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 Measuring 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."[1] 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 occuring 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.[2] 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.[3] 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.[4]

Another distinction can be made with reference to
the items considered under the terms capital and out-
put 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 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 prefe-
rable one.[5] With the passage of time, the capital be-
comes 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 deduc-
ted from the numerator and the denominator, no matter
whether we are dealing with average or incermental ca-
pital-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.[7]

Another debatable item of capital is the producers' and traders' inventories.[8] 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 ouput produced, which is not the case with regard to inventories. Hence, to limit biasedness 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.[9] 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.[10]

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."[11]

(2) <u>Problems of Estimating the Capital-Output Ratio:</u>

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 fluc-
tuations. In fact, it is misleading to compare capital
formation at current prices to national product at cur-
rent 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.[12] Here we face the problem of
looking for the convenient price indeces, with which
we can deflate capital and output. In general, the avai-
lability 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 in-
dex, 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,[13]because
of the nonavailability of sufficient data of the dif-
ferent 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.[14] 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 utili-
zation is concerned. Any change in the ratio, assuming
constant prices in capital and output and constant la-
bour 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 concer-
ning the "capacity" output. Hence, several methods
are used by different economists to eliminate the ef-
fect of the fluctuation of output as far as possible.
But none of these methods yields completely satisfac-
tory results.[16]

1- One method is simply to note that the series is
distorted by the occurence 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 overutilised and the coef-
ficient will experience a downward bias. But, usually,
the economy is vulnerable to the under-utilization of
                   more
capital 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 under-utilization of capital associated with a long depression such as the 1930's.[17] 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 dec-
rease in the productive capacity of capital, so that at
the end of its life span, when the capital becomes scrap-
ped, 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 fulfil-
led 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 be-
come 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.[18]

To judge his conclusion, we may express his idea
explicitly by means of the following diagram:

Diagram 1
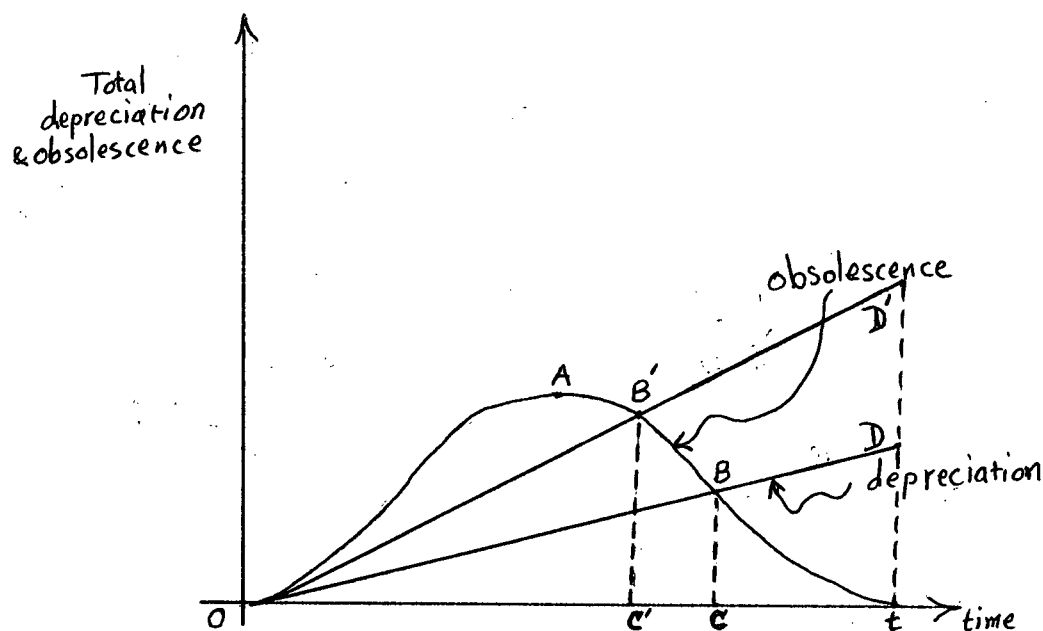
Time is measured along the horizontal axis, with t rep-
resenting the end of the life-span of capital. Total
depreciation charges and obsolescence are measured
along the vertical axis. This diagram makes clear two
important points related to Hoffman's argument. The
first is that he seems to be concerned 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 over-
valuation of capital measured by OAB. The degree of
compensation depends on the amount of the annual dep-
reciation. 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 overvalua-
tion 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 con-
cludes is only one possibility. Another possibility
is well revealed by means of Diagram 2.

