DESCRIPTION OF A PROGRAMME WHICH PROJECTS EMPLOYMENT AND OUTPUT FOR NAIROBI AND KENYA

by

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INTRODUCTION

This paper is a description of some important aspects of a
computer simulation programme which produced the simulation results
presented in Discussion Paper No. 172.[1] It is written for someone
who intends to use the programme either in its present or amended
form. Complete familiarity with Discussion Paper No. 172 is assumed
in this paper. Documentation shown in the programme listing also
provides essential information about the programme.[2]

The simulation process is iterative. The programme relates
the outcome from one year to that of the next. The first year
projection is built upon base year values, the second year projection
is built upon the first year projection, etc. The simulation period
used for Discussion Paper No. 172 was 1972 through 1985; 1971 was the
base year. With only minor adjustments, the programme could generate
a longer simulation period.

The programme is designed so that it can produce a wide
variety of different simulation outcomes without making major changes
in the programme. The primary purpose of this paper is to explain
how these programme changes can be achieved. Procedures for
updating the programme are also described.

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[1] D.E. Black, An Employment and Output Projection Model for
Kenya and Nairobi, Discussion Paper No. 172, Institute for Development
Studies, University of Nairobi, 1973.

[2] A programme listing is available in the I.D.S. library.

The programme consists of a controlling programme (MAIN), ten subroutines, and a BLOCK DATA segment. The function of each part of the programme is described briefly by documentation in the programme listing. This paper will describe only the particular features of the programme which relate to the controls for the specification of each simulation.

CONTROLS IN MAIN

One function of MAIN is to call the appropriate sequence of subroutines. The usual sequence is:

```
CALL GDPCAP
CALL KPRØ
CALL ØUTGDP
CALL NPRØ
CALL KTP
CALL NTMP
CALL UNTMP
```

Prior to these call statements, certain options are selected. These options are discussed below. A simulation is complete with the execution of UNTMP. The programme can then be ended, or a new set of options can be selected — in which case the same set of subroutines are called again. If many simulations are required, loops are usually a convenient control mechanism.

MAIN contains all of the simulation controls which can be easily altered for successive simulations within one job. There are four integer variables which must be given values for each simulation:

IPØP, IPØPNB, ICTX, and IGDP. The values which each can be given are:

```
IPØP:   1,2,3, or 4
IPØPNB: 1 or 2
IGDP:   Any whole number
ICTX:   1 or 2
```

---

3.   It is not necessary to call all these subroutines for each simulation. However, deletions must begin at the bottom of the list, and any group of deletions must include all those below the highest one on the list.

The value of IPØP and IPØPNB determine which of the population
projections will be used for Kenya and Nairobi respectively. In
both cases, 1 selects the highest growth rate projection. The
lower numbers select progressively slower rates of population
growth. (Note that these numbers are not equal to the actual
projections, they only rank predetermined projections from highest
to lowest.) IGDP sets the average annual growth rate for Kenya
aggregate GDP. ICTEQ selects one of the two sets of adjusted
Chenery-Taylor equations. The equation set which is used for a
simulation is printed out with the simulation output. The
continous-trend projection, which is an alternative to the
Chenery-Taylor equations, can be used by calling subroutine
KPRØ1 instead of KPRØ in the sequence of calls listed above.

OTHER CONTROLS

The simulation controls which can be easily changed only
between jobs are contained in subroutines NPRØ, NEMP, and in the
BLOCK DATA segment.[4] The control in NPRØ, is YADJ; YADJ must be
given a value before each of the statements which project Nairobi
sectoral GDP. YADJ can be either a positive or negative fraction,
and it equals the amount by which a Nairobi sectoral GDP growth rate
differs from the Kenya GDP growth rate for the same sector. For
example, if Kenya industrial GDP is projected to grow at 6.23 per
cent for a given period of time and YADJ has been set equal to+ 0.10,
the Nairobi industrial GDP would be projected to grow at 1.10 x 6.23
per cent for the same time period.

---

4.   If it is necessary to simulate with a number of different
values for these particular controls, the programme can be
rewritten so that the controls can be altered in MAIN as are the
other controls in MAIN.

In NEMP the control is PADJ: PADJ must be given a value
before each of the statements which project Nairobi sectoral
employment. PADJ can be either a positive or a negative fraction,
and it equals the amount by which a Nairobi sectoral rate of labour
productivity growth differs from what it would have been in the
absence of any adjustment. PADJ alters the employment projection
equations so that the rate of employment growth projected for Nairobi
reflects the assumed difference in labour productivity growth. For
example, if PADJ is set equal to 0.10 before the industrial
employment projection statement, then the rate of Nairobi industrial
employment growth will be reduced so that the implied productivity
growth rate is 10 per cent greater than it would have been without the
adjustment.[5]

In BLOCK DATA, values are given to the employment output
elasticities for Nairobi and Kenya. These can be altered by changing
the appropriate DATA statement.

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5. The rate of employment growth used in NEMP is derived as
follows:

$$Qg - Eg^* = (1 + a) + (Qg - Eg) \quad (1)$$
where Qg = rate of Nairobi GDP growth
Eg - rate of Nairobi employment growth
Eg^*= adjusted rate of employment growth
a = productivity adjustment.
Thus, equation (1) states that the new productivity growth rate
equals $(1 + a)$ times the unadjusted rate. Rewriting (1),

$$Eg^* = aQg + (1 + a) Eg.$$

All of the foregoing simulation controls are ones which can be manipulated without altering the basic structure of the programme. They all involve changing only a few simple statements. Other alterations could, of course, be made by undertaking more extensive programme revisions.

BASE VALUES AND UPDATING

Base year values of population, employment and GDP for Nairobi and Kenya are provided by the BLOCK DATA segment. The projection period is also specified in BLOCK DATA. Base year value of Nairobi non-wage employment are provided by DATA statements in UNEMP. The projection results presented in Discussion Paper No. 172 can be updated by changing the base year values of all the variables, changing the simulation period, and re-estimating and changing the employment-output elasticities.