.A.R. case.

With regard to exports, it had been planned, as we know, to reduce the share of cotton in exports and to diversify the country’s exports in favour of manufactured goods. According to this policy, the rate of increase in the exported manufactured commodities should be large enough to compensate for the decrease in cotton exports and to raise total exports to a level higher than imports. By comparing the structure of exports before and during the plan period, we find that cotton’s share in exports has been reduced from 70% in 1955/56 - 1959/60 to 56.1% during the plan period. By contrast, the share of non-agricultural goods (including cotton yarns and cotton fabrics) in total exports has risen from 20.3% in the five years
proceeding the plan to 24.5% only in the Plan period.\textsuperscript{14} Actually, increasing total exports and making a structural change in it at the same time, is not an easy target, whether for the U.A.R. or for any other developing country in its first phase of development. Lack of experience and skill in the manufacturing field will make it difficult for the U.A.R. to compete with established manufacturing countries in world

+ The Soviet Experts' report on Vocational and Technical Training in U.A.R. emphasized the need for establishing a central organization for vocational and technical training that would be responsible for planning and coordinating the manpower requirements. The report pointed out that the general education in U.A.R. does not keep pace with the large industrial projects of the development Plan. See: Monthly Review of Economic and Social Event, (Cairo: Institute of National Planning), Nos. 9 - 10, September - October, 1965, pp. 71 - 72.
markets in the near future. Although this structural change in exports has improved for U.A.R., as has been explained before, it is unlikely to yield results in the short run. Thus, it is not expected to raise exports in U.A.R significantly in the near future.

However, this is only one side of the coin; the other side is imports. If imports can be reduced relatively to the present level of exports, a surplus can be realized without any increase in exports. Reviewing the data during the past period, including the Five-Year Plan, we find that imports have had a rising trend. The question is whether this trend will change in the future and whether it will begin to decline. It is expected that the irrigation projects built in the Five-Year Plan and the completion of the Aswan Dam+

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+ U.A.R. has not reaped yet the full benefit anticipated from the High Dam. This will make possible a substantial expansion of the cultivated area, the conversion of a considerable acreage of cultivated land from basin irrigation to perennial irrigation,
will increase agricultural products and, consequently, reduce the import of food. Also, in the industrial sector, the import substitution industries which have had a gestation period longer than had been expected, are expected to produce yields after the planning period and, consequently, reduce the imports of consumption goods. On the other hand, the accelerated rate of growth of population together with the needs of economic development with respect to the imported machines, tools, intermediate goods, etc., all work to raise the level of imports. For these reasons, even if imports have a decreasing trend, it is not to be expected that its level will decrease sufficient to make a significant surplus in the balance of current payments, as long as the development process is in its earlier phases. Thus, the possibility of making a surplus in the current balance of payment through the increase in exports or the reduction in imports is

= improved navigation along the Nile, a large increase in output and exports of rice and a very significant expansion in power production. It has been estimated that the direct increase in national income as a result of the High Dam will amount annually to 15% or more of GDP in 1964/65. See, Gerakis, "U.A.R.'s Five-Year Plan," p. 10.
limited with respect to U.A.R., at least in the near future.

(b) With regard to grants, most countries cannot depend, usually, on them as a major source of foreign investment, since they are in amount limited (except for certain special cases). Loans are the most prevalent source of foreign exchange in cases where the country cannot make a sufficient surplus in its balance of current payments. But the interest rate on borrowing and the burden of loan repayment create subsequent balance of payments difficulties, which can often have an adverse effect on the economic development of the country concerned. This is actually the case in the U.A.R. The already heavy burden on its balance of payment is a serious bottleneck to the development process. That is why the Planning Committee has decided that industrial enterprises, which are financed by foreign currency should repay their due commitment through the export of all their products to abroad. Thus, it can be concluded that foreign investments
which can be allocated "safely" to U.A.R. are relatively limited, at least in the near future, given the prevailing situation.