Diagram 2
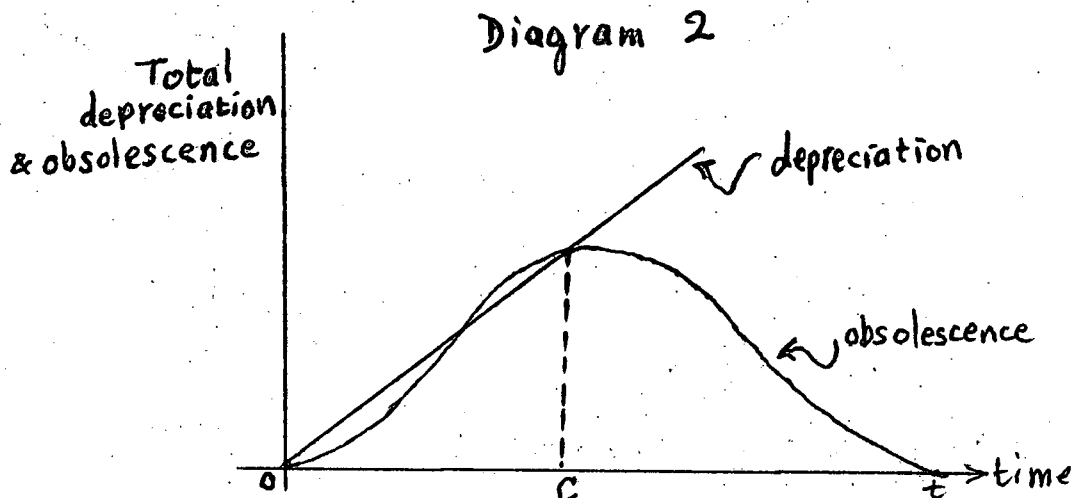
According to Hoffman's argument, the rate of obsolescence of capital will be small at the beginning of its life. This allows for the other possibility that depreciation charges may exceed obsolescence over the range OB. This results in an undervaluation of capital, which may compensate for, or even exceed, 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,[19] 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.[20] 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.[21] 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 porduced by 96% of the labour force, why don't
we estimate by the same way, the amount of output pro-
duced by 100% of the labor force. Also, why is "poten-
tial 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 inconvernience of this
method in the case of the developing economy can be fur-
ther revealed by looking at Levy's definition of "po-
tential output". According to him, it is that output
produced with "the use of best available technologies,
least cost combinations of inputs and rate of utiliza-
tion of both capital and labour consistent with the pre-
vailing full-employment norms of the the economy."[23]
Obviously, these qualifications do not apply to the
developing countries.

2- A second method for estimating the capital inten-
sity is used by Borukhov.[24] 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 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 indestries.[25]

In fact, this method can be used to measure the in-
put of ca>pital in a certain product, i.e., capital in-
tensity, but it is not useful as an indicator to the
amount of capital required to produce one unit of out-
put. This is because of the concept of the indivisibi-
lity of capital. Using capital consumption in the nu-
merator, the capital coefficient will be small indica-
ting 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 di-
viding 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 incremen-
tal 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.[26] 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 identi-
cal. 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 inter-
changeable; and that they can be referred to as incre-
mental capital-output ratio."[27] However, it is more ac-
curate, 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 in-
crease in output and deflating the denominator and the
numerator, if possible, with the price indices indica-
ted 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 coun-
tries 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 dif-
ficult to measure the productivity of labour, at least
we can adjust the ratio for the labour input by sub-
tracting from the denominator the value of the increase
in output attributable to the increase in labour force.[28]
In this sense Leibenstein 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 be-
tween the net incremental capital-output ratio and the
adjusted incremental capital-output ratio. By the for-
mer he meant the incremental capital-output ratio cal-
culated 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.[29]

The second shortcoming is that it relates the in-
vestment 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.[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[+] is one of the most popular types of production functions, both theoretically and emperically.

+ It may be written as:

$$Q = a K^{\alpha} L^{\beta} ; \qquad \alpha > o , \quad \beta > o$$

where Q = output; K = capital; L = labour.

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

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[+] $\partial Q/\partial K = \alpha \, a \, K^{\alpha-1} \, L^{\beta} = \alpha \, Q/K$;

$\partial Q/\partial L = \beta \, a \, K^{\alpha} \, L^{\beta-1} = \beta \, Q/L$.

Therefore:

$$\alpha = \partial Q/\partial K \cdot K/Q$$

$$\beta = \partial Q/\partial L \cdot L/Q$$

$$\alpha/\beta = (\partial Q/\partial K \cdot K/Q)(\partial L/\partial Q \cdot Q/L)$$

$$= K/\partial K \cdot \partial L/L = K/L \cdot \partial L/\partial K$$

Thus,

$$K/L = \alpha/\beta \cdot \partial K/\partial L$$

Under cost minimization:

$(\partial Q/\partial L)/w = (\partial Q/\partial K)/r$; or $\partial K/\partial L = w/r$

where w = wage rate, and r = interest rate.

Therefore:

$$K/L = \alpha/\beta \cdot w/r$$

$$\log (K/L) = \log (\alpha/\beta) - \log (r/w)$$

$$\partial(\log (K/L)) / \partial (\log (r/w)) = -1$$

Or equivalently:

$$\partial(\log (K/L)) / \partial (\log (w/r)) = 1 .$$

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 elaticity of substitution between capital (K) and labour (L) :

$$\partial (\log (K/L)) / \partial (\log (r/w))$$

will be equal to ∞ 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 suppo-
sed 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 20th 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 yeares of the 19th century, raised agricultual
yields 70% - 100% as much as before.[7] In the 20th cen-
tury, the improvements introduced in the agricultural
sector have taken the form of intensive methods of cul-
tivation, which have a comparable moderate effect on
the increase of agricultural output. On the other hand,
the annual compound growth rate of population has in-
creased 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.[8] 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[9] - has made the importation of different
food stuffs unavoidable. However, the building of the
High Dam in Asswan is supposed to contribute signifi-
cantly to agricultural output. It will lead to the cul-
tivation 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 pren-
nial 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.[10]

