MACRO-ECONOMIC ANALYSIS OF OUTPUT, EMPLOYMENT AND MIGRATION IN SIERRA LEONE

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ABSTRACT

MACRO-ECONOMIC ANALYSIS OF OUTPUT, EMPLOYMENT AND MIGRATION IN SIERRA LEONE

By

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The objectives of this research were to develop an analytic framework to analyze the relationship between output, employment and migration at macro level and to apply this framework to Sierra Leone economy to examine the growth, migration and employment prospects of the economy as well as the implications for output, employment and migration of a number of alternative development strategies. The research was motivated by the lack of an existing framework to analyze comprehensively problems of output, employment and migration facing developing countries--the Sierra Leone economy was selected because of both the availability of data and the fact that the economy has many features common to other developing countries. However the models are also of general applicability to other developing economies for short- and medium-run policy analysis (5 to 10 years). The models are also useful for sector-specific policy analysis. This is because they can run simultaneously with detailed sector models and sector specific policies can be analyzed within a broader macro framework.

In this study an improved framework is proposed which has a higher degree of disaggregation than existing models and takes explicitly into

account interactions in both the product and factor markets. In contrast to conventional classification, the product market is disaggregated into a number of interacting sectors on the basis of type of output (agriculture and nonagriculture), scale of operation (small-scale and large-scale) and location (rural and urban). Particular attention also has been given to the modelling of the labor market. Based on disaggregation of the product market into small- and large-scales the labor market is disaggregated into a small-scale sector where wages are competitively determined, and a large-scale sector where they are exogenously fixed. A further refinement is introduced into the labor market by disaggregating the labor force by educational levels to reflect different supply and demand conditions for different educational levels. Migration, specific by educational level between rural and urban areas, occurs in response to the differential between competitively determined rural wage rate and expected urban wage. The expected urban wage is defined as the weighted sum of the wage rates in small- and large-scale sectors in urban areas, the weights being the probabilities of finding an urban job in each sector. This emphasis on intra- and inter-sectoral and regional relationships in both the product and factor markets as they affect output, employment and migration adds strength to the model results.

The models were run using aggregated information from comprehensive primary data generated by field surveys, unlike most macro models which depend largely on secondary data. The model results indicate that despite the favorable rate of growth of GDP and a slight decline in migration, there is no relief from unemployment if current policies are

continued. This underscores the importance of development strategies which increase employment. In the policy runs the impact of various development strategies were examined with emphasis on how they would affect output, employment and migration. The impact of strategies examined can be broadly classified into three groups. In the first group, the impact of various agricultural development strategies such as agricultural export promotion and an increase in agricultural productivity were examined. In the second group, the impact of various strategies to promote labor-intensive nonagricultural sectors such as small-scale industry promotion and a switch to labor-intensive techniques of production in large-scale industry were examined. Lastly, the impact of relaxing the foreign exchange constraint by increasing foreign capital inflow was examined. An important finding of this study is that at the macro level there is no trade-off between increased output and employment. This is largely because (a) on the demand side, the consumption demand by the rural population have high income elasticities for labor-intensive products. This consumption demand linkage is important because consumption is the largest component of total demand and rural consumers account for a very high proportion of total consumption, and (b) on the supply side, the more labor-intensive sectors are also efficient users of scarce capital and foreign exchange. There is, thus a great potential for designing development strategies which can stimulate both growth and employment.

MACRO-ECONOMIC ANALYSIS OF OUTPUT, EMPLOYMENT AND MIGRATION IN SIERRA LEONE

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I. INTRODUCTION

Problem Setting

Throughout the developing world, countries are experiencing rapid rates of urban unemployment, rural-urban migration, and urbanization. Urban employment opportunities have been growing too slowly to absorb even the natural growth of urban population. In general, though the rate of output growth has been between 5 to 7 percent per year, the growth rate of nonagricultural employment has been negligible. This slow rate of growth of nonagricultural employment accompanied by a high rate of rural-urban migration creates urban unemployment problems of increasing intensity. Besides these high rates of unemployment, the rate of growth of unemployment is also of concern. Turnham (1970), in a study of eight countries, concluded that the number of unemployed was growing by 8 percent annually.

Rural-urban migration also leads to a high growth rate of urban centers. According to studies carried out by the Population Program Division of the Economic Commission for Africa for the period 1965-70, the growth rate of urban population in Africa was 6.1 percent per annum. Allowing for the natural growth of urban population at 2.5 percent, about two-thirds of urban population growth can be attributed to migration. In a number of principal cities there has been an urban growth rate averaging 12 percent per annum, while in a few of these cities the rate has reached as high as 15 percent a year (ECA (1971)).

Where labor is the dominant input in agricultural production, these high rates of rural outmigration have been a factor contributing to national food deficits and rising food prices. These countries must use scarce foreign exchange to import basic food grains in order to supplement domestic production for a growing population.

These problems have occurred despite satisfactory output growth rates in a large-scale capital-intensive manufacturing sector, and have given rise to the "growth without development" phenomenon. More specifically, there is a growing consensus that a mere increase in output is not enough and that such an increase must be accompanied by other factors, particularly income-earning opportunities among the bulk of the population.

Economists have been trying to understand the role of labor in the development process. To analyze this, models were proposed based on historical experience. Some of the best known models were based on the concept of dual economy which has as its central feature the coexistence of a large agricultural sector--with its traditional technology and low labor productivity--with an active and dynamic nonagricultural sector.

Lewis (1954) and Fei - Ranis (1964) based models on this concept of dualism and assumed that surplus labor existed in agriculture. The development process was viewed as a shift in center of activity from agriculture towards industry as surplus labor was transferred from agriculture to the nonagricultural sector.

As evidence accumulated that the marginal productivity of labor in agriculture was positive (Mazumdar (1965), Hansen (1967)), the assumption of surplus labor was abandoned. These neo-classical models, also based on the dual economy concept, focused on the differences in the

marginal productivity and wage rates between the agricultural and industrial sectors. The development process again relied on transfer of labor out of agriculture to achieve the optimal resource allocation.

Expectations based on these dual economy theories that industrialization in developing countries would be associated with an aggregate supply and demand balance in the factor market, proved disappointing. The provision of employment was not automatically ensured by output expansion, and wage rates in the modern sector of urban areas rose substantially. Migration, instead of solving the problem of unfulfilled labor demand in urban areas, has created a problem of excessive labor supply and continues despite high unemployment in urban areas. This highlighted the fact that the problem of labor absorption and migration was treated inadequately in these models.

In view of the high and rising rates of rural-urban migration and urban unemployment, much of the controversy concerning the role of labor in the process of economic growth has turned to the need for generation of employment opportunities instead of fulfilling the need for additional workers to the industrial sector.

Another problem of great practical concern relates to treatment of labor in applied planning/policy models. There is a wide gap between applied models and empirical observations. Blitzer (1975) observes that until very recently, labor absorption entered only tangentially, if at all, into most applied models. In most cases either labor is not treated at all or is looked at only on the demand side. Where labor is treated, very rarely is it disaggregated by education. In situations where employment and migration are education-specific, models that treat labor as homogenous are too simplistic. Also, in most of the cases labor is

constrained at an economy level and in very few cases is it disaggregated by location. In cases where labor is disaggregated by location, the rule has often been to specify exogenously migration from one region to another. Although a fair number of studies now exist on migration that give valuable insights into the process of migration, very little attempt has been made to integrate migration into a policy framework taking into account macro level interactions.

Thus the usefulness of conventional applied models to examine the problems of employment and migration facing developing countries is limited. There is need for a framework that is more disaggregated and can capture intra- and inter-sectoral and regional interactions in both the product and factor market. Such a framework should also treat migration explicitly in order to meaningfully analyze output, employment, and migration.

Objectives of the Research

The general objective of this study is to provide a framework to quantify the impacts of alternative policies on output, employment and migration using a comprehensive set of micro-level data generated by field surveys.[1] Specifically, the objectives are:

(1) to develop and improved analytic framework to analyze the relationship between output, employment, and migration at the macro level;

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[1] These field surveys are: Byerlee et al. (1976) Migration; Liedholm and Chuta (1976) Small-Scale Industry; Spencer and Byerlee (1976) Farm Management.

(2) to apply the framework to the Sierra Leone economy using primary data to gain insights into growth, labor migration and employment prospects of the economy; and

(3) to examine the implication for output, employment and migration of a number of alternative development strategies. The impact of strategies examined can be broadly classified into three groups. In the first group, the impact of various agricultural development strategies such as agricultural export promotion and increased agricultural productivity will be examined. In the second group, the impact of various strategies to promote labor-intensive nonagricultural sectors such as small-scale industry promotion and a switch to labor-intensive techniques of production in large-scale industry will be examined. Lastly, the impact of relaxing foreign exchange constraint by increasing foreign capital inflow will be examined.

Thesis Outline

In the second chapter, the treatment of labor and migration in theory and practice is critically reviewed in order to identify existing weaknesses and a more realistic framework for analysis of relationships between output, employment and migration is proposed. This framework is used to construct macro economic and migration models which are applied to the Sierra Leone economy. An overview of Sierra Leone's recent development with emphasis on output, employment and migration is provided in Chapter III. Sierra Leone was selected because of the availability of comprehensive micro-level data generated by field surveys, and the economy has features common to many developing countries. In Chapter IV,

econometric analysis of migration is presented to quantitatively estimate the magnitude of various factors affecting migration and to test if there is any significant difference between the behavior of educated and uneducated migrants. The elasticities of migration derived in this analysis are used in a migration model. In Chapter V, macro-economic and migration models based on the framework proposed in Chapter III are laid out. The models are applied to the Sierra Leone economy to gain insights into the output, employment and migration potential of the economy and to examine the implications of different policies. Results of both the projection period and policy runs are presented in Chapter VI. A summary of the model framework, and conclusions on the effects of various development strategies on output, employment and migration together with the suggestions for future research are presented in the last chapter.

II. METHODOLOGY FOR MACRO ANALYSIS OF OUTPUT, EMPLOYMENT AND MIGRATION

The objective of this chapter is to build a framework within which output, employment, and migration can be analyzed. The treatment of labor and migration in both theory and practice is reviewed with emphasis on their adequacy to analyze output, employment, and migration. Since theoretical models provide the framework within which applied models are constructed, they are reviewed first. This is followed by a review of the treatment of labor and migration in applied policy models. In the third section, empirical evidence on the behavior of labor markets and migration in Africa will be reviewed so that existing conditions in the factor market can be incorporated into the proposed framework. Based on identification of weaknesses in present methodological designs, an improved framework is presented in the last section. The proposed framework will be used to construct models of Sierra Leone economy in order to project the potential of the economy, and to analyze impacts of various policies on output, employment and migration at the macro level.

Treatment of Labor and Migration in Theoretical Models

Role of Labor and Migration in Economic Growth

Studies of economic growth and development have sought to understand the role of labor in the growth process. To analyze the process of economic growth a number of models have been proposed using the concept of a dual economy. The dual economy models divide the economy into two broad sectors: the traditional agricultural and the modern nonagricultural

sectors. The first of these models assumed surplus labor in the agricultural sector (e.g., the Lewis and Ranis-Fei models).

The classical models are based on the assumption that the marginal product of the agricultural labor force is zero or even negative (i.e., surplus labor) and that wage in agricultural sector is institutionally determined and is above its marginal product. In the early stage of development, this redundant agricultural labor is available to the industrial sector at a constant wage which is equivalent to the institutional agricultural wage plus a premium to overcome constraints on labor mobility (e.g., a higher cost of living in urban area and the psychological cost of migrating). Hence the labor supply curve to the industrial sector is perfectly elastic. The development process is then viewed as generating sufficient growth in the industrial sector of the economy to permit the transfer of this surplus labor from agriculture to industry.

Criticisms of the Ranis-Fei model focused on its level of disaggregation, its simplicity in the treatment of labor movement, and on the realism of its assumptions. Assumptions especially about labor market conditions are criticized. Labor is assumed to have zero or even negative marginal productivity in the agricultural sector while implicitly full employment in the industrial sector is assumed.

Empirical evidence from India (Mazmudar, 1965) and Egypt (Hansen, 1966, 1969) refuted the assumption of zero marginal productivity in the agricultural sector. Based on this evidence, the assumption of zero marginal product of labor was questioned.

Dual economy models which followed dropped the labor surplus assumption. One of the earliest neoclassical models was Jorgenson's (1967). Jorgenson assumes that all factors of production in both sectors

have a positive marginal product and that there is a quasi-institutional wage in agriculture. This agricultural wage is variable and is proportional to wages in the industrial sector which are determined by marginal productivity. Migration is treated as a mechanism which works to equalize the marginal productivity of labor between the two sectors. The agricultural labor force moves in response to a wage differential. The absolute differential between urban wage and agricultural wage remains constant over time so that wages grow at the same rate in both sectors and migration is sufficiently responsive to prevent a widening of the wage gap. The development process again relied on the transfer of labor out of agriculture to achieve optimal resource allocation.

The dual economy models provided valuable insights into the importance of the agricultural/industrial nexus. However, the expectations, based on these earlier dual economy theories, that industrialization in developing countries would be associated with an aggregate supply and demand balance in the labor market, were disappointing. Instead of filling the demand for labor in the modern sector, migration has created a problem of excessive labor supply and continues despite high and rising unemployment in urban areas. Thus, highlighting the fact that the problem of labor absorption is analyzed inadequately in these models. It became evident that the problem of employment could not be studied in isolation from migration. Due to the importance of migration in any analysis of the role of labor in economic growth, a methodological framework within which migration is studied and attempts to integrate migration within a macro-economic framework are briefly reviewed.