Second, with regard to domestic resources, the rate of savings in U.A.R. is low, as it is shown in Table 3. Given the rising trend of the capital-output ratio with the development process, and given the limited foreign resources, as we have seen above, the rate of saving will have to make a remarkable jump in order to sustain (not even to increase) the achieved rate of growth of the economy.

A low rate of saving indicates a high rate of consumption. Hence, an increase in the level of savings requires a reduction in consumption, private and public. Private consumption has risen in absolute terms during the Five-Year Plan. The share of public consumption in GDP, instead of falling from 17% to 15% of GDP in the Plan period, has risen to 21%. This represents one of the sharpest and most unwelcome deviations from the objectives of the Plan. This high level
of consumption endangers the success of economic development. That is why the Planning Committee has taken new measures to cut government expenses in addition to raising prices of consumer and durable goods to reduce private consumption as well.\textsuperscript{17} It may be worth mentioning that the rate of saving, after rising from a very low level in the immediate postwar period, has shown no long run change. It seems to have been stable at a level of 12\% of GNP.\textsuperscript{18} Even in the Five-Year Plan it had risen very slightly. With this low level of saving, together with the expected limited amount of foreign exchange and the already existing heavy burden on the balance of payment, the rate of growth achieved during the Five-Year Plan—although it falls short of the planned target—cannot even be sustained in the future as the development process continues and the capital coefficient tends to rise. The rising trend of the capital-output ratio with economic development makes the development process a big challenge for the countries with scarce capital (including U.A.R.).
More efforts and more sacrifices are needed in the future to overcome this challenge, otherwise the rate of growth in U.A.R will deteriorate. These difficulties will not last for ever. The establishment of a successful new industrial economy will raise the income per capita and overcome the scarcity of capital which is the hindrance to a high rate of growth in U.A.R., as long as we expect a rising trend in the capital-output ratio over the development path.
# APPENDIX TO CHAPTER IV

## Table I

<table>
<thead>
<tr>
<th>Country</th>
<th>Per capita income (US $)</th>
<th>c/o</th>
<th>$X_1$</th>
<th>$X_2$ (US $)</th>
<th>$X_3$ (o/o)</th>
<th>$X_4$ (US $)</th>
<th>$X_5$ (o/o)</th>
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<tr>
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<td>140</td>
<td>8</td>
<td>4.0</td>
<td>4.7</td>
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<td>5.5</td>
<td>162</td>
<td>23</td>
<td>6.4</td>
<td>4.8</td>
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<td>210</td>
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<td>18</td>
<td>10.55</td>
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<td>258</td>
<td>22</td>
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<td>5.8</td>
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<td>4.3</td>
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**Sources:**
Notes:

(1) Data for most countries relate to the year 1966. But, for some countries, the data refer to only 1-3 years prior to 1966, which is the most recent data available. As far as the nature of our problem is concerned, this is not likely to endanger the results obtained.

(2) The figures for the marginal capital-output ratio C/O, and the cost of labour (wage/week) $X_4$ are calculated as follows:

$$C/O = \frac{((GFCF)_{t-1} \times GNP_{t-1})/100)}{GNP_t - GNP_{t-1}}$$

where GFCF is the gross fixed capital formation as a percentage of gross national product (GNP), t indicates the time. A one year lag is assumed between investment (the numerator) and the corresponding output (the denominator).

$$X_4 = \frac{\text{wage per week in non-agricultural sectors (in national currency)}}{\text{the exchange rate (1 U.S.A. dollar=?national currency)}}$$

N.B.: The data for wage rate in the agricultural sector in some countries included in the sample, could not be found.
CONCLUSION

To judge the performance of the First-Five Year Plan in U.A.R., we shall take the achievements realized in Yugoslavia and India as norms helping us to pass some sort of judgement. These two countries have been chosen for two reasons: (1) The structure of their economies, at least at the start, was similar to that of U.A.R. with respect to the preponderant agricultural sector and the meagreness of the industrial sector. (2) Both have adopted development planning, although they differ with regard to the relative importance given to the public and private sectors. The public sector in Yugoslavia dominated the economic life of the country, while in India it is still quite small, even on mixed economy standards. In this respect, U.A.R. stands in between.