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[11] and has increased to about 20 - 21% of
GNP in 1959/60.[12] Only 7% - 10% of the labour force
has been working in the industrial sector.[13] More at-
tention 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 ta-
riffs 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.[14] 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 in-
dustrial Plan was amalgamated in a Five-Year Plan co-
vering 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 con-
trol 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 finan-
cial institutions were placed under sequestration. In
1957, it was announced that all other financial insti-
tutions 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.[18]
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 opera-
tions, leaving to the private sector only 25% of to-
tal exports in 1962. In internal trade, the official
aim is to raise the government's share to 25%.[19] Pri-
ces of different commodities have been set under govern-
ment'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 un-
cultivated land which was exempted before). Compensa-
tion was paid in bonds to the landowners. The landhol-
dings of the royal family were confiscated without com-
pensation. 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 maxi-
mum 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.[20]

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 coutry. 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 illitracy. About 60% of the population suffer from Bilharzia, a disease which is said to reduce the productivity of the patient by 25% - 50%.[23] Illitracy is another wellknown "disease" which affects the productivity and the performance of the population. Although the illitracy rate shows a decreasing trend, illitracy still embodies most of the population. The illitracy rate has fallen from 92.7%

in 1907 to 85.2% in 1937 and to 70.3% in 1960.[24] 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.[25]

+ 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 Na-
tional Planning Committee, which was responsible for
the Plan. The target of the Plan, as had been original-
ly 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 inclu-
ded in it. The rest of the plan comprises forecasts and
targets based on unspecified policies, that will be de-
termined 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 con-
sumer goods, estimated by informed guesses, to deter-
mine 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 coun-
tries, the planners calculated the investments required
in each sector.[29] Total investment requirements amoun-
ted to LE 1636 million, one third of which were planned
to be financed from abroad.[30] The majority of the in-
vestments (about 90%) was intended to be undertaken
by public authorities.[31] The selection of projects within
each sector was left to the ministries, which were en-
couraged to chose projects with high value added re-
turns, high employment and high import-saving capacity.[32]

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)

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

Source: Bent Hansen, Development and Economic Policy in the UAR (Egypt), (North-Holland Publishing Company, Amsterdam: 1965), p. 301.
+Ibid., p. 297.

To fulfil the target of doubling the national in-
come 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)

	1964/65	1969/70	Implied Annual Compound Growth Rates	
			1959/60 to 1964/65	1964/65 to 1969/70
Agriculture	512	627	5.1	4.1
Industry	540	802	14.6	8.2
Construction	51	75	-0.5	8.0
Subtotal commodity sectors	1,103	1,504	8.7	6.4
Trade and finance	162	265	5.0	10.4
Basic development sectors:				
Transportation and Communications	117		3.8	
Housing	84		2.9	
Public utilities	9		5.2	
Security, justice, defence	61		3.6	
Public administration	45		6.4	
Subtotal, basic development	316	435	3.9	6.6
Other services:				
Education	67		5.2	
Health	15		6.4	
Social and religious	6		8.4	
Culture and recreation	18		6.7	
Personal services	108		3.9	
Subtotal, other services	214	360	4.8	11.0
Subtotal, all services	692	1,060	4.4	8.9
Ground total	1,795	2,564	7.0	7.4

Donald C. Mead, Growth and Structural Change in the Egyptian Economy, (Richard D. Irwin, Inc., Homewood, Illinois: 1967), p. 240.

With regard to employment, it has been planned to expand by one sixth, i.e., 1026 employment's 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).[33]

The Savings's 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.[34] 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 it external debt.[35] 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.[36] The export's target was established as a 36% increase by the end of the First Five-Year Plan,[37] while imports were expected to be reduced by 6% of its level at the base year.[38]

(3) Appraisal of the Investment Program in the Plan:

The First Five-Year Plan, as we have seen, consisted of an investment programme plus a forecast for the rest of the economy based on the automaic 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 aggument 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 Zimmerman[40] pointed out, the economic development problem has four aspects that shoud be decided upon:

(a) What rate of investment should give the best results?

(b) How much to invest (long-term structural plan-
ning)?

(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 prog-
ram did not define how investment will develop during
the Plan.[41]

The incremental capital-output ratio was an impor-
tant 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 "... invest-
ment 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.[43] 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.

A- 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 absorbs 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)

LE Million

Year	Savings	Percentage of Savings in GNP
1953	102.04	12
1954	151.42	15
1955	155.85	15
1956	114.94	10
1957	145.14	12
1958	114.80	10
1959	111.30	10
1960	201.40	14
1961	272.11	18
1962	251.86	15
1963	121.93	7
1964	169.26	9
1965	207.16	12

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 domustic 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 rspects 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

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[+] 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 plan-
ners had expected to appear in 1964/65.[46] 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.[47] Thus, it had been planned that U.A.R. will start to repay its debt in the fifth year of the plan.[48] Undountedly, 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., 1953-65

(LE million, Current Prices)

Year	Imports	Exports	Current balance of payment
1953	179.7	142.5	- 37.2
1954	164.4	143.9	- 20.5
1955	187.2	146.0	- 41.2
1956	186.4	142.3	- 44.1
1957	190.4	171.6	- 18.8
1958	230.4	163.8	- 66.6
1959	214.4	154.3	- 60.1
1960	225.0	191.6	- 23.4
1961	238.5	161.2	- 77.3
1962	300.9	157.4	-143.5
1963	398.3	226.0	-172.3
1964	414.3	233.6	-180.7
1965	405.8	262.5	-143.3

Source: Excluding column 4; U. N., Yearbook of International Trade Statistics 1967 (New York: 1968)

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 re-
sources have almost realised the requirement of the
Plan. The average rate of saving has increased to 12.2%.
Unexpectedly, foreign resources have exceeded the plan-
ned level by LE 142.78 million. Actual foreign resour-
ces are LE 688.9 million[+] and the planned had been
LE 545.12 million. Consequently, the actual total in-
vestments are LE 1712.22 million compared with the
planned amount of LE 1637 million.