Integration of Growth and Migration Models

Migration is the major link between rural and urban labor markets but treatment of this process in conventional dual economy models was inadequate. Recently the human capital investment approach, or derivative of the approach has become standard framework for economic analysis of migration.

The human capital investment approach to migration postulates that potential migrants will move if the present value of an expected future income stream in some other region exceeds the present value of expected future income streams in the present region of residence by more than the costs of migration. Human capital investment theory was first extended to the problem of labor migration by Sjaastad (1962). The model can be expressed as:

$$V(0) = \int_{t=0}^{n} [Y_u(t) - Y_r(t)]e^{-rt}\, dt - C(0)$$

where V(0) is the discounted present value, $Y_u(t)$, $Y_r(t)$ is the income in period t in urban and rural regions respectively. C(0) is the cost of migration; n is the number of periods in the migrants' planning horizon; and r is the discount rate. However, operationalizing this theory poses problems especially of arbitrary assumption about future wages, the choice of discount rates, and the time horizon. In practice, the solution has been to include variables which approximate the present value, e.g., by making migration a function of current income in the origin and destination areas. Such a procedure implicitly assumes that the time horizon is unlimited and that both the income and discount rates are constant over time. This simplifies the computation considerably. The theory provides a cogent explanation of the predominance of the young

and educated in the migration stream. Younger people migrate more often because they have a longer time horizon over which to capitalize earnings differentials. According to the theory, one would expect the rural-urban income differential to be eliminated eventually as a result of migration. It does not explain adequately why migration continues in spite of the high and rising unemployment in urban areas in developing countries.

An extension of the human capital investment approach has been developed by Todaro (1969) who explicitly relates rural urban migration to urban wages and unemployment in developing countries. The model can be expressed as:

$$V(0) = \int_{t=0}^{n} [P(t)Y_u(t) - Y_r(t)]e^{-rt}\, dt - C(0)$$

where P(t) is the probability of being employed in urban destination as of period t. $V(0)$, Y_u, Y_r, C, Y and n are as defined previously.

The decision to migrate from rural to the urban areas is related not only the urban-rural wage differential but also the probability of finding an urban job. This probability of finding urban employment is defined as equal to the fraction of the urban labor force actually employed in the manufacturing sector. Expected urban income is defined as the urban wage weighted by the probability of finding an urban job. Migration is then functionally related to expected wage differential which is the difference between the expected urban wage and the rural wage.

The Todaro model is a contribution towards theory of migration by explicitly noting the interrelationship between wages and unemployment and explains why migration can take place despite high and rising unemployment.

Since the treatment of migration in the conventional dual economy models was too simplistic, a logical extension was to integrate the dual economy and migration models. To analyze the interrelationship between growth, employment and migration, Harris and Todaro (1970) incorporated the expected wage differential model of migration proposed by Todaro with the conventional dual economy model.

The Harris-Todaro (1970) model divides an economy into two sectors: manufacturing and agricultural with manufacturing located exclusively in urban area and the agricultural sector in rural area. The sectors' production functions are neoclassical. Labor and capital are inputs in the production of manufacturing and land and capital are inputs into agricultural production. Supply of land and capital is fixed while labor is the variable factor and is allocated endogenously between the two sectors. Furthermore, they assume an institutionally determined wage rate in urban areas and a wage determined by labor supply and demand in rural areas. The behavioral function of rural-urban migration is a modified version of the Todaro (1969) model of migration.

Though the treatment of the labor market interaction is more rigorous and migration is more explicitly treated than in the dual economy models of Ranis-Fei and Jorgenson, there are several weaknesses in the Harris-Todaro model. As a dual economy model, it is highly aggregated. Agriculture is the only activity allowed in the rural region, and manufacturing is the only activity allowed in the urban region. The model ignores the urban traditional sector which affects both urban income and employment probability and, consequently, expected urban income. The model does not treat adequately important interactions in the product market between the agricultural and nonagricultural sectors.

These theoretical models which analyze interactions in the factor and product market provide the framework within which applied policy models are constructed. In the next section, the treatment of labor and migration in applied policy models is reviewed in order to identify existing weaknesses in them. Emphasis will be on the adequacy of the models to analyze employment and migration within a macro-economic framework.

Treatment of Labor and Migration in Applied Policy Models

The theoretical models together with empirical observations provide a base for construction of applied policy models. There, however, is a wide gap between theory and practice. Until very recently, labor absorption and the labor transfer process entered only tangentially, if at all, into most applied models.

In this section, applied policy models will be reviewed briefly with emphasis on the extent to which labor and migration has been treated. For this purpose, three criteria are used to evaluate the adequacy of the applied policy models to analyze employment and migration.

I) Is there a treatment of labor? If so, does the model look only at demand or at both demand and supply?

II) Is labor assumed homogenous or is there disaggregation by education or skill?

III) Is labor constrained at the economy level or is it disaggregated by location into rural and urban areas? Does treatment include rural-urban migration?

Using the first criteria, there are models that exclude labor altogether (see Figure 1). For example, four of the seven planning models in a well-known volume on methodology of planning, edited by

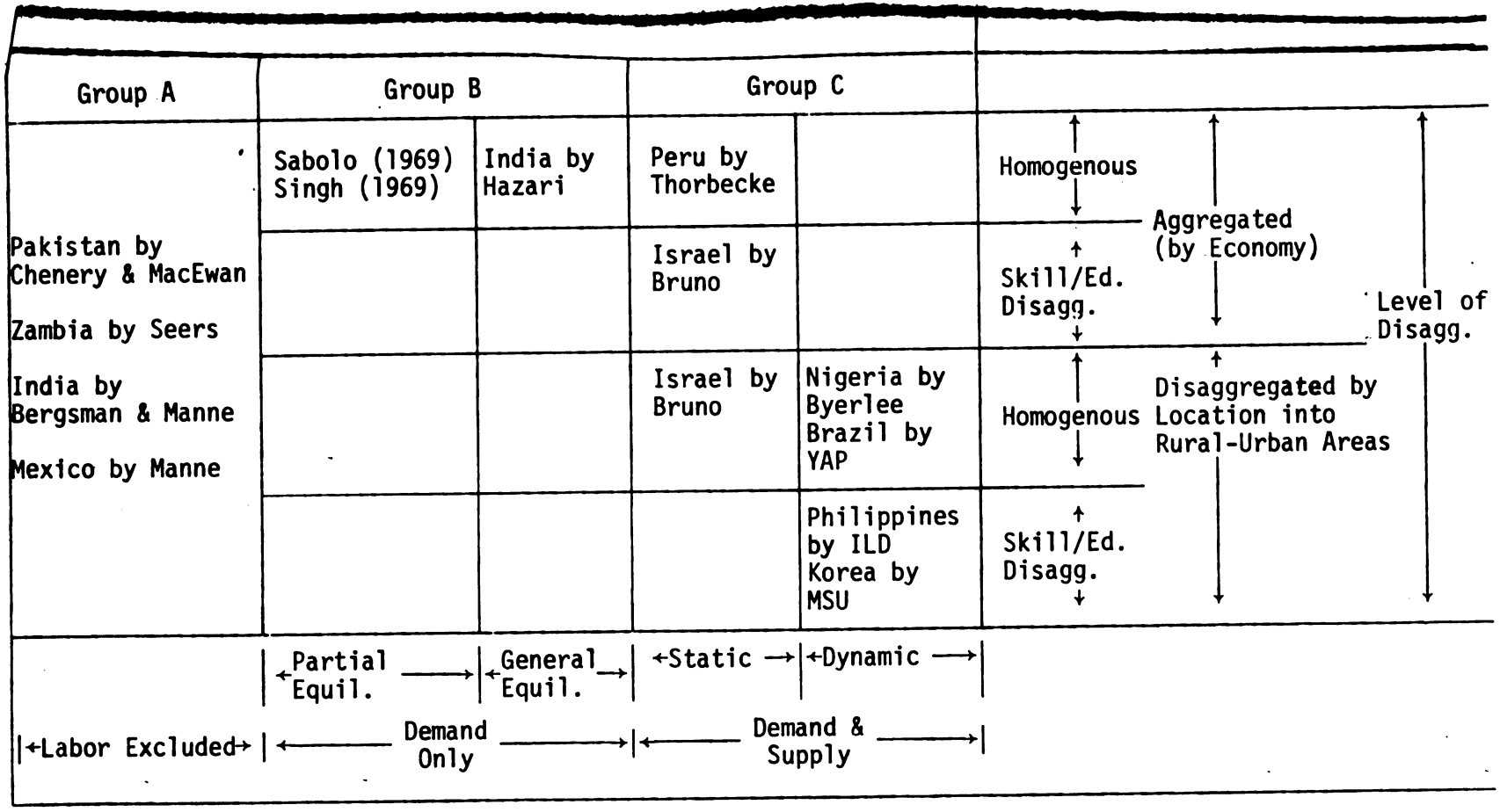

FIGURE 1

FRAMEWORK FOR CLASSIFYING TREATMENT OF LABOR AND MIGRATION IN APPLIED MODELS

Adelman and Thorbecke (1966), have no discussion of labor. These models are of Pakistan by Chenery and MacEwan, Zambia by Seers, India by Bergsman and Manne, and Mexico by Manne.

Some models look only at demand for labor and employment projection is done either within a partial equilibrium framework or within a general equilibrium framework. The partial equilibrium model focuses on the principal variables involved in the particular problem studied, and treats the rest of the economy as exogenous. The general equilibrium approach takes simultaneity into account and captures both the direct and indirect effects of the changes a given variable makes in the system.

In partial equilibrium framework, employment is a function of independent variables and depending on the values of independent variables, employment is projected (e.g., Sabolo (1967) and Singh (1969)). Sabolo (1969) regressed the logarithm of sectoral employment as a proportion of total population on the logarithm of per capita GDP for six sectors. The regression equations provided estimates of sectoral employment elasticities with respect to per capita income. These elasticities were used to project employment trends assuming a given GDP growth rate.

In a general equilibrium approach, employment is put within an input-output or linear programming framework (e.g. Harzari (1970)). In this format it is assumed the country modelled has surplus labor and does not regard labor as a constraint. The only constraints on the productive capacity of the economy are those related to capital, foreign exchange and other intermediate inputs. Projected employment can be aggregated or disaggregated at various levels by skill or by location or by both skill and location. An equation might look like:

$$E_{ik} = l_{ik} X_i$$

where: x_i is gross output in sector i

l_{ik} is the labor input coefficient for sector i specific for labor skill k

E_{ik} is employment in sector i of type k labor

Models that exclude supply or look only at the demand side implicitly assume surplus labor. In situations where labor is not surplus or where a category of labor (e.g. skilled) is in short supply, models that do not check for consistency on the supply side are of limited use.

A more realistic group of models are those that examine labor in both demand and supply side and treat it in the same way as capital, foreign exchange, and other intermediate inputs. Labor allocation is thus a constraint in this group. Accordingly, the supply of labor is assumed fixed exogenously at some upper level and the equation may take the following form:

$$\sum_{i=1}^{n} l_{ik} X_i \leq \bar{L}_k$$

where: l_{ik} and X_i are same as before and $\bar{L}_k$ is an exogenous projection of the total supply of labor in category k. This ensures that the output level is consistent with availability of labor besides other intermediate inputs. Within this supply and demand approach, the model can either be static (e.g. model of Peru by Thorbecke (1970), Israel by Bruno (1966) and India by Sandee (1967)) or dynamic (e.g. Nigeria by Byerlee (1971), Brazil by Yap (1976)).

Using the second criteria, labor can be treated either as a homogenous input (e.g. Peru by Thorbecke (1970), India by Sandee (1969)) or disaggregated by education or skill (e.g. Israel by Bruno (1966) and

Philippines by ILO). Where employment and migration are education- or skill-specific, models that treat labor as homogenous are simplistic.

Using the third criteria, labor can be aggregated either at an economy level (e.g. Peru by Thorbecke (1970) and Israel by Bruno (1966)) or disaggregated by location into rural and urban areas (e.g. Nigeria by Byerlee (1971) and Brazil by Yap (1976)). Where labor is constrained at the economy level, i.e., where total demand for labor in all sectors is less than or equal to total labor supply, the assumption that labor is perfectly mobile between rural and urban areas is implicit and the labor supply constraints by geographical locations are assumed away. Hence, these models cannot analyze interrelationships between employment and migration.

Models that do disaggregate labor by location capture interactions in the factor market between rural and urban areas and can examine employment and migration more comprehensively. The model allows transfer of labor between regions and there is explicit migration behavior. In most of these models (e.g. Nigeria by Byerlee (1971) and Brazil by Yap (1976)), the migration function used are extensions of the Todaro-Harris model of migration based on the human capital investment theory discussed earlier.

Synthesis of Empirical Evidence on Behavior of Rural and Urban Labor Markets and Migration in Africa

In this section, labor markets and rural-urban migration will be reviewed so that existing conditions in the factor market can be incorportaed into the proposed framework.

The Rural Labor Market

The great majority of people in African countries live in rural areas. The estimates range from over three quarters of the population to 90 percent, depending on the country and definition used for rural areas. It is estimated that the natural rate of population growth in these areas is about 2.3 to 2.6 percent (ILO (1971)).

Underemployment rather than unemployment is a major problem for rural people in Africa. There is evidence that labor is a binding constraint at the peak agricultural seasons (Spencer and Byerlee (1976), Norman (1973)). The demand for hired labor is at its peak just at the time when the need for potential wage earners to work their own holdings is also at its highest, and hired labor constitutes only a small proportion of the total labor input.

Rural nonagricultural activities are an important source of employment. Employment in nonagricultural activities can be a primary or part-time occupation during the slack labor demand period. Studies in Nigeria (ILO (1970)) and Sierra Leone (Byerlee et al. (1976)) estimate that about one-fifth of the males in rural areas engage in nonfarm activities as primary occupations. In Sierra Leone, Spencer and Byerlee (1976) estimate 11 percent of the male population in rural areas worked part-time in rural nonfarm activities.