The First-Five Year Plan in U.A.R. has achieved 89% of its output target. This is, in fact, a good performance if we compare it with the performance under the First Five-Year Plans of Yugoslavia (1946 -
The First Five-Year Plan in Yugoslavia aimed at doubling per capita income. This ambitious aim was not realized until the end of 1955. In India, the First Five-Year Plan aimed at raising real national income by less than 12%. Actually, it was increased only by half as much. In Yugoslavia the actual growth for 1947-52 was 1.9% per annum. In U.A.R. the achieved average annual rate of growth during the First Plan was 5.8%.

Although the achievements in the First Five-Year Plan in U.A.R. were remarkable, the future of the economic development of the country does not look optimistic unless the bottlenecks encountered in the First Plan are deliberately considered. One might mention three obstacles affecting economic development in the U.A.R.: the heavy burden on the balance of payment; the low level of domestic saving, and the low quality and unorganized human resources.

The heavy burden on the balance of payments has been one of the serious bottlenecks for economic development in the U.A.R. To mitigate the seriousness of
this problem, more efforts should be devoted to increasing exports and decreasing imports. With regard to exports, it might be reasonable to concentrate on the production of goods in which U.A.R. has comparative advantage, no matter whether they be agricultural (e.g. rice, onions, vegetables, fruits) or manufactured goods.

In a report undertaken by the United Nations in 1954, it was found that for the U.A.R. "among the industries which could probably dispense with protection are most minerals, fertilizers, cement, vegetable oil, soap, leather products, cigarettes and some food processing industries." The textile industry, also, was judged competitive at that time. These goods are probably competitive with their counterparts abroad. Why do not the planners concentrate on these industries in the export sector and use them as a means to obtain the foreign exchange needed to finance the growing industrial sector? In fact, the target of increasing exports should have higher priority, at least at the present time, than the aim to change the structure of foreign trade
in the U.A.R. in favour of manufactured goods.

With regard to imports, intermediary and investment goods form, at present, about 70% of total imports.\textsuperscript{10} As a rule, a developing country is not in a position to produce all kinds of modern equipment, and needs to import it in considerable quantities. These large-scale imports of equipment create considerable balance-of-payments difficulties. To solve this problem one could imagine three levels of production techniques, and hence, three levels of sectors within the same country. The first sector is based on the lowest level of capital intensity and makes the maximum use of existing equipment. The second sector works with a higher level of capital intensity. Existing capital equipment can probably be replaced by more efficient means of production manufactured within the country. The third sector uses the most advanced level of technique, not from the viewpoint of the level of technical development of a given country, but according to international standards. The investments in this sector ought to co-
stitute the main levers of development since they should generate the largest returns to capital invested, and would provide a clear orientation as regards future development.\textsuperscript{11}

This might suggest an approach suitable to the U.A.R. in seeking to alleviate the balance-of-payments problem. The sector, which may be expected to use the lowest capital intensity technique, can probably best be represented by agriculture. This suggestion can be supported by the high yields per acre already achieved by the agricultural sector in U.A.R.,\textsuperscript{12} which has economized capital by the successfully used labor intensive techniques. Of course, the productivity of this sector could be further raised by using more advanced, capital-intensive, technique, but because of the scarcity of capital, at present, it might be better to allocate it to the sectors, where capital-labour substitution is more difficult, e.g. manufactured sector, transport and communication, etc. Moreover, in the agri-
cultural sector, it is also, in general, easier than in other sectors to accumulate capital by labour intensive methods. This accumulation of capital may take the form of land improvements, irrigation projects, etc. The division between the second and the third sectors is considered more difficult. It would require a careful projection of relative efficiencies of various capital-producing industries in the U.A.R., taking account of economies of scale and other dynamic efficiency considerations, and in light of the possible technological developments in these capital goods industries overseas. This amounts to determining those capital goods industries for which the U.A.R is likely to have the greatest comparative advantage (or the least comparative disadvantage), after they have passed through the initial "infant industry" stage. Such projections are notoriously difficult to make, but a rational allocation of scarce foreign exchange reserves would require such choice to be made for the economy.
The production of capital goods have already been included in the Second Five-Year Plan,\(^+\) which was supposed now to have started, had the 1967 war not occurred. This policy, although it mitigates the burden on the balance of payment, raises the capital-output ratio. The capital-goods industries have longer gestation periods, and consequently higher capital-output ratios than the consumption industries, which have been stressed in the First Five-Year Plan. High capital-output ratios, as we know, require high investment. Thus, domestic savings would have to rise to fulfil these requirements and to decrease the dependence of the country on foreign loans. One of the points emphasized in the theoretical models of aid dependence developed within the Agency for International Development, is that if a country is eventually to make a

