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RESERVE (832)

THE MEASUREMENT OF GROWTH RATES AND TREND IN
KENYA, 1964 - 1974

ABSTRACT

The aim of this paper is to discuss the methods that have been used to measure the rate of economic growth and economic trend in Kenya during the period 1964-1974. The results of such methods are presented and their weaknesses discussed. The rate of economic growth has been the subject of development policy in Kenya and the discussion of the rates enables the policy-makers to select the various techniques to apply as each technique has its own merits and demerits.

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Views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of the Department of Economics, University of Nairobi.

ABSTRACT

The aim of this paper is to discuss the methods that have been used or are being used to measure the rate of economic growth and economic trend in Kenya during the period 1964-1974. The results of such methods are presented and their weaknesses discussed. The rate of economic growth has been the cornerstone of development policy in Kenya, and the discussion of the rates enables to the policy-makers to select the various techniques to apply, as each technique has its merits and demerits.

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THE MEASUREMENT OF GROWTH RATES AND TREND IN KENYA, 1964-1974.

The Promotion of Rapid Economic Growth as a Major Government Objective:

The Government of Kenya has placed a high priority on the promotion of rapid economic growth. This objective is well articulated in the official document, African Socialism and Its Application to Planning in Kenya, otherwise known as the Sessional Paper No. 10 of 1965. In that document, rapid growth is accorded a topmost priority in the following terms (p.18):

The most important of these policies is to provide a firm basis for rapid economic growth. Other immediate problems such as Africanization of the economy, education, unemployment, welfare services, and provincial policies must be handled in ways that will not jeopardize growth. The only permanent solution to all of these problems rests on rapid growth... Growth, then, is the first concern of planning in Kenya ...

The theme that rapid economic growth is the permanent solution to the country's social problems has continued to be repeated in all the three subsequent Development Plans as well as elsewhere in the official development pronouncements.

The emphasis placed on growth rates has a lot of merits. The historical performance of the economy can be assessed through an examination of the country's growth rate. Similarly, the economic welfare of people in the country can be discussed through the assessment of the growth rate record. Moreover, the growth rate record of the country can be compared with that of any other country in order to assess the relative economic performance of the countries involved. Furthermore, the rates of growth are used in some planning models to project the future resource requirements. Lastly, growth rates are used to measure the present and future well-being of the people in the country. For these reasons, there has been a lot of merited emphasis on promoting rapid economic growth rate.

How rapid is rapid growth rate? This question calls for a measure, an index, or a yardstick, by which we can assess the rates. Without such a measure, there would be no precision in the discussion of the rates, and precision is very much necessary for the subject under discussion.

The purpose of this article then is to examine the various techniques that may be used or have been used to measure the rates of growth of an economy and the economic trend. The Kenyan data for the period 1964-1976 are used either as a whole or the segment thereof. It is found that the various techniques or methods used to calculate growth rates may yield different results. According to the Kenyan data the differences in techniques used give results that appear to be the same, more, or less, if the same data are used for the same period. But the results are very sensitive to the time period covered.

II. The Measurement of Growth Rates: Some General Theoretical Problems.

Any attempt to measure growth rates of an economy is beset with many problems, the four major ones of which are: (a) the nature of bills of goods; (b) the question of capacity output; (c) the choice of a period; and (d) the adoption of a statistical means of presentation.

(a) The most fundamental problem is measuring the rates of change concerns the nature of the bills of goods which are assumed to change during the period. Are we talking about the same goods? Have the nature and quality of the goods changed during the period? What about the composition of the goods: has it changed, particularly as new products appear in the market? These are the questions which never receive attention among those who calculate growth rates of the national product. What is normally calculated is the monetary value, at constant or current prices, of what a country produces in a year. From these values, growth rates are calculated.

(b) Then there is the question of capacity output. The calculation of growth rates over a period of time assumes implicitly that there is full employment of productive factors per year. If there is no full employment, then the economy may be increasing its output as it approaches its capacity output. But this is not what is meant by growth rates: there are meant to measure rates of change of production of goods at full employment.