Evidence is accumulating indicating that the rural labor market is competitive. In Sierra Leone, Spencer and Byerlee (1976) analysis showed wage rates varied by labor type and season reflecting differences in the opportunity cost of labor of different types and at different seasons of the year. Findings from Sierra Leone (Spencer and Byerlee (1976) and Nigeria (Norman (1973)) indicate a good correspondence between the MVP of labor and the wage rate.

The Urban Labor Market

The urban labor market is reviewed with respect to its various related dimensions. These are a) the structure of employment, b) earnings, c) rural urban migration, and d) unemployment.

The Structure of Urban Employment

Following the familiar notion of urban duality, urban labor markets in Africa can be divided broadly into two categories: large-scale (or organized) and small-scale (or unorganized) sectors. Factor intensity and characteristics of labor employed between the two sectors differ. Large scale sectors are usually characterized as capital intensive in contrast to small-scale labor-intensive sectors. Educated persons comprise a higher proportion of employment in the large-scale compared to small-scale sectors.

Within the large-scale sectors a further subdivision can be made between public sector employment (or government) and employment in the private sector. Government employment, in fact, accounts for half or more of the total employment in the large-scale sectors. In Kenya, ILO (1972), estimates government employment to account for 40 percent of total employment in the large-scale sectors.

Small-scale sectors include small-scale trade, transport, services, and small-scale manufacturing, and employment in this sector is important. This sector is relatively easy to enter in the sense that very little capital--human or physical--is required and there is a high job turnover. In Sierra Leone, Chuta and Leidholm (1976) observed that in 1974 small-scale industrial establishments employed 88.6 thousand (or 95.6 percent) of the total industrial employment of 92.7 thousand. In Nigeria, Kilby (1969) estimated a total employment of 28.7 thousand in

small-scale sectors. This sector is also assumed to be the major employer of uneducated people. In the case of Sierra Leone, Byerlee et al. (1976) observed that one-half of the employed migrants without education were located in small-scale sectors.

It is also important to examine the trend in employment in the large-scale and small-scale sectors. Despite high rates of growth of output in the large-scale, modern nonagricultural sectors, the growth of employment in these sectors was disappointing. Though the growth rate of output in the modern sectors was about 5 to 8 percent per annum, the growth rate of employment was less than 2 percent. In Kenya, Ghai (1971) observes that while output in real terms increased at an annual rate of 6.3 percent between 1964 and 1969, employment grew at a rate of only 3.5 percent. And even then most of the expansion in employment was due to an increase in governmental jobs, where employment increased at an average annual rate of 5.5 percent.

A number of reasons have been advanced for this higher growth rate of output relative to rate of growth of employment (or productivity increase). A major reason has been due to institution of policies which have distorted factor markets--making capital cheaper and labor expensive--encouraging capital/labor substitution. Policies which have distorted factor markets in favor of capital include overvalued exchange rates, subsidized credit arrangements, tax policies such as accelerated depreciation and investment allowances and duty-free imports of capital goods. Policies relating to minimum wage rates have made labor expensive. A number of other factors also have contributed to this productivity

increase, including more and better training of labor and technological progress which has generally been capital-intensive.[1]

Data on employment expansion in the small-scale sectors are virtually nonexistent. Estimates can be made by subtracting large-scale employment and unemployment from the total labor force in urban areas. Byerlee and Tommy (1970) used this method to data from Freetown, Abidjan and Nairobi, and they estimate employment in small-scale sectors to be increasing at least 10 percent per year in these urban areas.

Earnings in the Urban Labor Market

Earnings in the urban labor market differ between large-scale and small-scale sectors. It is observed that the wage rates in the large-scale sectors are not determined by market conditions but by such factors as government minimum wage legislation and relative bargaining strengths of trade unions. Observations in Kenya (Ghai (1968)) and in Nigeria (Diejomah and Ormalide (1971)) suggest that wage rates in the modern large-scale sector are higher than dictated by market forces. Within the large-scale sectors there is some evidence that the private large-scale sector pays a higher wage than government.

There is also a large difference in wages between the large- and small-scale sectors. Wages in the small-scale sector are determined by supply and demand of labor. Evidence from Kenya (ILO (1972)) and Sierra Leone (Byerlee et al. (1976)) show that earnings in the small-scale sector are below the minimum wage established for government employment.

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[1]See Frank (1967), Berg (1970), Eicher et al. (1970) and ILO (1972).

Data available do not indicate any major changes in the level of wages in large-scale sectors in recent years. In a survey of African economies, the highest increase was recorded in Kenya, where average earnings increased by 5.8 percent in 1972. In other countries of East Africa, wages have stagnated. In several West African countries, minimum wage rates have remained at the same level for many years (ECA (1973)). One of the reasons advanced is that with the recognition of the inequality between rural and urban areas and between large- and small-scale sectors in urban areas, governments have been reluctant to raise minimum wages.

Data on trend in earnings in the small-scale sectors are practically nonexistent. It is very likely that earnings in this sector have also stagnated or even decreased as a result of increased absorption of labor, forcing labor productivity down (Byerlee et al., (1976)).

Rural-Urban Migration

The growth rate of urban population in Africa for the period 1965-1970 is estimated at 6.1 percent (ECA (1971)). There is a tendency for migration to be directed mainly towards one or two of the largest cities in each country so that the growth rates of cities with populations of 100,000 or more are often higher than the rates for the urban areas as a whole. Thus, in a number of principal cities, there has been an urban growth rate averaging 12 percent per annum, while in a few capital cities the rate has reached as high as 15 percent a year (ECA (1971)). If allowance is made for the natural growth rate of urban population at 2.5 percent, about two-thirds of urban population growth can be attributed to migration. The signfficance of rural-urban migration for the problem

of urban unemployment is that it makes the already serious problem of unemployment far worse.

Typically, migrants are younger and better educated. In Tanzania, Barnum and Sabot (1975) observed strong, positive relationships between rates of migration and educational level, and that educational selectivity has increased over time with secondary school leavers forming a higher proportion of total rural-urban migrants. In Ghana, Caldwell (1969) reported that 65 percent of respondents with no education had never migrated or did not intend to migrate, compared to 17 percent for those respondents who had some secondary schooling. In Kenya, ILO (1972) observed that the probability of migrating for persons with nine years or more of schooling is about five times greater than for persons with less education and over twenty times greater than for those without schooling.

Studies of rural-urban migration consistently show the importance of economic factors in migration. The basic economic consideration being rural and urban income (either absolute or expected) or their difference. In Ghana (Rourke and Sakyi-Gyinae (1972)), Nigeria (Diejomaoh and Ormilade (1971)), Kenya (Todaro (1971)), and Uganda (Knight (1968)) have observed that there is a significant rural-urban income disparity. In a survey of economic conditions in Africa by ECA (1973), it was found that wages paid to urban employees are generally higher than incomes in the agricultural sector. In Kenya, ILO (1972) observed that statutory minimum wages in urban areas are well above the incomes of all groups in the rural areas except for the more prosperous small-holder and the average owner of a nonagricultural rural enterprise. A number of reasons have been advanced for this gap such as minimum wage rates in urban areas and

low rural incomes. This has been augmented by government bias in the provision of social services to urban areas.

A number of authors have also observed that rural-urban income disparity is higher for educated than for uneducated persons. In Tanzania, Sabot (1975) observed a strong positive relationship between wage incomes and levels of education. For urban wage earners, average income rose from Sh. 251 for those with no education to Sh. 861 for those with some secondary education. In Kenya, ILO (1972) observed that gains from migration are usually much greater for the more educated than for those with less education.

Despite the remarkable similarity in the response of migrants to rural and urban incomes, the effects of education on migration have differed markedly. Beals (1967) found that in Ghana migration decreased with higher levels of education at both the origin and destination, while Greenwood (1971) found that in Egypt migration increased with higher levels of education at both the origin and destination regions. This ambiguity is due partly to the inclusion of aggregate educational attainment variables or educational enrollment variables in econometric models. Very few studies (e.g., Barnum and Sabot (1976)) have disaggregated the population by education.

Urban Unemployment

The evidence available does provide ample empirical confirmation that urban unemployment is of a high magnitude and that it is growing rapidly. In most of the African countries, the aggregate rates are typically between 10 and 15 percent of the labor force. The ILO (1972) mission to Kenya estimated that the level of urban unemployment was around 15 percent. Nonofficial statistics relating to unemployment

estimate that for all of Africa in 1970, the level was 10.84 million or 7.9 percent of the economically active population (Sabolo (1969)). The available evidence shows that the rates are high among youths and the educated. An ILO (1972) mission to Kenya observed that the majority of the unemployed were between 15 and 24 years of age.

While the rate of growth of educated workers due to rapid expansion of school systems is impressive, the rate of growth of wage jobs has been negligible, giving rise to phenomenon called "educated" unemployment. In most of these countries, only a small portion of students completing primary school enters secondary school; the group which leaves school after approximately seven years of education forms the bulk of job seekers in the urban areas. In Kenya, Elkan (1973) estimates that of 150 thousand leaving primary school each year no more than 30 thousand go to secondary school. This accelerated educational system combined with educational selectivity of migrants results in higher urban unemployment rates for educated. In Sierra Leone, based on Household Survey (1971) data, the unemployment rates for the educated in urban areas were consistently higher than for the uneducated. The survey also shows that unemployment is worse in large urban areas than in small urban areas (e.g., Freetown had 15.5 percent, Bo 15.1 percent compared to 9.5 percent in other small urban areas).

Data from individual countries tend to confirm the increasing incidence of unemployment over time (ILO (1970)). There is very little information on trends in unemployment at a disaggregated level. Barnum and Sabot (1975) observed in Tanzania the differential in rates of growth of unemployment by educational level.

Policy Implications

The above review of labor markets in Africa shows that urban unemployment is high and probably increasing. Both supply and demand factors have contributed to the emergence of the urban unemployment problem. While the supply of labor in urban areas has increased rapidly, partly due to high rate of natural growth of population and largely due to rural-urban migration, the demand for labor in the modern large-scale sector has stagnated or increased very slowly, primarily due to adoption of capital intensive technologies.

Various strategies have been suggested for approaching the employment problem at the macro level. These policies can be grouped into those which attempt to increase the demand for nonagricultural employment and those which seek to decrease the supply of labor in urban areas. In the former group, for example, are policies that encourage small-scale labor-intensive sectors. In the latter group, supply of labor can be reduced in the long run through reduction in the natural rate of population growth. The labor supply also can be decreased in the short run by reducing the rate of rural-urban migration. Among the policies suggested for decreasing rural-urban migration are reducing the rural-urban income differential by increasing rural incomes through agricultural development programs.

Urban unemployment, however, cannot be studied at the macro level without reference to the total economy. In particular, the impact of various development strategies must consider the relationship between growth, employment and migration. For example, the interactions in the product market between agricultural sectors and nonagricultural sectors are important. Likewise, interactions in the factor market between rural

and urban areas are important in determining the supply of labor to each region. As observed earlier in this chapter, the existing analytical framework to analyze these interactions in the product and factor markets at macro level are inadequate.

Towards a Framework for Macro Analysis of Output, Employment and Migration

In reviewing applied policy models, it was observed that they do not give adequate attention to labor and migration. Models that do not disaggregate labor by education and rural urban locations are of limited use in analyzing employment and migration. In this section an improved framework is suggested. This framework will be used to construct macro economic and migration models which are applied to Sierra Leone economy to analyze output, employment and migration.

In order to analyze output, employment, and migration, a more realistic disaggregation of both product market and labor market and explicit treatment of labor migration is needed.

Product Market Disaggregation

Characterizing rural areas with agricultural production and urban areas with modern manufacturing seems unrealistic. Evidence reviewed earlier in this chapter showed the importance of the nonagricultural activities, especially small-scale manufacturing and trade, as a source of income and employment for rural populations. The evidence also showed the importance of traditional small-scale industries in urban areas, which are operating under different technological frontiers and production functions than large-scale sectors.

A number of authors have proposed a higher level of disaggregated framework. Oshima (1962) argues that an adequate model should distinguish

three sectors--agriculture, industry, and traditional trade services. Reynolds (1969) distinguished four sectors--two traditional (agriculture and urban trade services) and two modern (industry and government). Byerlee and Eicher (1972) have put forward a case for dividing the economy on the basis of three criteria--type of output, firm size, and location. Dividing the economy on the basis of these three criteria, they then subdivide the economy into at least four sectors--small-scale agriculture, small-scale rural nonfarm, small-scale urban, and large-scale urban.

In this study, output will be disaggregated on the basis of three criteria following Byerlee and Eicher (1972). These three criteria are: type of output, scale of operation, and location. The first criterion, type of output, divides the economy into agriculture and nonagriculture. This division is needed to capture interactions between these two sectors and their relative distribution as development proceeds or due to impact of different policies. A factor which changes the relative distribution of these two sectors is the difference in income elasticities of demand for their output.

The second criterion, scale of operation, divides the economy into large-scale and small-scale sectors. These two sectors differ markedly in economic characteristics as was reviewed earlier. Firms in small-scale sectors are usually family owned, depend largely on indigenous resources, and are labor-intensive, in contrast to the capital-intensive large-scale sector. The small-scale sector also employs a relatively higher proportion of uneducated labor in contrast to large-scale sectors where educated labor dominates. Besides these there are other differences such as demand patterns which may lead to different employment implications.

The third criterion for disaggregating output is on the basis of location. This divides the economy into rural and urban sectors. This rural-urban distinction is important because rural and urban production and employment problems differ greatly. This also facilitates linking the economy with labor markets, where rural-urban migration is affected by income and labor market conditions in both the rural and urban areas. This will also enable analysis of impacts of various policies on rural and urban income distribution.