The financial resources, then, were not a bottle-
neck 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 pro-
cess. 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 pay-
ment 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 an-
num.[49] This has led to an increase in the consumption
of foods and other consumer goods. In spite of the in-
crease 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.[50] 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.[51]

Second, the output of the import substitution in-
dusties had not been produced during the Plan as fast
as it was expected, in order to significantly reduce
imported consumption goods.[52] Moreover, it can be

noticed that the imports of many of the goods which were produced locally had not fallen due tothe 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.[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.[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.[55] This makes it easier to judge whether the produced goods are competitive to their foreign couterparts 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.[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

Sector	Actual increase in output in constant prices (1958 = 100) LE million	realized capital output ratio	Actual allocation of investment in constant prices (1958 = 100) LE million
Agriculture and irrigation (including High Dam)	116.67	3.2	352.38
Industry, electricity and construction	151.24	4.7	724.10
Housing	- 8.77	--	197.47
Transport and Communication (including Suez Canal)	65.42	4.6	300.85
Other Services	134.89	1.5	196.50
Total	459.45	3.9	1771.30

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- <u>The Capital-Output Ratio and the Calculation of</u>
   <u>the required Investment in the Plan:</u>

The incremental capita-output ratio has been used
as an important tool in the Five-Year Plan. The plan-
ners have used the incremental capital coefficient to
determine the investments required in each sector.
They have derived the projected sectoral capital-out-
put 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 main-
tainance 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 projec-
ted capital-output ratios from both sources mentioned
above. In other words, we shall assume that the plan-
ners 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 re-
liable is this method in planning, will depend on the
comparison between the projected and the realized ca-
pital 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 secor, 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.[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 secor 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 tar-
get, LE 266 million has not been achieved. The rea-
lized output was LE 151.24 million, i.e. 43% lower
than the planned level. The underestimation of the ca-
pital-output ratio is, in fact, the cause of this great
divergence beween the actual and the planned level of
output. But, on the other hand, the high capital coef-
ficient 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 fol-
lows: :

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 in-
dustrial sector is, naturally, expected to make mis-
takes in production and administration. But some mis-
takes were not estimatable. One of these mistakes
which was hardly excusable is the appointment of mili-
tary 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 maladministration 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 maintainance 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,[60] 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 indestry, 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.[61] 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.[62] 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.[63] 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,[64] 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.[65] 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 mil-
lion. 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 trans-
port 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 re-
quired in each sector and then wait and expect the rea-
lization 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.[66]

The capital-output ratio is a technical realtion
between investment and output. It can be used to deter-
mine 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 trans-
formation. Changes in the equipment used, in the tech-
niques applied, in the efficiency of labour, in the
maintainanance of capital and in the capacity utili-
zation, 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 in-
vestment in the future as long as the country is under-
going structural change. Even if it is claimed that
the capital-output ratios in the underdeveloped coun-
tries which have made progress in the development plan-

ning embody all these changes, we cannot have faith
in the suitability of this ratio to any developing coun-
try, 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 tech-
nique 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.[67]
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 ac-
tual and the projected capital coefficient in many
cases can be explained as the result of the incon-
sistency between the different projects. The Plan should

have included a quantitative statement of production

in the different fields, and the outlay of this pro-

duction. 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-out-

put ratio and inpu-output tables, might be expected

to give a better result than using the capital coef-

ficient technique alone, as it has been done in the

Five-Year Plan in U.A.R.

C- The Aggregate Capital-Output Ratui and the Rate of
   Growth of the Economy:

It is argued, both theoretically and empirically
that there is an inverse relationship between the ca-
pital-output ratio (incremental) and the rate of growth
of the economy.[69] 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 increa-
sing investment or by decreasing the aggregate capital
coefficient.

The capital-output ratio for the whole economy de-
pends not only on mechanization, technical progress,
etc., but also on the sectoral structure of the natio-
nal economy and the rate of its development. Therefore,
the economic analyst should distinguish between the ca-
pital-output ratio involved in the production of speci-
fic 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 na-
tional economy as well.[70] 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 ex-
pected to be low.

According to the Plan, more weight has been given
to industry, electricity and construction.[71] This can
be shown by examining the share of investments direc-
ted to this sector with respect to total planned invest-
ments, 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 direc-
ted 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. Ac-
cording to this sectoral structure of the econnmy, the
projected aggregate capital-output ratio was 3.2 (Ta-
ble 1).