(c) The third problem pertains to the choice of a period to measure the rates of growth. This choice is crucial. Over a long period of time, there are cyclical and irregular fluctuations in economic activity. Different results will be obtained if the measurement of change is from one peak activity to another; or from the low activity to another; or from one low activity to a peak activity. Furthermore, there is the problem of choice of the length of time to be covered. Different time periods give different results. For these reasons, it is desirable to choose years that represent the same phases of cyclical fluctuations and to use only shorter periods as these are preferred to longer ones.

(d) The last problem concerns the adoption of a statistical means of presenting the growth rates. The usual practice is to calculate the average annual rate of change during the selected period. The technique used is the compound rate of growth. This is merely a convenient way of expressing an average rate of change, and does not imply that growth normally takes place at a compound rate from year to year.

Despite the foregoing problems, decision-makers need to calculate the measured growth rates. These are usually calculated using either annual current or constant prices for a period of years.

Several methods or techniques have been developed to measure growth rates. The most widely used are already mentioned, calculates the geometric average of the ratio's of change over the period. Another method used is that of calculating the arithmetical mean of the annual rates of growth. Two other methods are the geometric mean of percentage changes, and the exponential growth rates.

These techniques are listed on Table 1.

III. Application to the Kenyan Data:

The serial data for the period 1964-1974 were obtained from the revised data produced by the Central Bureau of Statistics (see the Statistical Abstract, 1970). The data are at current prices and at 1964 constant prices. For comparability, the World Bank data were also used; these were obtained from the Bank's Book, Kenya: Into the Next Decade (1975, p. 56, 57) These sets of data are on Table 2.

Calculated Growth Rates From the Kenyan Data

From Table 3, we can make the following summary and conclusions

1. The growth rates of the Kenyan economy, as calculated from the recorded data, has been relatively high, as compared with those of other African countries. At 1964 constant prices, these rates have been in the range of 7.3 percent annually, between 1964 and 1974.
2. The rates at 1964 constant prices seem to be about 7.3 percent annually for the various techniques used to measure growth rates.
3. The current prices rates are higher than the constant prices rates; these conclusions apply for the Government data as well as the World Bank data. These rates were about 10.3 percent annually.
4. The rates calculated are very sensitive to the period of time covered. It appears as if the longer the time span is used the higher the rates of growth, both at current and constant prices. Thus, the data covering the period 1964 - 1974 produced higher rates (7.3 percent) than those covering the period 1964-1972 (7.0 percent), both at 1964 constant prices.

Table 1:

Different Formulas used to Calculate Growth Rates

Method	Formula	Strengths of the Method	Weaknesses of the Method
<p>Geometric Average of the Ratios of change</p>	$R_1 = \left(\sqrt[n-1]{\frac{P_2}{P_1} \times \frac{P_3}{P_2} \times \dots \times \frac{P_n}{P_{n-1}}} - 1 \right) \times 100$ $= \left(\sqrt[n-1]{\frac{P_n}{P_1}} - 1 \right) \times 100$ <p>Use logarithms for calculation</p>	<p>Simple to calculate, using logarithmic method.</p>	<p>Omits the values of the intermediate years; seems to assume that the peaks and troughs of the inter-years even out in the business cycles and their effects on the real volume of output.</p>
<p>Arithmetic Mean of the Annual Rates of Growth</p>	$R_2 = \left(\frac{\sum_{t=1}^n \frac{P_t}{P_{t-1}}}{n-1} - 1 \right) \times 100$	<p>Takes into account all the years during the period.</p>	<p>The calculated rate of growth will not be negative even when output decreases.</p>
<p>Geometric Mean of Percentage Changes</p>	$R_3 = \sqrt[n-1]{\frac{P_2 - P_1}{P_1} \times \frac{P_3 - P_2}{P_2} \times \dots \times \frac{P_n - P_{n-1}}{P_{n-1}}} \times 100$ <p>Use logarithms for calculation</p>	<p>Takes into account all the years during the years in the period</p>	<p>Fails to yield meaningful results if one of the factors is equal to zero or if some of the factors have negative signs.</p>

Table 1: Continued.