Factor Market Disaggregation

Where there is a separation of labor market in the urban areas by educational level and where there is a differing response by educational level to factors affecting migration, the models that regard labor as homogenous are unsatisfactory.

In this study, labor markets will be disaggregated on the basis of two criteria--location and education. The first criterion, location, divides the labor market into rural and urban. This is necessary in order to properly analyze rural and urban labor markets and to give explicit treatment to the process of rural-urban migration as a link between rural and urban labor markets. An added advantage of this disaggregation is that it allows the structure of consumption demand to vary by rural and urban population. Given the significance of consumption, and to the extent that the demand patterns differ between the two groups, this disaggregation adds more realism. Consumption will be computed endogenously for each commodity for rural and urban groups separately, using population-specific elasticities.

The second criterion for disaggregating labor market is by educational level. The labor force cannot be regarded as homogenous if

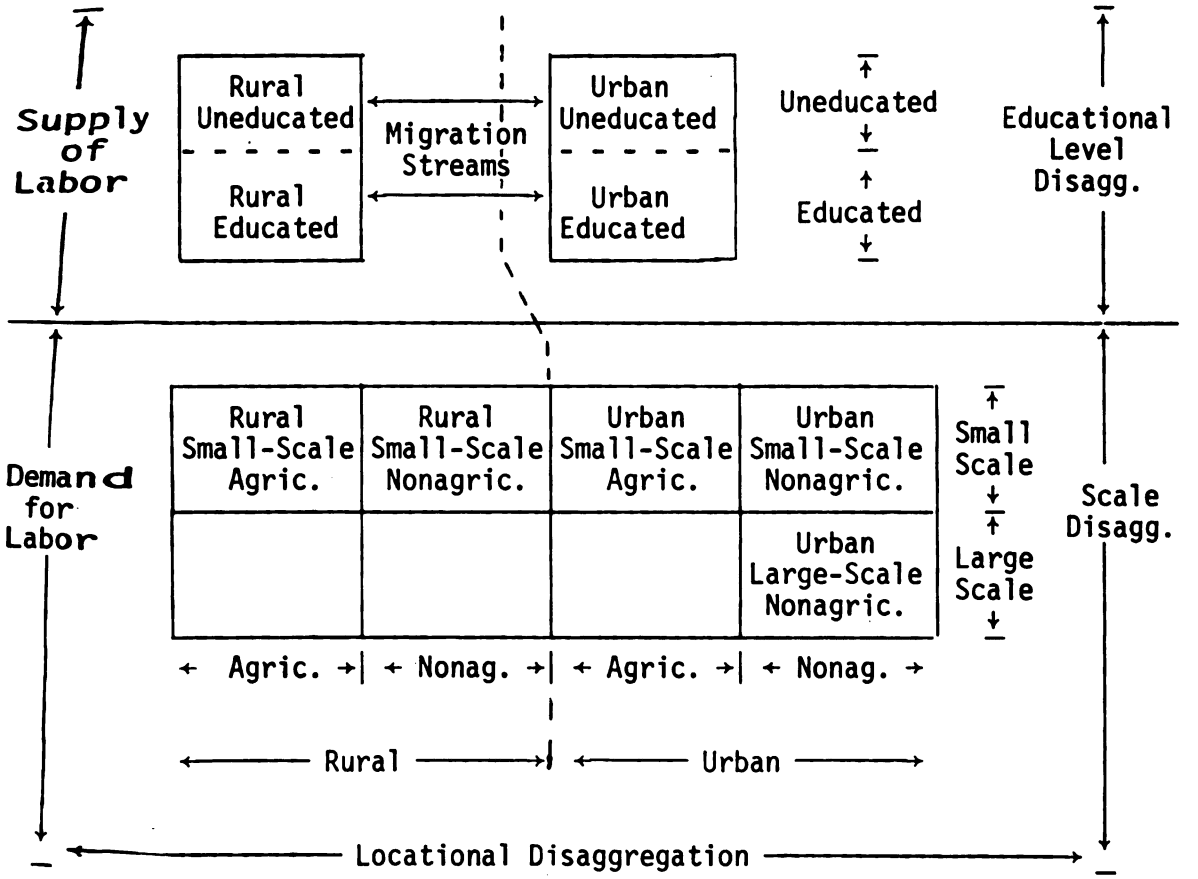
employment and migration are to be analyzed adequately. For this study, the labor force will be disaggregated by education into two groups: uneducated and educated. This dichotomy is of value in understanding employment and migration which are highly education-specific.

Migration will specifically be disaggregated by educational level into two streams, uneducated (those with less than four years of education) and educated (those with four or more years of education). This disaggregation is valuable in an analysis of migration which is education-specific. The small-scale sectors in urban areas are explicitly incorporated. These sectors affect urban employment probability and wages and, hence, expected urban wages.

Figure 2 shows the division of output and labor on the basis of the criteria discussed. Only sectors that are of practical importance based on empirical evidence and observation in Sierra Leone are used for this study though conceptually some sectors can exist, e.g., large-scale sectors (be they agricultural or nonagricultural) in rural areas are not of practical significance.

Macro Level Interactions

The framework captures important linkages within rural and urban sectors and between rural and urban sectors in product and factor markets. At the macro level, several types of intersectoral linkages are important. Linkages in the labor market include labor allocation between agricultural and nonagricultural activities in rural areas, and labor force distribution, through migration, between rural regions and urban areas. Linkages within product markets include backward and forward interindustry demand linkages between agriculture and other sectors of the economy and demand linkages through consumption



X: Of No Pratical Significance

FIGURE 2

PRODUCT AND FACTOR MARKET DISAGGREGATION

expenditures by rural and urban populations. These linkages should be captured in order to meaningfully analyze output, employment and migration.

III. OVERVIEW OF OUTPUT, EMPLOYMENT AND MIGRATION IN SIERRA LEONE

In this chapter the Sierra Leone economy is briefly described, with emphasis on output, employment and migration. Many of the features of the Sierra Leone economy common to other developing countries are highlighted.

The first section summarizes the national account statistics. The performance of the most important sectors of the economy is described in the second section. The third section discusses the population and labor force with emphasis on its distribution between the rural, small urban and large urban regions. Employment, unemployment and migration are discussed in the last section.

National Accounts

Gross Domestic Product (GDP) at factor cost in constant 1963/1964 prices grew at an average rate of 4.2 percent per annum, from Le 214.8 million in 1963/64 to Le 287.9 million in 1970/71. The population is esimated[1] to have grown at 2.3 percent per annum over the same period, from 2.18 million in 1963/64 to 2.71 million in 1970/71, so that GDP per capita at constant 1963/64 prices grew at 1.9 percent per annum, from Le 93 in 1963/64 to Le 106 in 1970/71. Over the period 1963/64 - 1970/71, however, the economy grew at an uneven rate. Whereas GDP grew by 4.2 percent per annum for the years 1963/64 - 1965/66, for the recession

[1] See section under population.

years 1965/66 - 1967/68 it fell by 1.1 percent per annum. The economy recovered in 1968/69 and grew by 7.5 percent per annum during 1968/69 - 1969/70 period, but the growth rate again fell in 1970/71 to 1.6 percent.

GDP can be disaggregated by expenditure into consumption, investment, savings and imports and exports. Investment grew at an average annual rate of 18.3 percent over the period 1963/64 - 1970/71 with substantial year-to-year variations. During the recession years 1965/66 - 1967/68, it dropped by 3.4 percent per annum. The share of investment in GDP has been increasing and almost doubled from 10.1 percent to 18.1 percent during the period 1963/64 - 1970/71.

Consumption grew at an average rate of 1.6 percent per annum during the period 1963/64 - 1970/71. Consumption, like GDP shows a substantial variation and the trend closely follows GDP. It grew steadily during the 1963/64 - 1966/67 period, dropped sharply during the recession, and again catching up during the recovery period 1968/69 - 1970/71. The share of consumption in GDP has been falling steadily and declined from 97.2 percent in 1963/64 to 80.1 percent in 1970/71.

The other accounting activity of GDP expenditure is foreign trade. Total imports have consistently been greater than total exports, except during 1968/69. The value of exports grew at an average rate of about 5 percent per year between 1964/65 and 1972/73. Imports rose at an annual average rate of 3.7 percent during the same period. Exports are predominantly minerals and agricultural commodities and the mix of the two has changed very little. Mineral exports represented more than 75 percent of the total exports, while agricultural exports represented 17 percent. Total exports averaged about 25 percent of GDP at market prices and imports about 30 percent during the period 1963/64 - 1970/71.

Sectoral Performance

Gross Domestic Product can also be disaggregated by industrial origin. Agriculture constitutes the largest single sector in the economy and it is the dominant source of employment. According to the 1963 population census almost three quarters of the labor force was in agriculture. Agricultures' contribution to GDP has been slowly declining from 38.6 percent in 1963/64, to less than 30 percent in 1973/74. Agriculture grew only at about 1.5 percent per annum during the period 1963/64 to 1970/71. This growth is less than the rate of population growth which increased from 1.5 percent a year in the 1960's to 2.2 percent a year in the 1970's. In fact, the real GDP per capita in agriculture actually declined. Compared to the growth rates in other sectors, agriculture had the lowest growth rate. The impacts of these low rates of growth in agriculture were felt both in terms of foreign exchange foregone because of food imports, especially rice, and in terms of providing food and employment for the growing population.

One of the reasons for the poor performance of the agriculture sector is the limited investment allocated to the sector. Although agricultural investment expenditures have increased from 4 percent of development expenditures in 1963/64 to about 25 percent, they still account for less than 1 percent of GDP. Another reason for this poor performance of the agricultural sector is the pricing policy which heavily taxes agricultural output. In 1971/72, the farmers' share of the export price (f.o.b.) was about 70 percent for palm kernels and between 40 to 50 percent for coffee and cocoa. Over the period 1968/69 to 1972/73, the total taxes raised directly from the agricultural sector amounted to about Le 19 million. In contrast, total government

expenditures, both current and development, directly allocated to agriculture were only about Le 14 million (World Bank, 1974).

Rice is the main staple food in Sierra Leone and accounts on the average for about 40 percent of the total value of crop production. In 1970/71, 808,000 acres were devoted to rice cultivation or over 50 percent of all land under cultivation. It is grown by about 81 percent of all farmers. Failure to produce enough domestic rice for self-sufficiency has continually troubled policy makers. Prior to the early 1950's, Sierra Leone was self-sufficient in rice production, but rice became a major component of food imports in the early 1960's. Average annual imports of rice for 1970/71 - 1972/73 of 26,000 tons, were more than double 1960/61 - 1962/63 levels and were close to 10 percent of total rice consumption in 1974/75.

Production of other food crops (excluding export crops) has shown an annual increase of 2 to 3 percent during the period 1963/64 to 1970/71. Some of the most important crops in this category are cassava, millet, groundnuts and citrus fruits.

Export crops such as palm kernels, coffee and cocoa form the bulk of agricultural export earnings. They represented 17 percent of total exports, with palm kernels accounting for 8.7 percent, coffee 3.7 percent and cocoa 2.8 percent of the total exports during the period 1963/64 to 1970/71.

Mining is the second largest sector in the economy following agriculture. Mining increased at an average annual rate of 3.1 percent during the period 1963/64 to 1970/71. Mining contribution towards GDP averaged around 17 percent during the period 1963/64 to 1970/71 with little year-to-year variation. The importance of the sector to the

economy is brought out more clearly by its contribution to export earnings and public revenues. Export of minerals has contributed more than 75 percent of the total value of domestic exports during the period 1963/64 to 1970/71. Exports of diamonds alone contributed 60 percent of export earnings during the period. The next important mineral is iron ore which contributed about 16.8 percent of export earnings during the period. The sector also contributes to revenues of the government through taxes on the mining companies, export duty on diamonds, royalties and license fees and profits of the joint enterprise, the National Diamond Mining Company of Sierra Leone. In 1970/71, the contribution of mining to current government revenue amounted to 16.6 percent. Much of the mining activity is of an enclave type, i.e., capital-intensive, foreign owned and with relatively few links with the rest of the economy. There is also the feeling that wealth provided by the diamonds has been responsible for the lack of urgency regarding reforms in agriculture.

Manufacturing and handicrafts contributed on the average slightly more than 5 percent of the Gross Domestic Product with little year-to-year variation during the period 1963/64 to 1970/71. The average growth rate of the sector during the 1963/64 to 1970/71 period was only 2.9 percent per annum. A distinction should be made between the large-scale factory type industry and small-scale industry because economic characteristics of the two differ. Liedholm and Chuta (1976), in their analysis of data from a small-scale industry survey in Sierra Leone, found that small-scale industries make extensive use of labor and are parsimonious in their use of capital. The labor-capital ratio for small-scale industry is substantially higher than for large-scale industry and small-scale industries possess higher output-capital ratios. Liedholm

and Chuta (1967) estimated that small-scale industry in 1974/75 accounted for approximately 2.9 percent of Sierra Leone's GDP or approximately 43 percent of the entire manufacturing sector's GDP, empahsizing that small-scale establishments are indeed a significant component of Sierra Leone's industrial sector.

Transport and communication has been expanding steadily at an average annual growth rate of 11.6 percent during the period 1963/64 to 1970/71. Its contribution to GDP increased from 6.8 percent in 1963/64 to almost 10 percent in 1970/71.

Wholesale and retail trade is the third largest sector in the economy following agriculture and mining. The sector's average annual growth rate was 6.5 percent during the period 1963/64 to 1970/71. Wholesale and retail trade sectors' contributions towards GDP averaged between 13 and 14 percent.