During the implementation of the Plan, the sectors'
weights, measured by shares in the actual increase in
output, have changed. Industry, electricity and con-
struction, together wih the agricultural sector have
contributed only 58%[+] of the increase in output com-
pared 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 ac-
tual 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 plan-
ned ratio, it would have been much more higher if the

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[+] 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 ser-
vices sector has compensated for the rise in the capi-
tal 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 in-
surance companies, health, education, etc. in the de-
veloped countries with their counterparts in the deve-
loping ones. The services sector is larger in the for-
mer 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 agri-
cultural 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. Accor-
   ding to it, the weekly money wage rate in manufac-
   turing is 2185 milliemes and 700 milliemes in agri-
   culture. 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.[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,[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.[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 wods, 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,

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+ Derived from Tables IV and V in the Appendix toCh. 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 ca-
pital. An upward trend in the capital coefficient in-
dicates that more difficulties have to be expected as
the development process proceeds. The time-path of eco-
nomic 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 deve-
lopment 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 pro-
cess in general, and its implications with regard to
the expected rate of growth of U.A.R. in particular
over the future period.

APPENDIX TO CHAPTER III

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 secors, 1954-1966

	Indus-try	Agri-cul-ture	Hou-sing	Trans-port & Commu-nica-tion	Other Servi-ces	Total
No lag	0.1644	0.4856	0.4386	0.4022	0.1086	0.5837
1-year lag	0.0377	0.2334	0.1289	0.4026	-0.329	0.2691
2-year lag	-0.067	0.3390	0.1289	0.5082	0.1470	0.2712
3-year lag	-0.678	0.6254	-0.163	0.1463	-0.153	0.4198

As it is clear from Table I, the correlation coef-
ficients, in general, are so low that we cannot de-
pend upon them to derive convincing results. Hence,
this trial fails to give us a reliable ansewer about
the gestation period in different secqors. It fails to
show us the length of the sectoral lag period, if any,
between investment and the increase in oùtput related
to it.

A handy and realistic way to calcultate the actual
incremental capital-output ratio during the Five-Year
Plan is to relate the ratio of gross investments du-
ring the planning period, excluding land and stock
changes, to the increase in gross value added form the
base year to the final year of the plan. This may has
been used in calculating the realized sectoral capi-
tal-output ratios in Table 5. The same method has been
used by Gianaris in his calculation of the incremen-
tal capital- output ratio with regard to a cross-
section of developed and developing countries.[75]

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)

	1948	1953	1954	1955	1956	1957	1958
All Items	93	98	94	94	96	100	100
Food	83	91	92	93	95	99	100
	1959	1960	1961	1962	1963	1964	1965
All Items	100	101	101	98	99	103	118
Food	101	102	103	103	105	111	139

Source: U. N., Statistical Yearbook 1962 and 1966.

Table III

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

	1948	1953	1954	1955	1956	1957	1958
General	79	85	83	84	93	101	100
Buildings	--	--	84	89	99	103	100
Textiles	70	92	90	93	96	103	100
	1959	1960	1961	1962	1963	1964	1965
General	100	100	102	101	100	105	113
Buildings	98	101	103	105	104	106	115
Textiles	98	98	96	96	103	105	110

Source: U. N.; Statistical Yearbook 1962 and 1966.

Table IV

GNP at Constant Market Prices
(1958 = 100)

LE million

Sector Year	Agriculture & Irrigation (including High Dam)	Industry, Electricity and Constru- uction	Hous- ing	Transport and Commu- nication	Other Services	Total
1953	267.34	168.36	57.14	56.12	312.30	864.26
1954	320.21	193.61	65.95	61.70	337.23	978.61
1955	331.91	208.50	69.14	65.95	351.07	1026.57
1956	389.58	228.12	69.79	60.41	363.54	1111.47
1957	381.00	250.00	68.00	65.00	362.00	1126.00
1958	364.00	278.00	70.00	72.00	373.00	1157.00
1959	407.00	312.00	73.00	92.00	407.00	1289.00
1960	399.00	340.53	73.26	100.99	436.63	1350.46
1961	436.63	384.15	77.22	112.87	529.70	1540.57
1962	478.57	484.69	79.59	125.53	497.95	1667.33
1963	479.79	512.71	79.49	157.77	527.38	1757.14
1964	565.14	523.49	72.71	170.87	585.24	1917.45
1965	515.67	491.77	64.49	166.61	561.52	1800.06

Sources: (1) D. C. Mead, Growth and Structural Change in the Egyptian
Economy, p. 285.
(2) U. N.; Yearbook of National Accounts Statistics, 1968

Notes:

Source (1) includes the Gross National Income and Product at market price from 1952/53 - 1962/63 in current prices. Source (2) contains the Gross Domestic Product at factor cost from 1962 - 1965.

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

Sector Year	Agriculture & Irrigation (including High Dam)	Industry, Electricity and Construct- ion	Hous- ing	Transport and Commu- nication	Other Services	Total
1953	17.41	48.47	54.11	22.58	13.17	155.74
1954	18.43	54.81	60.24	28.43	14.21	176.12
1955	21.42	75.95	61.90	29.16	16.42	204.85
1956	21.60	50.32	53.76	20.96	15.70	162.34
1957	21.38	50.49	47.52	28.21	16.14	163.74
1958	25.30	64.90	40.00	33.00	18.20	181.40
1959	26.50	63.00	31.10	35.80	15.00	171.40
1960	37.10	80.20	18.20	73.10	16.20	224.80
1961	61.36	124.21	41.27	80.68	40.39	347.91
1962	74.24	155.14	45.64	66.06	52.78	393.86
1963	70.45	144.82	39.49	60.17	39.30	294.23
1964	79.14	150.75	29.04	46.95	35.43	361.31
1965	67.16	149.18	42.03	46.99	28.60	333.96

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:

(1) D.C. Mead, Growth and Structural Change, p.290;
(1953 - 1963).