\(^+\) More than 50% of the total investments of the Second-Five Year Plan have been allocated to heavy industry. See, *Monthly Review of Economic and Social Events*, No. 1, January 1965, p.4.
successful transition, away from dependence on foreign aid, it must increase domestic savings sufficiently to cover domestic capital formation. A necessary condition for this development to take place is that the marginal savings rate exceeds the target investment rate. This target investment rate, in turn, is equal to the product of the marginal capital-output ratio and the target rate of growth of output. This means that the marginal savings rate in the U.A.R., assuming no change in the capital-output ratio, should exceed 28% of the increase in GNP. The stability of the rate of saving in U.A.R. for a long period at about 12% indicates that the marginal rate of saving has been almost stagnant at about this level. Thus, to achieve this high marginal rate of saving, the marginal rate of consumption has to be reduced to 72% of the increase in GNP. The

\[ + \text{The marginal rate of saving} = \text{actual marginal capital-output ratio (3.9) \times target average rate of growth of GNP (7.2)} = 28.\]

\[ ++ \text{The share of total consumption, private and public, in GNP has fallen only from 88% in the period preceding the Plan to 86% during the Plan. See, Gerakis, =} \]
feasibility of this great reduction in the marginal rate of consumption seems to be very doubtful, especially with the increasing rate of growth of population.

The marginal rate of saving required to fulfil the investment target can be reduced by decreasing the incremental capital-output ratio of the whole economy. One way of doing that is to allocate investments in favour of the sectors with lower incremental capital coefficient, such as agriculture and services in the Egyptian case. This way has been discussed before, and seems to be unadvisable with regard to the U.A.R. Another way to reduce the capital-output ratio can be by increasing the efficiency and skill of the labour force, by improving administration and management, by placing the right man in the right place to avoid as much as possible the waste in resources. Thus, the improvement in the quality of "human resources" can very likely also, be an effective mean in reducing the sectoral, as well as the overall capital-output ratio in U.A.R.

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"Human resources" are considered to be among the important bottlenecks in the economic development in U.A.R. According to some criteria for human resource development, U.A.R. is considered a semi-advanced country. But, the criterion applied is irrelevant, at least in the case of U.A.R. It considers the percentage of enrollment of both the second and third level of education, but ignores the possible misallocation of manpower resources. As an example, it is common to find the badly needed graduate of a technical school holding a white-collar position in the government. In fact, the U.A.R. may suffer from acute shortage of some skills, but its problem seems, also, to be the misallocation of resources already available. However, misallocation and shortage in skills leads to the same result: the non-availability of qualified manpower needed to fulfil the requirements of economic development. This can likely be a serious constraint on the absorptive capacity of the U.A.R., as long as the import of technicians is difficult because of the already heavy
burden on its balance of payment. Thus, the improvement of the "human resources" of the country, by training and reallocation of the labour force, is vitally important for the success of the economic development in the U.A.R.
Footnotes to Chapter I:


Footnotes to Chapter II:


(2) S.A. Abbas, Capital Requirements for the Development of South and South-East Asia (Croningen, Netherlands: J.B. Walters, 1956), p. 77.