Construction grew at an average annual rate of 12.8 percent during the period 1963/64 to 1970/71. This growth rate was almost three times the growth rate of GDP and faster than all other sectors except utilities. Construction sectors' contributions to GDP increased steadily from 3.3 percent in 1963/64 to 5.0 percent in 1970/71.

Utilities were the fastest growing sector, growing at 14.8 percent per annum during the period 1963/64 to 1970/71. However, the sector is the smallest of all the sectors and contributed less than 1 percent to GDP in 1970/71.

Population

Data for population in 1963 by age-sex and location are derived from the population census of Sierra Leone. For 1974 estimates were available of the total population and its distribution by location. The

age-sex composition within each location for 1974 was assumed to be the same as 1963. The component method whereby the population can be projected by age-sex from 1963 was not feasible as the available data on birth and death rate by location are extremely fragmentary and contradictory.

It is worth examining the changes in the pattern of distribution of population between rural and urban areas in 1963 and 1974. Table 1 shows the population distribution between rural and urban areas in 1963 and 1974. In 1963, 77.3 percent of the population was rural. Within the urban areas, the small urban areas had a higher percentage of the population than the large urban areas. In 1974, 73.0 percent of the population was rural, showing the relative decline of the population in rural areas. The remaining 27.0 percent was more or less distributed evenly between the small and large urban areas, indicating the importance of large urban areas in 1974 compared to 1963.

Although the population as a whole increased by 2.3 percent per annum during the period 1963-1974, the rate of growth of the rural population is only 1.8 percent, reflecting the out-migration of population from rural areas. This contrasts with the rate of growth of the urban population where the small urban areas grew at 3.3 percent and the large urban areas at 6.9 percent. Allowing for the natural rate of growth of 2.2 percent, this yields a growth rate due to migration of 1.1 and 4.7 percent respectively for small urban and large urban areas.

Table 2 shows the potential labor force (defined as population aged 10 to 64) as a proportion of total population in each location in 1963 and 1974. This proportion is higher in urban areas, approximating 70 percent, but only 64 percent for rural areas, reflecting the greater

TABLE 1
POPULATION DISTRIBUTION BETWEEN RURAL AND URBAN AREAS IN 1963 AND 1974

Total Population	1963		1974		Average Annual Rate of Growth, 1963-1974
	Total ('000)	Percent	Total ('000)	Percent	(%)
Sierra Leone	2,180.3	100.0	2,733.1	100.0	2.3
Rural	1,685.6	77.3	1,994.9	73.0	1.8
Small Urban	272.0	12.5	361.8	13.3	3.3
Large Urban	222.7	10.2	376.4	13.7	6.9

Sources: 1963 Population census of Sierra Leone
Central Statistics Office, Estimates for 1974

burden of dependency in rural areas. It also reflects out-migration of younger people from rural areas.

Labor Force

The size of a population, its age-sex composition and locational distribution combined with the participation rates specific for each age-sex and location group are the primary determinants of the size of labor force available to the economic sectors and to each location.

The labor force participation rates used for urban areas were obtained from ILO (1971). These are based to a large extent on comparative analysis of labor force structure in different countries at different stages of economic development. These labor force participation rates are shown in Table 3. The rates for males 20-64 years are on the average 90 percent, while for females they are about half of that for

TABLE 2
POTENTIAL LABOR FORCE[1] AS A PROPORTION OF POPULATION IN EACH LOCATION, 1963 AND 1974

Location	1963 (percentage)	1974 (percentage)
Sierra Leone	64.8	66.4
Rural	63.6	64.7
Small Urban	68.6	69.6
Large Urban	70.9	71.8

[1]Population between the ages of 10 thru 64.

Sources: 1963 Population census of Sierra Leone
Central Statistics Office, Estimates for 1974

males. Since the concept of labor force participation rates as it usually is defined does not have much meaning in rural areas, it is simply assumed that all males are 20 to 65 and 90 percent of the females in that age group participate in the rural labor force.

It is instructive to compare these labor force participation rates with labor force participation rates for migrants in urban areas observed by Byerlee, Tommy and Fatoo (1976). Overall, the labor force participation rates for migrants were consistent with the labor force participation rates of the urban population as a whole. Male migrants aged 25+ had on the average 90 percent participation rates; this is identical with the rates of males in that age group in urban population as a whole. For female migrants aged 25+, uneducated had lower (28 percent), while educated had higher (52 percent) participation rates, compared to an average of 45 percent for urban female population in that age group.

TABLE 3
LABOR FORCE PARTICIPATION RATES BY AGE AND SEX
FOR URBAN POPULATION, 1974

Age	Males	Females
	(percent)	(percent)
10-14	21.3	16.0
15-19	56.4	33.5
20-24	85.6	43.5
25-44	96.9	47.6
45-54	96.0	49.7
55-64	86.5	39.5

Source: ILO (1971, p. 117).

Based on these analyses of total population, its age-sex structure, its distribution by location and the activity rates specific for age-sex and location, the labor force available in each location in 1974 is estimated and shown in Table 4. About three-quarters of the labor force is in rural areas, the remaining quarter divided more or less equally between the two urban locations. Females comprise 40 percent of the rural labor force while in urban areas they form slightly less than one-third of the labor force. This is partly the reflection of the activity rates assumed in the computation.

Employment

According to estimates prepared by the Central Planning Unit, the total labor force increased from 927,000 in 1962 to 1,094,000 in 1972 or at an average annual rate of growth of 1.7 percent during the period.

TABLE 4
LABOR FORCE DISTRIBUTION IN 1974 BY LOCATION AND SEX

	Sierra Leone	Rural	Small Urban	Large Urban
		(in thousands)		
Total	1,287.46	1,021.46	126.00	140.00
Male	729.81	539.15	86.53	100.21
Female	557.65	482.31	39.47	39.78

Source: Estimates based on applying ILO (1971) participation rates to Sierra Leone population data.

Only about 149,000 or 89.2 percent of the 167,000 additional workers were able to find employment.

From the sectoral distribution of the employment shown in Table 5, it is evident that agriculture absorbed the largest share (56.0 percent) of the new entrants to the labor force. Construction, commerce, transport and public administration provide most of the remaining employment.

Most of these increases in employment were in the small-scale sectors. With the exception of utilities and mining, contribution of employment creation by large-scale sectors was slight. On the average, large-scale sectors accounted for only 7.9 percent of the total increase in employment during the period 1962-1972.

Time series data available for wage employment in large-scale sectors are shown in Table 6. The average annual rate of increase in employment in large-scale sectors was 2.2 percent during the period 1962-1972 and is largely a reflection of accelerated growth during the period 1962-1965. Employment in large-scale sectors since 1966 has actually declined from 67,692 (in 1968) to 65,728 (in 1972). This decline in

TABLE 5
EMPLOYMENT INCREASE IN LARGE-SCALE SECTORS COMPARED TO TOTAL INCREASE IN EMPLOYMENT, 1962-1972

	Total Increase in Employment, 1962-1972 (In Thousands)	Increase in Employment in Large-Scale Sectors,[1] 1962-1972 (In Thousands)
Agriculture, forestry hunting and fishing	83	1.1
Mining and quarrying	-5	1.2
Manufacturing	10	2.6
Construction	9	-2.7
Electricity, water and sanitary services	1	0.6
Commerce	24	1.2
Transport, storage and communications	10	2.0
Services	17	5.8
All sectors	149	11.8

[1]Establishments with six or more workers.

Sources: Bank of Sierra Leone, Economic Review
Ministry of Development and Economic Planning

employment in large-scale sectors, in spite of increase in output, is due to a productivity increase in the large-scale sectors. The increase in productivity can be attributed to a number of factors. New investment can be capital-intensive in response to various market imperfections which encourage capital-labor substitution. Productivity increases can also be due to on-the-job training of both labor and management.

TABLE 6
WAGE EMPLOYMENT IN LARGE-SCALE SECTORS[1]

Year	Wage Employment (At the End of the Year)	Annual Rate of Increase In Percentage
1962	53,628	
1963	58,146	8.4
1964	61,699	6.1
1965	67,692	9.7
1966	67,388	-0.4
1967	63,643	-5.6
1968	63,070	-0.9
1969	64,513	2.3
1970	64,315	-0.3
1971	65,318	1.6
1972	65,728	0.6

[1]Establishments with six or more workers, excluding government employment.

Source: Bank of Sierra Leone, Economic Review (1972).

Unemployment

In assessing the magnitude of urban unemployment it should be kept in mind that the discussion in this section is on the visibly unemployed. These rates of unemployment do not include underemployment in the traditional sectors of the urban areas. According to the survey of the Central Statistics Office (1967-1969) there is substantial unemployment in urban areas. These rates of unemployment shown in Table 7 indicate

TABLE 7
UNEMPLOYMENT IN SIERRA LEONE

Location	Percentage of Labor Force Visibly Unemployed
Western Area	
Freetown	15.5
Other Urban	13.5
Southern Province	
Urban (1968)	10.1
Bo (1968)	15.1
Northern Province	
Urban (1968)	11.0
Eastern Province	
Urban	9.5

Source: Central Statistics Office (1967-1969).

variation in unemployment rates ranging from 9.5 percent in urban areas of the Eastern Province to 15.5 percent in Freetown.

There are no comprehensive statistics which show the trend of unemployment over the last decade. The time-series which exist cover only job-seekers registered at employment exchanges. These job seekers constitute only a fraction of the total number. There is sometimes a relationship between the unemployed who register at the exchange with the unemployment rate. The higher the unemployment rate, the fewer the chances of finding work, therefore, fewer persons register. Hence the number of job seekers registered is not a safe indicator of the total

TABLE 8
REGISTERED UNEMPLOYED BY YEARS, 1962-1973

Year	Registered Unemployed
1962	9,006
1963	8,509
1964	11,604
1965	12,315
1966	13,632
1967	14,704
1968	14,603
1969	15,502
1970	14,156
1971	13,483
1972	12,839
1973	12,122

Source: National Accounts of Sierra Leone

number of unemployed and should be interpreted with caution. The number of registered unemployed shown in Table 8 indicates that unemployment has increased over time.

Both demand and supply conditions have contributed to the emergence of the urban unemployment problem. Demand for labor in the modern large-scale sector has either stagnated or increased very slowly, primarily due to adoption of capital-intensive technologies. However the supply of labor in urban areas has increased rapidly, partly due to high natural rates of population growth and largely because of rural-urban migration.

Summary and Policy Issues

In this chapter some of the features of the Sierra Leone economy relevant to this study were described. The review has shown that the Sierra Leone economy has much in common with other developing countries. Agriculture is the dominant sector of the economy. However, the growth rate in the agricultural sector has lagged far behind that of the rest of the economy. This disparity in growth between the agricultural and nonagricultural sectors is reflected in a disparity between development in rural and urban areas.

Like most developing countries, urban unemployment rates are high and increasing, while high rates of rural urban migration continue to aggravate the problem. Greater awareness of the economic and social problems created by rural-urban migration and unemployment has been shown by the Sierra Leone government. The general objectives of the employment policy of the Sierra Leone National Development Plan, 1974/75-1978/79 are (1) to accelerate the growth of productive employment, and (2) to reduce unemployment. The development strategy of the plan contains several elements stimulating labor-intensive production and encouraging fuller utilization of human resources. Many policies and programs to achieve these objectives are contained in the development plan. Among these are to increase the overall rate of growth of the agricultural sector from 1.7 to 5.4 percent per annum. Agricultural development is expected to serve employment objectives in several ways. First, agriculture is the most labor-intensive of all the sectors and has a potential for labor absoption. Secondly, the increase in rural income is expected to slow rural-urban migration and consequently decrease urban unemployment. It is also possible that the increase in rural income

will increase demand for labor-intensive products, thereby stimulating total employment. Within the agricultural sector, the goal is to increase rice production. Export crop production is also expected to be increased to provide another source of export. Small-scale industries will be encouraged in order to increase employment. There is, thus, a need to analyze the impact of these policies on output, employment and migration at a macro level.

IV. ECONOMETRIC ANALYSIS OF RURAL-URBAN MIGRATION RATES[1]

The objectives of this chapter are two-fold. The first is to estimate quantitatively the magnitude of various factors affecting migration. These elasticities of migration will be used in a migration model to forecast the distribution of the labor force between rural and urban areas. The second objective is to test for significant differences between the behavior of educated and uneducated migrants. If the response of these two groups is found to be significantly different, this will reinforce the argument for disaggregating the labor market by educational level.

In this chapter, previous econometric studies of migration are critically reviewed first. Based on the review, a migration function which avoids earlier deficiencies is presented in the second section. Discussion of the data used and estimation procedures are presented in the third section. In section four empirical results are discussed and these are used as a basis for policy implications in the final section.

Review of Econometric Studies

Econometric analysis of migration rates is now standard part of research on migration by economists. Most of the studies are concerned with the response of migration to economic variables, and the framework

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[1]This chapter is based on a paper by Byerlee, Tommy and Fatoo (1976) "Rural Urban Migration in Sierra Leone: Determinants and Policy Implications," African Rural Economy Paper No. 13, Dept. of Agricultural Economics, Michigan State University. For details about the characteristics of migrants and migration process, consult this paper.

of the model is based on human capital investment approach or its derivative. However, several problems are inherent in past analysis of this type in developing countries. Most studies on migration have had to rely on census data, restricting the specification of the model by the use of birth place data instead of place-to-place migration flows. In these studies (e.g., Beals, Levy and Moses (1967), Sahota (1968), Adams (1969) and Greenwood (1969)), migration data employed refers to cumulative lifetime migration from one region within a country to another, i.e., the number of persons born in region i and enumerated in region j. The use of such data may result in simultaneity bias in the estimates of the coefficients, since migration which has occurred over a long period of time is likely to have influenced the independent variables such as wage rates employed in the regression models. Moreover, it is questionable to relate migration which has occurred over a longer period of time to variables defined at present time.