(2) U.N. Yearbook of Nationsl Accounts Statistics,
1968; (1964 - 1965).

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

Unfortunalely, we could not use Creamer's method[+]
in deflating the investment series in U.A.R. because
of the lack of the required data with respect to wor-
king 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 be-
tween capital-output ratios in the developed and under-
developed economies. The first hypothesis is that ca-
pital-output ratios are greater in the developed coun-
tries 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 un-
derdeveloped 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 va-
riables. The dependent vaiable will be the gross in-
cremental capital-output ratio. There are two alter-
native 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 deve-
lopment 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 capi-
tal coefficient to the difference in the level of deve-
lopment, 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

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+ This is not to deny that contemporaneous countries do
  not, in fact, have "equal opportunities" due to re-
  source differences, trading and tariff arrangements,
  etc.

question is whether there is a signigicant 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.

(1) Theoretical Review:

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, therefor, 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.[1]

This aspect is supported also, to some extent, by Harvey Leibenstein.[2] He stated 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 under-developed ones, since usually the industrial sector is relativetly greater in the former than in the latter.[3]

B- 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 compo-
sition of output shifts away from the primary towards
the tertiary industies, 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 com-
pared withe the capital-output ratio in some secondary
industries. Furthermore, some more advanced countries
have higher capital-output ratios than some seemingly
less advanced countries.[4] This view requires the in-
vestigation of the industrial sector in each of the de-
veloped and underdeveloped countries and the measure-
ment of the capital-output ratio in each type of
manufacturing. This cannot be achieved easily for the
lack of data. However, it is bayond 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.[5] 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 inefficien-
cy in using them are common characteristics in the in-
dustries of the underdeveloped economies. On the con-
trary, in the developed countries , more attention is
paid to this fact which, in turn, leads to lower capi-
tal coefficients in these countries than in the under-
developed 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 edu-
cation 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 ac-
cordingly. Consequently, the same quntity of labour,
without any increase in capital, yields a greater out-
put. 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 clsely 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:

$$C/O = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + u_r \quad (1)$$

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. Hor example, a high capital-output ratio is
likely to raise the physical productiviy of labour and,
consequently, the wage rate of the labour force. More-
over, the high capital coefficient, by raising produc-
tivity 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 hy-
pothises dicussed before.[+]

To evaluate the impo$\overset{r}{\text{\tiny|}}$tance 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 underdeve-
loped and developed countries respectively. Each one
includes 10 countries. The first group includes coun-
tries with income per capita ranging from \$130 - \$800
(all in U.S.A. dollars). The second group includes coun-
tries with income per capita ranging from \$1000 - \$3000.

By regessing C/O on each of the independent vaiables
$(X_1, \ldots, X_5)$ in equation (1), we got the following two
equations:

$$C/O = 1.0782 - 0.0467X_1 + 0.6148X_2 + 0.0306X_3$$
$$ (1.9399) (0.2655) (0.4646) (0.1024)$$

$$ + 0.1087X_4 + 0.5017X_5 + u_r$$
$$ (0.1123) (0.4689) R^2 = 0.3887 \quad (2)$$

$$C/O = 0.3025 + 0.0818X_1 - 0.5022X_2 + 0.0914X_3$$
$$ (3.3286) (0.1774) (6.4421) (0.0579)$$

$$ + 0.5375X_4 - 0.0707X_5 + u_r \quad R^2 = 0.7697 \quad (3)$$
$$ (0.0125) (0.1456)$$

Equation (2) is for the underdeveloped countries
and (3) for the devloped ones. In the first equation,
the coefficients of X_2 and X_5 are the only statistical-
ly 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 ana-
lyse these results because it is unsatisfactory, since
the matrix of the correlation coefficients reveals mul-
ticollinearity 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 multicolliniarties 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:

$$C/O = a_o + a_1X_1 + a_3X_3 + a_4X_4 + u_r \qquad (4)$$

Another reason, why the results of the equaions (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 regessing the C/O on each of the three independent variables included in equation (4), we obtained:

$$C/O = 1.7303 - 0.4568X_1 + 0.1899X_3 + 0.0766X_4 + u_r \quad (5)$$
$$(0.6015) \quad (0.0913) \quad (0.0351 \quad (0.0160)$$
$$R^2 = 0.9496$$

$$C/O = 1.8629 + 0.1435X_1 + 0.1025X_3 + 0.1277X_4 + u_r \quad (6)$$
$$(2.6462) \quad (0.3042) \quad (0.0931) \quad (0.0458)$$
$$R^2 = 0.1616$$

$$C/O = -2.4299 + 0.1061X_1 + 0.1317X_3 + 0.4247X_4 + u_r \quad (7)$$
$$(2.9765) \quad (0.3003) \quad (0.0516) \quad (0.0127)$$
$$R^2 = 0.7895$$

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 insignigmificant in equation (7).

(b) The coefficient of X_3, the industry's share in GDP, is statistically signigicant in the two equations. It indicates that X_3 has a positive relationship with the C/O, which is compatible with the theoretical hy-

pothesis 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 under-
developed countries group than in the case of the de-
veloped 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 al-
most 44% higher than the latter). But this is counter-
acted 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 coun-
tries 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 theo-
retical 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 presen-
ted 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 expec-
tation, then, is that capital-output ratio will in-
crease with rising relative $_\wedge$labour cost. The positive coef-
ficient of X_4 confirms this theoretical speculation.