(6) Domar, p. 97.


(11) Abbas, Capital Requirements, p. 77.


(14) Creamer, Capital and Output, p. 27.

(15) Thus, if we relate capital to this "full capacity output," we get what we call the "capacity capital-output ratio."

(17) Ibid., pp.316-317.


(21) Knowles, *Potential Economic Growth*, p.9


(25) Ibid., p.49.

(26) Creamer, Capital and Output, p.27; and Kuznets, "Quantitative Aspects," p.46.

(27) Kuznets, Ibid., p.49.


Footnotes to Chapter III:


(3) D.C. Mead, *Growth and Structural Change*, p.33.


(6) Ibid., p.163.

(7) Ibid., p.2.

(8) Ibid., p.21.

(9) Ibid., p.46.

(10) Ch. Issawi, *Egypt*, p.130.


(12) Ibid., p.320; and D.C. Mead, p.241.

(15) D.C. Mead, pp. 51-53.
(16) Ibid., pp. 48-49.
(17) Ibid., p. 50.
(19) Ibid., p. 63.
(20) Ibid., pp. 159-162.
(21) Ibid., p. 56.
(22) Ibid., p. 90.
(23) D.C. Mead, pp. 27-28.
(24) Ibid., p. 29.
(25) Ibid., p. 33.
(26) Hansen and Marzouk, p. 280; and Mead, p. 236.
(27) Hansen and Marzouk, p. 280.
(28) Ibid., p. 279, and p. 299.
(29) Ibid., p. 303.
(30) Ibid., p. 308.
(31) Ibid., p. 278.
(32) Ibid., p. 303.
(33) Ibid., p. 298, and p. 301.
(34) Ibid., p. 313.
(36) Ch. Issawi, p.68.
(37) Ibid., p.67.
(38) Mead, p.243; and Issawi, p.67.
(39) Hansen and Marzouk, p.304.
(41) Hansen and Marzouk, p.299.
(42) Mead, p. 106.
(43) Fore example, for the diversity in the figures of Gross National Income and Product, see:
For the Capital formation figures, see:
For the Savings figures, see:
Issawi, p.255; Hansen, statistical appendix; and Meas, appendix.

For foreign trade figures, see:
Hansen, Tables 7.1-7.12; Issawi, Tables 26-32; Mead, Tables 7-1 to 7-18; and U.N., *Yearbook of International Trade Statistics*, different volumes.

(44) Hansen and Marzouk, pp. 308-309.


(47) *Ibid*.


(52) Mead, p.243.
(53) Ibid., p.102.
(54) Hansen and Marzouk, p. 308.
(55) Ibid., p.307.
(58) Issawi, p.70.
(59) Hansen and Marzouk, p.287.
(62) See: Appendix to Ch.III.
(63) Hansen and Marzouk, p.296.
(64) M. Kakegi, "Egypt Expands Industry, Improves Agriculture" Foreign Trade (Ottawa: Dept. of Trade and Commerce, April 16, 1966), p.27.

(65) Hansen and Marzouk, p. 296.


Leibenstein conducted an empirical study of the relationship using both cross-section and time-series data. His conclusion was that its inverse nature holds in 129 cases out of 134 used in time-series study, and the same conclusion was confirmed by his cross-section study on a random sample of 18 countries.

(5) Bhatt, *Employment and Capital Formation*, p.44.

(6) Ibid., p.53.


(10) Ibid., Table 2, p.476.


Footnotes to Chapter V:


(3) The planned increase in output was LE 513 million (Table 1) and the realized figure was LE 495.45 million (Table 9).

(4) Hamilton, *Yugoslavia*, p. 120.


(9) Ibid.


Knowles, J.W. *The Potential Economic Growth in the United States*. Congress of the United States,


Organization for European Economic Cooperation *Problems of Development: Series of lectures on economic growth*, 1961


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