Second, most analyses of migration have focused on interregional migration. Interregional migration includes besides rural to urban migration, rural to rural, urban to rural and urban to urban. As such, these studies (e.g., Beals, Levy and Moses (1967), Mabogunje (1970)) do not give reliable estimates of response of rural-urban migration to various factors.

Third, although numerous studies of migration in Africa have identified economic motives as dominant in the decision to migrate, they have suffered in the measurement of income. Most of them have used secondary data or proxies for income such as regional per capita income (e.g., Sabot (1975)) or even per capita food production (e.g., Levi (1972)). Sabot (1976), Essang and Mabawonku (1974) and Rempel (1971) have

carefully measured urban incomes, though none has measured incomes of rural households from which migrants originate. In this study, rural wages are obtained from a sample of 16,000 rural wage observations obtained in a farm management survey by Spencer and Byerlee (1976).

Finally, for rural-urban migration, various studies in developing countries indicate that education has a significant effect on migration, but it has not been possible to provide consistent interpretation of the observed relationships. Beals, Levy and Moses (1967), Greenwood (1969, 1971), Sahota (1968) and Schultz (1971) used regression analysis to estimate labor force migration in Ghana, Egypt, India, Brazil and Colombia respectively. The education level of the migrants could not be determined in these studies, but the education levels of the origin and destination regions were included as explanatory variables in order to examine the relationship between education and migration. One of the problems with this procedure is that it constrains the level of precision at which we can analyze the determinants of migration. The estimated regression constrains the coefficients of the independent variables to be the same for each education subgroup. As pointed out by Barnum and Sabot (1975) and Levy and Wadycki (1974), a significant association between regional average educational levels and migration rates is not sufficient to confirm that the educated have a higher propensity to move than the uneducated. The estimated coefficients of the education variables may have captured a number of effects, including the effect of education on an individual's willingness to migrate as well as the attraction of educational opportunities for potential migrants. Even if it is established that the educated have a higher migration propensity there is no way to determine whether this is due predominantly to

higher level of responsiveness to a given rural-urban income differential or to a wider income differential for the educated than the uneducated. It is not surprising that the estimated effects of education on migration have differed markedly among studies of migration in different countries, despite the remarkable similarity in the estimated responses of migrants to such factors as regional income and urbanization levels. Greenwood (1969, 1971) and Sahota (1968) found that migration decreased with higher levels of education at the origin and increased with higher levels of education at the destination. Beals (1967) found that migration decreased with higher levels of education at both the origin and destination, while Greenwood (1971) found that migration increased with higher levels of education at both the origin and destination regions. Very few studies besides Levy and Wadycki (1974) and Barnum and Sabot (1975) have disaggregated the population by education and tested whether or not these structural differences are statistically significant.

Levy and Wadycki (1974) found significant difference in the urban income elasticity between migrants who have had a secondary education and those who did not have any primary education. The income elasticity for educated group was higher. Barnum and Sabot (1975) did not find any significant difference in the expected rural urban wage differential elasticity for educational categories. However, Barnum and Sabots' results should be interpreted with caution as they did not exclude those who had migrated to attend school or were apprentices.[1] Given the educational system in Tanzania, students from rural areas are very likely

[1]Barnum and Sabot (1976) used as their dependent variable men born in the country who came to town after the age of 13.

to go to regional capital or regional urban areas rather than to urban areas with higher income per se. This is because students have little choice as to which urban area school they can attend and are directed by the ministry of education. Even if students were free to choose urban destination, variables such as the location and quality of schools probably are more important.

Levy and Wadycki (1974) included education-specific wage rates but the study suffered from the use of nonspecific unemployment rates. If there is a separation of the labor market in the urban areas, a single unemployment rate is inadequate. In the case of Sierra Leone, the urban destination unemployment rate for the educated is higher than for the uneducated, in which case a single average unemployment rate in urban destinations would understate the unemployment for the educated and overstate for the uneducated. These varying urban unemployment rates by education were observed in Tanzania by Barnum and Sabot (1975).

In this study some of these deficiencies in earlier analyses are overcome through data collected specifically for the purpose of analyzing migration rates. The survey data were used to compute education-specific rates of migration for the last five years. Furthermore, in analyzing migration rates students are specifically excluded for reasons explained earlier. The function is disaggregated by two educational subgroups using education-specific urban wage and unemployment rates. To test for the significance of the difference between corresponding parameter estimates in regressions, observations for the two groups will be pooled.

The Migration Function

The migration function is based on the theory of investment in human capital discussed in Chapter II. Rural-urban migration is viewed within a framework of costs and returns of investment in human capital. Costs are comprised of money costs and psychic costs. Money costs include costs of transportation, increased expenditures on food and lodging during the period spent on traveling and in searching for a new job. Psychic costs are costs such as homesickness, acclaimatization, strain and so on. Since these costs are likely to vary with miles traveled, distance is used as a proxy. Also, distance is likely to be a factor in determining available information. The opportunity cost of migration is the income foregone in the origin. The economic return is the income the rural resident expects to receive in the urban area. These economic costs and returns should be discounted. Since precise information on time horizons, discount rates and changes in income are not available, migration rate is related to the current income in origin and destination areas.

The expected economic returns to migration cannot be estimated on the basis of the income of those employed in urban destinations in situations where there are high levels of unemployment. In such a situation a potential migrant cannot be sure of finding a job, and unemployment has to be taken explicitly into the migration decision (Todaro, 1969).

The size of the urban area is included to represent a number of factors such as a larger labor market and urban amenities (i.e., "bright lights") which influence economic components of the costs and returns.

Education and migration appear to be complementary human capital investments. One of the objectives of this chapter is to empirically analyze education-migration relationships and therefore the function is disaggregated by educational level. The rural-urban migration function is then given by:

$$M_{ijk} = f(W_i, W_{jk}, U_{jk}, P_j, D_{ij}, e)$$

where M_{ijk} = average annual gross rate of adult migration for the k^{th} educational cohort from rural origin i to urban destination j

W_i = average monthly income of adult males in rural region i

W_{jk}, U_{jk} = average monthly income and percentage unemployed respectively for the k^{th} educational cohort of male migrants in the j^{th} urban center

P_j = population size of the j^{th} urban area

D_{ij} = the road distance in miles between the main center of rural region i to urban center j

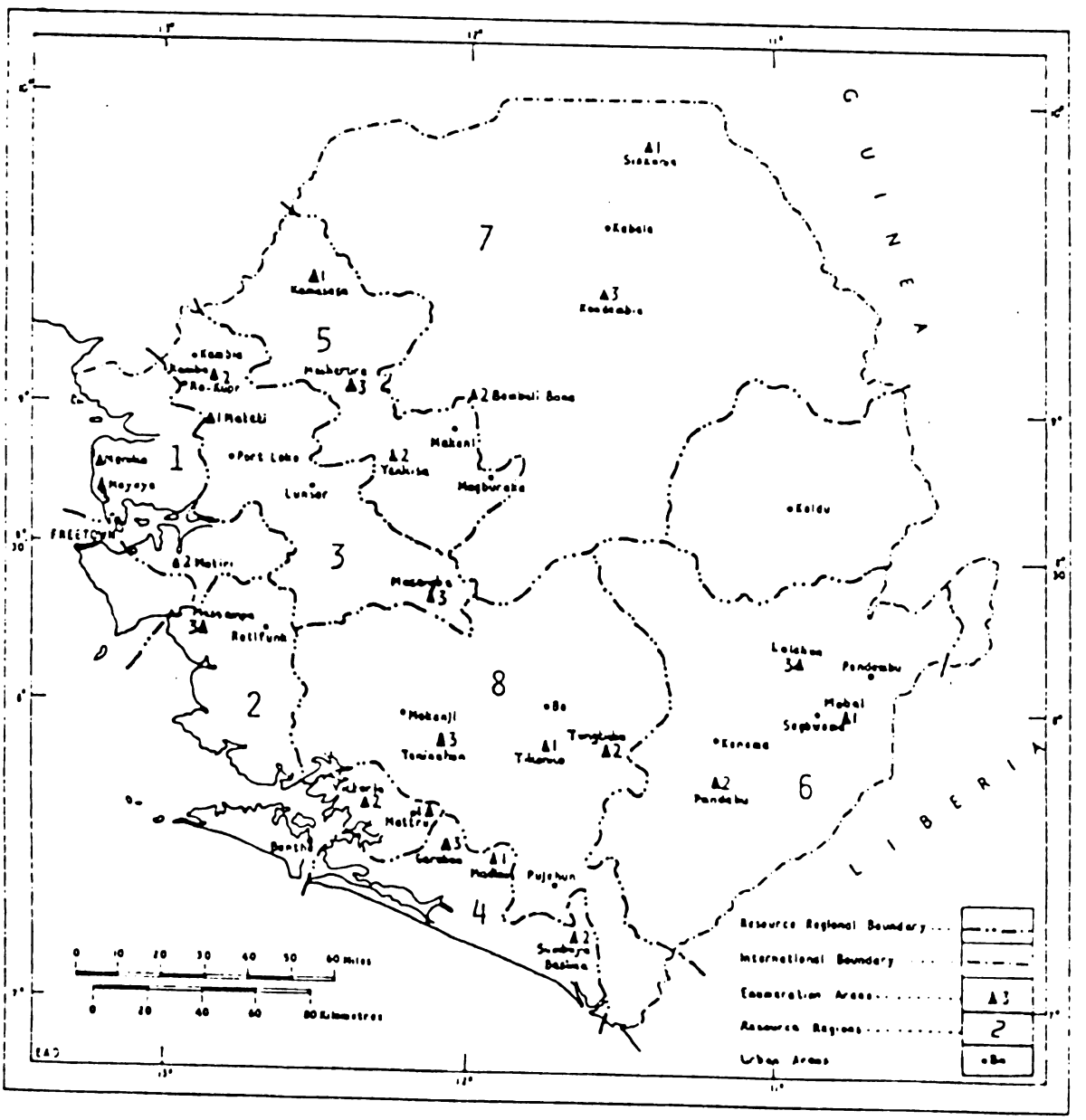
e = random error

and i = 1, 2, . . .8, corresponding to the eight rural resource regions of figure 3

j = 1, 2, . . .5, corresponding to the five urban centers above 20,000 population--Freetown, Kono, Bo, Kenema and Makeni

k = 1, 2, representing two educational cohorts--less than four years education and four or more years education.

Some comments on the specification of the function are in order. The measure of rural income used here is wage rate rather than household income. This measure of rural income was chosen because (a) it was shown that an active and competitive rural labor market exists (Byerlee and Spencer, 1976), and (b) given this competitive market and dominance of household rather than individual decision making, this wage rate should be a close approximation of the value of marginal product (VMP) of labor



Sierra Leone

FIGURE 3

RURAL ENUMERATION AREAS AND URBAN AREAS OF THE MIGRATION SURVEY

(Knight, 1972).[1] Furthermore, since females have a low participation rate in the urban labor market, male wage rates were used. However, the same rural wage rate was used for both educational cohorts on the assumption that educated persons receive the same wage rate in traditional farming activities as those without education.

Though the model is formulated in terms of variables which are more relevant to male migrants, who comprise most of the labor force, the migration rates include both males and females. The most important reason for female migration is marriage to a male migrant usually from the same rural area, female migration is correlated with male migration. To determine the relationship between male and female migration, a correlation coefficient was computed. The coefficient between male and female migration from specific rural origin to specific urban destination was 0.78 for uneducated migrants and 0.87 for educated migrants. For these reasons, the model is formulated in terms of variables which are more relevant to male migrants. Since persons in the labor force provide an economic base for other nonworking migrants, particularly housewives from the same rural area, the model is used to explain both male and female migration.

Data

All data with the exception of urban unemployment and urban size were obtained from a migration survey. Although urban unemployment data were available, the sample was too small to estimate education-specific unemployment rates for the medium size towns of Bo, Makeni and Kenema.

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[1] In the case of individual decision making, the relevant income is the value of the <u>average</u> product if income is shared among household members.

Unemployment data were derived from the urban household survey of the Central Office of Statistics (1967-1971) which were shown by Byerlee, Tommy and Fatoo (1976) to be highly consistent with unemployment data from the migration survey. Also, the sample size prevented reliable income estimates for the small towns (less than 20,000 persons) and these towns were exluded from the analysis.

Migration Rates

Migration rates can be expressed as gross migration or net migration. Net migration is the difference between out-migration and in-migration. Net migration rates are indicators of rural out-migration or urban in-migration. Where the characteristics of in-migrants differ from out-migrants, net migration rates are less meaningful. In a situation where the rural out-migrants are dominated by young and educated while the rural in-migrants are older persons, gross rural out-migration rates are better indicators of those entering the urban labor force. A correlation coefficient was computed to determine the extent to which variations in net migration are the results of variations in gross rural out-migration or variations in gross rural in-migration. The correlation coefficient between net migration and gross rural out-migration is 0.89 compared to -0.14 between net migration and gross rural in-migration, indicating that the large proportion of variation in net migration is due to variations in gross rural out-migration. Hence, gross rates of rural out-migration are used.[1]

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[1] For a discussion of the information loss involved in models of net migration as compared to models of gross migration see Sjaastad (1962) and VanderKamp (1972).

An added advantage of using gross rural out-migration rates is that they are more reliable than net migration rates. In computing net migration rates, residual error is compounded due to errors in estimating rural-to-urban migration and urban-to-rural migration rates.