It was also pointed out in these theoretical ar-
guments 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.[9] The overall capital-output ratio is, also, generally higher in the developed countries than the developing ones,[10]

However, this does not mean that the empirical work

done in this repect supports the first hypothesis
(that the capital-output ratio is higher in the deve-
loped 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 supproted by the empirical work of Kuznets,[11]
Bhatt,[12] and Abbas.[13] 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 rela-
tively large, especially in the case of the underde-
veloped 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 oh the results.

(3) <u>The Implication of the Rising Trend of the Capial-</u>
<u>Output Ratio with rspect to the expected Rate of</u>
<u>Growth in U.A.R.</u>:

Applying the above mentioned result - that the ca-
pital-ouput ratio will increase with the fevelopment
process--to the case of U.A.R., we find that the deve-
lopment path does not look optimistic. As the time
passes, the rate of investment required for develop-
ment shoud 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 ex-
change; second, domestic savings.

First, foreign exchang can be derived from two
sources: (a) Earning a surplus in the balance of cur-

rent payment; (b) Obtaining grants and loans from other
ountries.

(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 manufac-
tured 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 le-
vel 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

proceding the plan to 24.5% only in the Plan period.[14]
Actually, increasing total exports and making a struc-
tural change in it at the same time, is not an easy
target, whether for the U.A.R. or for any other de-
veloping 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 com-
pete with established manufacturing countries in world

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+ The Soviet Experts' report on Vocational and Tech-
  nical 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 require-
  ments. The report pointed out that the general edu-
  cation 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 ren. Thus, it is not expected to raise ex-
ports 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 re-
latively to the present level of exports, a surplus
can be realized without any increase in exports. Re-
viewing 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[+]

+ U.A.R. has not reaped yet the full benefit antici-
   pated 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 ex-
pectec, are expected to produce yields after the plan-
ning period and, consequently, reduce the imports of
consumption goods. On the other hand, the accelerated
rate of growth of population togerher 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 sur-
plus in the current balance of payment through the
increase in exports or the redection 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 preva-
lent source of foreign exchang in cases where the
country cannot make a sufficient suplus in its balance
of current patments. But the interest rate on borro-
wing and the burden of loan repayment create subse-
quent 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 develop-
ment 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.[15]
Thus, it can be concluded that foreign investments

which can be allocated "safely" to U.A.R. are rela-
tively 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 sus-
tain (not even to increase) the achieved rate of growth
of the economy.

A low rate of saving indicates a high rate of con-
sumption. Hence, an increase in the level of savings
requires a reduction in consumption, private and pub-
lic. Private consumption has risen in absolute terms
during the Five-Year Plan. The share of public consump-
tion 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.[16] This high level

of consumption endangers the seccess of eonomic deve-
lopment. 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.[17] It may be worth mention-
ing 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.[18] Even in the Five-Year Plan
it had risen very slightly. With this low level of sa-
ving, together with the expected limited amount of
foreign exchange and the already existing heavy bur-
den 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 growh 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

	Country	Per capita income (US $)	c/o	X_1	X_2 (US $)	X_3 (o/o)	X_4 (US $)	X_5 (o/o)
Group I	Cylon	132	3.35	4.2	140	8	4.0	4.7
	U.A.R.	158	3.97	3.5	162	23	6.4	4.8
	Paraguay	189	2.57	3.6	210	16	9.02	1.6
	Hondorus	199	2.64	4.5	214	18	10.55	2.7
	Phillipines	230	2.16	5.5	258	22	13.49	4.1
	Peru	233	2.87	6.6	253	22	1.60	4.9
Group II	Jamaica	430	2.95	4.3	491	26	24.36	3.1
	Uraguay	550	0.27	0.1	559	25	15.22	2.7
	Japan	791	2.12	9.8	919	28	30.29	7.3
	Ireland	798	4.00	3.2	845	33	29.68	5.2
	Austria	1033	3.07	4.1	1183	41	31.74	4.8
	Israel	1155	3.18	8.4	1330	30	83.47	7.3
Group III	Belgium	1502	3.01	4.6	1667	30	29.56	7.1
	W. Germany	1518	4.22	4.5	1740	40	50.29	4.5
	France	1542	2.85	5.2	1729	35	30.49	4.0
	U. K.	1577	3.21	2.8	1644	35.	42.33	6.4
	Australia	1764	308	4.7	1978	34	65.17	4.3
	Denmark	1808	2.22	4.6	2246	31	74.39	7.4
	Canada	1980	2.31	5.6	2329	33	88.84	8.5
	U. S. A.	3153	1.93	5.1	3504	33	98.69	6.5

Sources: (1) U. N., Yearbook of National Accounts Statistics 1967.
(2) UNESCO, Statistical Yearbook 1967.
(3) ILO, Yearbook of Labour Statistics 1967. (Geneva: International Labour Office, 1968).

Notes:

(1) Data for most coutries relate to the year 1966.
But, for some coutries, 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 calcula-
ted as follows:

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

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 de-
nominator).