Method	Formula	Strengths of Method	Weaknesses of the Method
Exponential Growth	$Y = ab^x$ $R_3 = b.$ Use logarithms of normal equations		Ignores the point of origin (the initial year from which growth started); The growth rate so measured tends to be exaggerated.
Modified Exponential	$Y_c = k + ab^x$ $R_4 = b$ Use (1) method of selected points (2) method of semi-averages		

5. The calculated trend equation of the Kenyan economy, at the 1964 constant prices, is

$$Y_C = (455.5)(1.071)^X;$$

Origin: 1964; X units, yearly.

IV. Conclusion.

From the measured output, the Government's objective of promoting rapid economic growth rate has been largely achieved. As calculated from the various statistical methods available, the rates of measured incomes have been relatively higher than those of many underdeveloped countries. The trend seems to be moving in the desired direction too, at a trend rate of 7.1 percent annually.

Table 2:

GROSS DOMESTIC PRODUCE AT BOTH CURRENT AND CONSTANT
1964 PRICES.

The Total GDP are at Factor Cost

YEAR	TOTAL GDP IN 1964 CONTANT PRICES (1)	TOTAL GDP IN CURRENT PRICES (2)	TOTAL GDP IN 1964 CONSTANT PRICES (3)	TOTAL GDP IN CURRENT PRICES (4)
1964	330.1	330.1	328.4	328.4
1965	332.2	329.8	330.9	327.5
1966	374.4	382.1	379.2	381.1
1967	396.4	405.7	396.5	403.1
1968	427.3	442.9	427.1	439.3
1969	454.7	476.3	454.3	475.7
1970	485.1	518.9	485.1	521.9
1971	512.0	570.1	517.8	575.8
1972	547.4	648.5	553.8	646.9
1973	585.9	724.9	-	-
1974	663.1	877.9	-	-

Source: The total GDP at factor cost (1) and (2) are the revised data from the Central Bureau of Statistics. The GDP (3) and (4) are the World Bank Mission Estimates reported in Kenya: Into the Next Decade (Baltimore: Johns Hopkins University Press, 1975) pp. 56, 57.

Table 3:

The Results Obtained from the Kenyan data: 1964-1974 at current prices and at 1964 constant prices; the World Bank Data, 1964-1972 at Both Prices are Included for Comparability.

Method Used	Calculated Growth rate, Percent, R_1 : (1964-1974)		Comparable World Bank calculations (1964-1972)	
	Constant Prices	Current Prices	constant Cu Prices	Current Prices
Geometric Average of the Ratios of change	7.3.	10.3	6.8	8.3
Arithmetic Mean of the Annual Rates of Growth	7.4	10.5	7.0	9.0
Geometric Mean of Percentage changes	Results derived from the Kenyan data seem to be trivial and have therefore been omitted.			
Exponential Growth	7.3			
Modified Exponential	The Kenyan data does not show any asymptotic pattern. Therefore the results obtained from the calculation of the modified exponential seem meaningless.			

Table 3:

The Trend Equation of the Kenyan Economy: $Y_c = ab^X$

Year	Time centered X	Index of GDP Y	Log Y	X log Y	Trend Values Log Yc	Trend values in natural form. Yc
1964	-5	330.1	2.5186	-12.5930	2.5095	323.2
1965	-4	332.2	2.5213	-10.0852	2.5393	346.1
1966	-3	374.4	2.5734	- 7.7202	2.5691	370.8
1967	-2	396.4	2.5981	- 5.1962	2.5989	397.1
1968	-1	427.3	2.6307	- 2.6307	2.6287	426.3
1969	0	454.7	2.6778	- 0	2.6778	476.3
1970	1	485.1	2.6867	2.6867	2.6883	497.8
1971	2	512.0	2.7093	5.4186	2.7181	522.5
1972	3	547.4	2.7383	8.2149	2.7479	559.7
1973	4	585.9	2.7679	11.0716	2.7777	599.4
1974	5	663.1	2.8216	14.1080	2.8075	641.9
				3.2745		

The trend equation in logarithmic form is $\log Y_c = 2.6585 + 0.0298 X$

The trend equation is natural form is $Y_c = (455.5) (1.071)^X$.

Origin: 1964; X units, yearly.