Gross rates of adult out-migration from rural region i to urban destination j, specific for education group, are computed using the following equation:

$$M_{ijk} = \frac{m_{ijk}}{N_{ik}} \times 1{,}000$$

where m_{ijk} is the number of adults in the k^{th} education cohort migrating from origin i to destination j and N_{ik} is the number of people in the k^{th} education cohort in the origin i population. These rates are shown in Table 9. The table shows that the educated persons have consistently higher propensity to migrate than those without education.

Rural and Urban Wage Rates

Rural wage rates used are from the wage rates reported in a farm management survey by Spencer and Byerlee (1976). The hourly wage rates were multiplied by the average number of hours worked per month by an adult male. These wage rates per month are shown in Table 10.

Urban wage rates were computed by destination, specific for each education group and are shown in Table 11. Comparison of these wages between the education groups shows that educated migrants in urban areas consistently earn higher wages than uneducated migrants, except in Kono.

Urban Unemployment Rates

Urban unemployment rates are shown in Table 12. The unemployment rate for the educated in urban areas is consistently higher than for the

TABLE 9
AVERAGE ANNUAL GROSS RATES OF ADULT OUT-MIGRATION FROM RURAL TO URBAN AREAS BY EDUCATIONAL LEVEL[1]

Rural Origin Region	Education Level	Urban Destinations				
		Freetown	Kono	Makeni	Kenema	Bo
Scarcies	Uneducated[2]	4.5	.8	.2	0	.6
	Educated[3]	20.0	0	0	0	0
Southern Coast	Uneducated	.9	1.2	0	.4	.5
	Educated	19.2	2.7	0	8.2	8.2
Northern Plains	Uneducated	3.3	5.2	1.2	.7	.4
	Educated	51.3	51.3	20.5	0	5.1
Riverain Grasslands	Uneducated	.6	.5	0	.6	1.5
	Educated	11.3	11.3	0	2.8	11.3
Bolilands	Uneducated	6.2	2.9	1.6	.6	.2
	Educated	37.8	0	5.4	0	5.4
Moa Basin	Uneducated	.4	2.2	.2	3.0	.4
	Educated	15.8	17.1	1.3	17.1	1.3
Northern Plateau	Uneducated	1.7	7.9	0	.3	.2
	Educated	12.9	12.9	6.5	0	0
Southern Plains	Uneducated	.8	4.6	0	1.3	.8
	Educated	34.7	29.2	2.8	19.4	29.2

[1]Rates per thousand of population.

[2]Uneducated are those with less than four years of education.

[3]Educated are those with four or more years of education.

Source: Migration survey

TABLE 10
RURAL WAGE RATES BY REGION

Rural Region	Wage (Leone per Month)
Scarcies	14.03
Southern Coast	9.82
Northern Plains	9.60
Riverain	7.52
Bolilands	7.61
Moa Basin	7.32
Northern Plateau	10.53
Southern Plains	12.82

Source: Spencer and Byerlee (1976).

TABLE 11
URBAN WAGE RATES BY EDUCATIONAL LEVEL

Urban Destination	Wage (Leone per Month)	
	Uneducated	Educated
Freetown	43.27	73.83
Kono	80.28	68.35
Makeni	52.00	62.50
Kenema	44.22	54.38
Bo	41.27	50.26
Average Urban Wage	48.17	65.74

Source: Migration survey

TABLE 12
RATES OF URBAN UNEMPLOYMENT BY EDUCATION

Urban Destination	Unemployment Rates	
	Uneducated	Educated
Freetown	14.4	17.8
Kono	12.5	16.9
Makeni	7.7	17.7
Kenema	6.3	17.1
Bo	20.6	20.6

Source: Central Statistics Office, Household Survey (1971).

uneducated. The unemployment rate for the educated does not vary as much with destination as it does for the uneducated.

Estimation Procedures and Empirical Results

The estimation procedure employed was ordinary least squares regression. To test if any significant difference exists between the behavior of educated and uneducated migrants, data for both were pooled and the following linear relationship was fitted:

$$M_{ijk} = b_0 + b_1E + b_2W_i + b_3EW_i + b_4W_{jk} + b_5EW_{jk} + b_6U_{jk} + b_7EU_{jk} + b_8P_j + b_9EP_j + b_{10}D_{ij} + b_{11}ED_{ij} + e$$

where all variables except E are as defined previously. E is a dummy variable for education such that E = 0 for an observation on uneducated

migration and E = 1 for educated migration. Consider now the coefficient of W_i and EW_i. The coefficient b_2 of W_i indicates the influence of wage in rural area on the uneducated migrant, while the sum of the coefficients of W_i and EW_i (i.e. $b_2 + b_3$) indicates the influence of rural wage on the educated migrant. The coefficient of EW_i (i.e. b_3) indicates whether b_2 and $(b_2 + b_3)$ differ significantly. In other words, b_3 indicates whether or not the influence of rural wage differs significantly for the uneducated migrant as compared to educated migrants.

Table 13 contains the estimated relationships for rural-urban migration by educational subgroups. The first figure below each coefficient is the "t" statistic, while the second figure is the elasticity calculated at the mean value of the variables. Up to four equations are reported for each group. First, there is the standard linear form on all variables in the model. In the case of educated migrant, however, strong multicollinearity exists between urban size, P_j, and urban wages, W_{jk}. Therefore, a second run was made in which urban size was dropped.

A more relevant measure of urban wages is the expected wage which takes into account the probability that the migrant will be unemployed in the urban destination. That is, the expected wage is computed as $W^e_{jk} = (1 - U_{jk})\, W_{jk}$ where U_{jk} and W_{jk} are the unemployment rate and average wage rate respectively for k^{th} education group in destination j. Accordingly, the unemployed variable and wage variable were incorporated into an expected wage variable--W^e_{jk}. Finally, the expected wage differential $(W^e_{jk} - W_i)$, which is the difference between the expected urban wage and the rural wage was used. The expected wage differential takes into account not only the difference between rural and urban income but also the probability of finding an urban job.

TABLE 13
GROSS RURAL TO URBAN MIGRATION OF ADULTS
IN SIERRA LEONE: ORDINARY LINEAR FUNCTION

Type of Migration Stream	Reg.	Intercept	$WAGE_I$	$WAGE_J$	EXP WAGE $DIFF_{ij}$	$UNEMP_J$	EXP $WAGE_J$	POP_J	$DIST_{IJ}$	$WAGE_I E$
Uneducated	Standard	-.3910 (0.264)	-.10406 (0.610) -0.395	.00666* (4.240) 2.345		-.00199 (0.225) -0.146		.00119* (3.565) 0.809	-.00166* (3.956) -1.352	
	Expected Wage	-.05369 (0.379)	-.10413 (0.591) -0.396				.00718* (3.760) 2.232	.00127* (4.676) 0.863	-.00164* (3.818) -1.336	
	Expected Wage Diff.	.0542 (0.614)			.00552* (2.853) 1.249			.00116* (4.140) 0.730	-.00175* (3.934) -1.318	
Educated	Standard	3.2695 (1.229)	-.13638 (0.102) -0.065			-.10052 (0.747) -1.534		.00981* (4.900) 0.838	-.00986* (3.017) -1.009	
	Urban Size Dropped	-5.6964 (1.502)	-.14372 (0.102) -0.069	.08919* (4.240) 4.752		.13370 (0.837) 2.040			-.00875* (2.565) -0.896	
	Expected Wage	-1.8343 (0.834)	-.13606 (0.105) -0.065				.07501* (1.682) 3.211	.00512 (1.404) 0.437	-.01004* (3.199) -1.028	
	Expected Wage Diff.	-1.4667 (1.300)			.1013* (3.589) 3.125				-.0110* (2.965) -1.011	
Pooled	Standard	.04461	-.12036	.00659				.00114	-.00164	
	Urban Size Dropped	-.11995	-.12489	.00546		.01827			-.00120	
	Expected Wage	-.04473	-.1201				.00718	.00127	-.00164	
	Expected Wage Diff.	.1732 (0.341)			.00359 (0.314)				-.00118 (0.461)	

TABLE 13
(continued)

Type of Migration Stream	Reg.	$WAGE_JE$	$UNEM_JE$	$EXP\ WAGE_JE$	$EXP\ WAGE\ DIFF_{IJ}E$	POP_JE	$DIST_{IJ}E$	E	R^2
Uneducated	Standard								.539
	Expected Wage								.494
	Expected Wage Diff.								.433
Educated	Standard								.449
	Urban Size Dropped								.386
	Expected Wage								.478
	Expected Wage Diff.								.316
Pooled	Standard	-.00568 (0.160)	-.09801 (0.721)			.00858* (2.286)	-.00821* (2.499)	3.2105 (0.787)	.571
	Urban Size Dropped	.08372* (4.813)	.11539 (0.963)				-.00754* (2.247)	-5.5857* (2.053)	.521
	Expected Wage			.06783* (1.936)		.00385 (1.307)	-.0084* (2.660)	-1.7987 (1.154)	.592
	Expected Wage Diff.				.0977* (4.219)		-.0098* (2.665)	-1.634* (1.723)	.475

All variables of the model have the predicted sign with the exception of unemployment in some runs which in any event was not significant. In most cases the explanatory power of the equations is quite high as measured by the R^2 value compared to most cross-sectional analyses of migration.

Distance is consistently a significant deterrent to migration. This deterrent effect as measured by the elasticity is less for educated migrants than uneducated migrants. Furthermore this difference is significant as measured by the negative interaction effect of education and distance in the pooled estimate. This less deterring effect of distance for educated migrants can be explained in terms of both the economic costs of moving over long distances, which are relatively less compared to returns for educated migrants, and the social costs of adjusting to an alien social and cultural setting, which could be less for educated migrants. Educated migrants also may have access to better information and since their migration is more permanent it may be more feasible to invest in long-distance migration.

Likewise in all regression runs, the size of the urban area is positive and significant. The interaction between education and urban size suggests that this effect is more for educated migrants. This is in accordance with the hypothesis that educated migrants, particularly those with specialized training, will move to a larger labor market area.

The rural wage rate in this analysis consistently has a negative but not statistically significant impact on migration. Moreover, for educated migrants the computed elasticity of migration with respect to the rural wage is negligible at .06 while this same elasticity for uneducated migrants is .39. Although these figures are low it is expected

that educated migrants whose returns to migration are much higher will be less repsonsive to rural incomes.

In constrast, the urban wage rate has a significant and large impact on rural-urban migration. A 1 percent increase in urban wages results in a 2.34 percent and 4.75 percent increase in the migration of uneducated and educated migrants respectively. Further evidence that the educated are more responsive is given by the pooled estimate where the interaction between education and urban wages is significant and positive.

Although unemployment rates in the urban centers varied from 7 percent to 18 percent this factor does not have a significant impact on migration (although it is generally in the predicted direction). When combined with the wage rate to give an expected wage, the coefficient of the expected wage variable is significant and positive. The expected wage differential is also significant. A 1 percent increase in the expected wage differential results in a 1.25 percent and 3.12 percent increase in the migration of uneducated and educated migrants respectively.

Implications of the Analysis

The econometric analysis of migration was quite successful in predicting the urban destination of migrants. The expected rural-urban wage differential which not only takes into account the difference between rural and urban income but also the probability that the migrant will be unemployed in the urban destination, is significant. Seen in this perspective, the decision to migrate to urban areas seems to be a rational economic decision even in the face of urban unemployment. It is also clear there are differences in the behavior of migrants who have different levels of education. Educated migrants are less influenced by rural wages and distance and more influenced by urban wages and

urban size. Consequently if migration is to be meaningfully analyzed within a macro economic framework, the labor market should be disaggregated by education level.

V. MACRO MODELS FOR ANALYSIS OF OUTPUT, EMPLOYMENT AND MIGRATION IN SIERRA LEONE

The purpose of this chapter is to construct economy-wide models in order to quantitatively analyze the relationship between output, employment and migration. The sectoral framework for construction of the models was developed in Chapter II. They are used to gain insights into the growth, labor migration and employment prospects of the Sierra Leone economy, and to examine the implications of different policies. In the first and second sections of this chapter the macro model and then the migration model are described. The macro model will be used as a constrained maximization according to some objective function to project the growth of the economy as well as to analyze various policies. The purpose of the migration model is to provide analysis of labor force distribution between rural and urban regions. Though separate, the models are interdependent and the linkages between them are described in the last section.

Macro-Economic Model

In this section an overview of the macro model is presented followed by a discussion of the sectoral level disaggregation and the structure of the model.

Overview of the Model

The macro model is an extended version of one originally formulated by de Haen, Byerlee and Spencer (1974).[1] Basically the model is an extension of input/output and is set in a linear programming framework. However, unlike conventional macro models, the proposed model has:

1. A higher degree of disaggregation in both the product and factor market in order to analyze output, employment and migration,
2. A higher degree of endogenicity. Consumption, investment, imports and employment are all determined endogenously, and
3. The model is based largely on primary data unlike most macro models which are based usually on secondary data. As far as the small-scale sectors are concerned, the macro-model uses the aggregated information provided by field surveys.

Model Mechanism

The economy is disaggregated in both the product and factor market. In the product market the economy is disaggregated into a number of interacting sectors on the basis of type of output (agriculture and nonagricultural), scale of operation (small-scale and large-scale) and location (rural and urban). The sectors produce to satisfy sectoral balance equations, i.e., supply of a commodity of a sector should equal to demand. The demand for a commodity consists of intermediate demand, private consumption specific to a population group, government purchases, exports and investment demand. Government purchases and export demands are exogenously determined while the rest of the demands are endogenously

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[1] Some of the extensions of the macro model include: more flexibility in the consumption and investment components, disaggregation of labor market by educational level and linking the macro model with the migration model.

determined. Intermediate demand is determined in an input/output coefficient matrix. Private consumption is disaggregated by consumer groups, i.e., rural, small urban and large urban, and is computed endogenously using group-specific consumption elasticities. Investment demand is transformed by sector of origin according to the capital/investment coefficient matrix similar to the input/output coefficients matrix. Investment by sector is detemrined endogenously using sectoral capital/output coefficients. Employment disaggregated by educational level (uneducated and educated) is allocated endogenously using labor input coefficients.