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

N.B.: The data for wage rate in the agricultural sec-
tor 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 rea-
lized 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 agricultu-
ral sector and the meagreness of the industrial sec-
tor. (2) Both have adopted development planning, al-
though they differ with regard to the relative impor-
tance given to the public and private sectors. The
public sector in Yugoslavia dominates the economic
life of the country,[1] while in India it is still quite
small, even on mixed economy standards.[2] In this res-
pect, U.A.R. stands in between.

The First-Five Year Plan in U.A.R. has achieved
89% of its output target.[3] This is, in fact, a good
performance if we compare it with the performance un-
der the First Five-Year Plans of Yugoslavia (1946 -

1951) and India (1951 - 1956), respectively. The First
Five-Year Plan in Yugoslavia aimed at doubling per ca-
pita income.[4] This ambitious aim was not realized un-
til the end of 1955[5]. 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.[6] In Yugoslavia the actual growth for 1947 - 52
was 1.9% per annum.[7] 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 develop-
ment 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 deve-
lopment 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, vegetales, 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."[8] The textile industry, also, was judged competitive at that time.[9] 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 exchang needed to finance the gowing 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.[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 secor 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 con-

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.[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.,[12] which has economized capital by the successfully used labor intensive techniques. Of course, the productiviy 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 techological 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 exchang 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 sup-
posed now to have started, had the 1967 war not occured.
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 the consumption_{-goods}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 emph-
sized in the theoretical models of aid dependence
developed witin the Agency for International Develop-
ment, is that if a country is eventually to make a

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+ More than 50% of the total investments of the Second-
  Five Year Plan have been allocated to heavey 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 pro-
duct of the marginal capital-output ratio and the tar-
get rate of growth of output.[13] 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 mar-
ginal rate of saving, the marginal rate of consumption
has to be reduced to 72% of the increase in GNP.[++] The

+ The marginal rate of saving = actual marginal capi-
   tal-output ratio (3.9) x target average rate of growth
   of GNP (7.2) = 28.

++The share of total consumption, private and public,
   in GNP has fallen only from 88% in the period prece-
   ding 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, espe-
cially with the increasing rate of growth of population.

The marjinal rate of saving required to fulfil the
investment target can be reduced by decreasing the in-
cremental 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 in-
creasing the efficiency and skill of the labour force,
by improving administration and management, by placing
the right man in the rigt place to avoid as much as
possible the waste in resources. Thus, the improve-
ment 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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= " U.A.R.'s Five-Year Plan," p.11.

"Human rsources" are considered to be among the im-
portant bottlenecks in the economic development in
U.A.R. Accroding to some criteria for human resource
development, U.A.R. is consdidered a semi-advanced
country.[14] 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 misal-
location of resources already available. However, mis-
allocation and shortage in skills leads to the same
result: the non-availability of qualified manpower nee-
ded to fulfil the requirements of economic development.
This can likely be a serious constraint on the absorp-
tive 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 improve-
ment of the "human resources" of the country, by trai-
ning and reallocation of the labour force, is vitally
important for the success of the economic development
in the U.A.R.

FOOTNOTES

Footnotes to Chapter I :

(1) T.K. Lakshman and Smt. Vijayalakshmi, "Studies
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ficance," The Indian Journal of Economics,
Vol. 49, No. 192 (July 1968), p.26.

Footnotes to Chapter II :

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United States: its variation and stability,"
in The Theory of Capital, ed. F.A. Lutz and
D.C. Hague (New York: St. Martin's Press,
1965), pp. 95-96.

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

(3) V.V. Bhatt, " Aggregate Capital-Output Ratio: Some
conceptual issues," Indian Economic Journal,
Vol. 10, no. 4 (April 1963), p. 401; Domar,

p. 99; and J.Vanek and A.A. Studenmund, "Toward a Better Understanding of the Incremental Capital-Output Ratio," The Quarterly Journal of Economics, Vol. 32, no, 3 (August 1968), p. 452.

(4) Bhatt, " Aggregate Capital-Output Ratio," p. 99.

(5) Vanek and Studenmund, p.452; Domar, p.98; and S. Kuznets, Capital in the American Economy: Its formation and financing (Princeton: Princeton University Prss, 1961), p.56.

(6) Domar, p.97.

(7) For an advocate of the exclusion of land and natural resouces from "capital", see: Bhatt, "Aggregate Capital-Output Ratio," p.399.

For a proponent of the inclusion of land in "capital", see: Abbas, Capital Requirements, p.77.

For a view on including only improvements of land and natural resources in "capital", see: S.Kuznets, "Quantitative Aspects of the Economic Growth of Nations; Capital Formation Proportions: International comparisons for recent years," Economic

Development and Cultural Change, Vol.8, no. 4
(July 1960), p.1; and Domar, p.97.

(8) F. Lutz, _The Teory of Capital: Proceedings of a_
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(21) _Ibid._, p.56.

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(23) D.C. Mead, pp.27-28.

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(28) _Ibid_., p.279, and p.299.

(29) _Ibid_., p.303.

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(43) Fore example, for the diversity in the figures of
     Gross National Income and Product, see:
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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.

(45) Ibid., p.299.

(46) Ibid., p.308.

(47) Ibid.

(48) Mead, p.242.

(49) Andreas S, Gerakis, " Some Aspects of the U.A.R.'s

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(50) Calculated from: U.A.R.,Institute of National Plan-

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Lwibenstein 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.

(4) Leibenstein, <u>Economic Backwardness</u>, pp.180-181.

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(7) Leibenstein, <u>Economic Backwardness</u>, p.183; and
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