Given the values of exogenous variables and parameters, the model determines the optimum amount of sectoral production so as to maximize a given objective function subject to the resource constraints and the commodity balance equations. At the beginning, the economy has a given stock of labor specific for educational level between rural and urban areas, and foreign exchange to allocate among the various production sectors. Given these resource constraints output is produced to maximize total GDP and production is determined. Production is increased or decreased to satisfy the various demands until all balance equations are satisfied and an equilibrium solution is reached.

Model Results

The model will give a range of economic results which can be classified broadly into two categories: a physical quantities solution and a set of shadow prices. The physical quantity solution will be at two levels, the macro level and the sectoral level. At the macro level it will compute:

1. The components of national accounts, i.e., GDP, consumption, investment and imports by country, regions, type of output and scale of operation, and
2. Employment specifically by education, region and scale of operation.

At the sectoral level the model will compute:

1. Levels of output and value added by sector,
2. Employment by education in each sector, and
3. Investment, consumption and competitive imports by sector.

Each of these quantitative results is useful. The macro-economic results are useful in predicting the growth of an economy under varying assumptions and in determining the resource requirements. The sectoral level results provide more reliable projections since the model takes into account intra- and inter-sectoral dependencies.

The details of national income accounts along with sectoral accounts and set of shadow prices will help appraise the implications of a solution and will give valuable insights into the growth and employment prospects of the Sierra Leone economy. The model will be used to explore the impact of different economic policies or development strategies on output and employment.

Sectoral Disaggregation

The sectoral disaggregation adopted follows the framework developed in Chapter II. It was argued that the product market should be disaggregated by type of output, scale of operation and location. This disaggregation is necessary to adequately analyze output, employment and migration.

The first criterion, type of output, divides the economy into agricultural and nonagricultural sectors. The second criterion, scale

of operation, divides the economy into large-scale and small-scale sectors. For the purpose of the study, small-scale includes those establishments employing less than fifty persons. Firms employing fifty or more persons are defined as large-scale. The third criterion of location divides the economy into rural, small urban and large urban sectors. For the purpose of this study, rural areas are defined as localities consisting of less than 2,000 persons, small urban areas as localities with populations between 2,000 and 20,000 persons, and large urban areas as localities with populations over 20,000 persons.

Dividing the economy on the basis of type of output, firm size and location, fourteen sectors are delineated as shown in Figure 4. Since agriculture is characterized by a large number of small holders, farmers with an average farm size of 6.6 acres, all the four agricultural sectors--rice, other food crops, export crops and livestock, fishing and forestry (or residual agriculture)--are assigned to the small-scale classification. Within the small-scale industry, Liedholm and Chuta (1976) found that many of the economic characteristics of small-scale industry vary by location, emphasizing the importance of including location in the analysis and providing support for distinguishing between rural and urban industries. Hence the small-scale industries are assigned to each location, with technology allowed to vary in each location. The remaining two small-scale sectors, agricultural marketing and transportation, and small-scale nonagricultural trade, are assigned to all locations. The large-scale sectors--construction, mining, large-scale manufacturing, utilities and large-scale trade and services--are assigned to urban areas. In all these large-scale sectors, technology does not

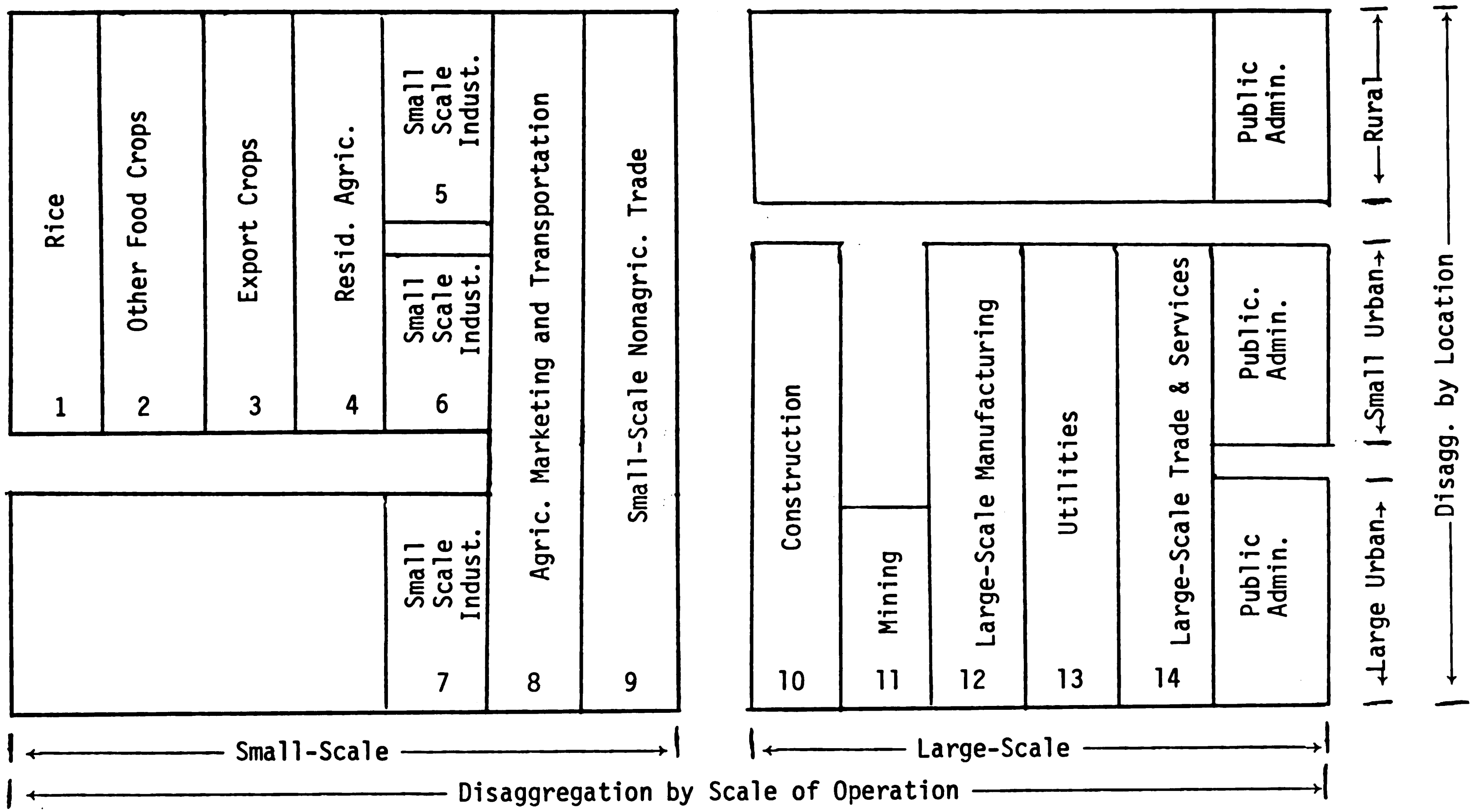

FIGURE 4

SECTORAL DISAGGREGATION BY SCALE AND LOCATION

vary by location. Division between the three geographic locations is on the basis of estimates of output from each location.

Structure of the Model

Basically, the model consists of a set of simultaneous linear equations. The major components of the model are: commodity balance equations, inter-sectoral demand, consumption, investment, import balances, exports, foreign exchange constraint, labor force and employment, national and sectoral accounting and objective function.

All monetary units are expressed in leones at 1974 prices. The model is solved for two end years, 1974 which is the base year and 1981 which is the end of the seven year projection period. The model is also run under various policy assumptions.

Notation

For purposes of consistency, the following rules in notation have been followed:

1. Exogenous variables are denoted by upper case letter with a bar,
2. Endogenous variables are denoted by upper case letters (without a bar),
3. Parameters are denoted by lower case letters,
4. Subscripts: j refers to sector, y to region and z to educational level of labor. j goes from 1 to 14 and the numbering system corresponds to figure number 4. y goes from 1 to 3 where 1 is rural region (population less than 2,000 persons), 2 is small urban (population between 2,000 and 20,000 persons) and 3 is large urban (population over 20,000 persons). z goes from 1 to 2 where 1 is uneducated

TABLE 14
VARIABLES AND PARAMETERS

Endogenous Variables	
Notation	Definition
X_j	Gross output of sector j
I_j	Gross investment in sector j
C_{jy}	Final goods from sector j produced domestically and consumed by population in region y
M^x, M^v	Imports of intermediate and investment goods respectively (noncompetitive)
M_y^c	Noncompetitive imports of consumer goods by population in region y
E_{jz}	Employment in sector j, specific for educational level z
E_{yz}, U_{yz}	Employment and unemployment in region y, specific for educational level z
V_j	Value added in sector j
Exogenous Variables	
Predetermined	
$\bar{N}_y$	Population in region y
$\bar{L}_{yz}$	Labor force in region y, specific for educational level z
Policy Variables	
$\bar{A}$	Total public expenditure on goods and services
$\bar{G}_j$	Public consumption of domestically produced goods or services from sector j
$\bar{F}$	Foreign exchange available from sources other than exports
$\bar{E}_z^g$	Government employment specific for educational level z

TABLE 14
(continued)

Model Parameters	
Notation	Definition
a_{ij}	Inter-industry input-output coefficients for goods and services transferred from i to j
b_{ij}	Capital required from sector i per unit of gross investment in sector j
k_j	Incremental capital-output ratio in sector j
s_y	Average propensity to save, specific for population in region y
e_{jy}	Expenditure elasticity of demand for commodity group j produced domestically, specific for population in region y
m_j^x	Import requirements of intermediate goods per unit of output of sector j
m_j^v	Import requirements of investment goods per unit of investment in sector j
u_{jy}	Elasticity of import of consumer goods from sector j with respect to expenditure; specific for population in region y
g_y	Regional breakdown of public administration, defense and services
r_y	Regional breakdown of overlapping sectors, 8, . . ., 14
l_{jz}	Labor input per unit of output in sector j, specific for educational level z

(those with less than 4 years of education) and 2 is educated (those with 4 or more years of education).

Commodity Balance Equations

The basic set of constraints of any interindustry model relates to the distribution of the supply of products from each sector among the alternative sources of demand.

$$X_j + M_j = \sum_{i=1}^{14} a_{ij} X_j + \sum_{y=1}^{3} C_{jy} + \sum_{i=1}^{14} b_{ij} I_j + \overline{E}_j + \overline{G}_j$$

$$M_j = 0 \text{ if } j \neq 1$$

where X_j and M_j denote the level of domestic output and competitive imports respectively; and $a_{ij} X_j$, C_{jy}, $b_{ij} I_j$, E_j and G_j denote the interindustry demands, private consumption, interindustry investment requirements, exports and government consumption. The constraints simply require that the total supply of each sectors' output must be equal to the corresponding total demand. It should be noted that there is competitive import of rice only and hence M_j is 0 for all other commodities.

Inter-sectoral Demand

The base of the inter-sectoral demand is an input-output table of the economy. On the basis of previous discussion on sectoral disaggregation, fourteen sectors have been delineated. The input-output table is a square, sector-by-sector matrix where rows represent output destination and the columns indicate input requirements. Each coefficient, a_{ij}, in the table is the amount of commodity i used in the production of the one unit of commodity j.

The starting point for the input-output table was one prepared by Esaeson for the United Nations Development Program (UNDP) and covered

the 1973-1974 fiscal year. This source provided a starting point for the estimation of coefficients for large-scale sectors, but many of the estimations of small-scale sectors were derived from primary data. The input-output table employed in the model is shown in Table 15. The table shows the limited interaction between the sectors as is typical of developing countries.

Consumption

Total consumption, C_y, for each population group is given by:

$$C_y \leq (1 - s_y)\ GDP_y$$

where s_y, the average propensity to save, specific for population group y is exogenously specified. Then for sectoral consumption price effects are neglected. Assuming a piecewise linear approximation of the consumption function in the neighborhood of the initial expenditure shares, C_{jy}/C_y^o, the consumption of a particular domestic commodity, specified by population group y, C_{jy}, is determined by conventional elasticity procedures:

$$\frac{C_{jy}^t}{N_y^t} = \frac{C_{jy}^o}{N_y^o}\left[1 + e_{jy}\left(\frac{\frac{C_y^t}{N_y^t} - \frac{C_y^o}{N_y^o}}{\frac{C_y^o}{N_y^o}}\right)\right]$$

where e_{jy} is the expenditure elasticity of demand, C_y^t is total consumption and N_y is population, specific for region y.

Since price elasticity of demand for each commodity is neglected, to bring in more flexibility, 10 percent variation around the Engel curve is allowed. The economic implication of this modified specification is that the consumption pattern automatically adjusts itself to relative

TABLE 15
INPUT-OUTPUT COEFFICIENTS OF THE SIERRA LEONE ECONOMY, 1974[1]

Destination Sectors j / Production Sectors i	Agriculture				Small-Scale Nonagric.					Large-Scale Nonagric.				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Rice	.0	.0	.0	.0	.080	.050	.060	.0	.0	.0	.0	.005	.0	.0
2. Other Food Crops	.0	.0	.0	.0	.080	.050	.060	.0	.0	.0	.0	.025	.0	.0
3. Export Crops	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. Residual Agric.	.0	.0	.0	.0	.012	.007	.009	.0	.0	.0	.0	.025	.0	.0
5. Small-Scale Ind., Rural	.010	.010	.010	.010	.0	.0	.0	.0	.002	.010	.0	.013	.0	.0
6. Small-Scale Ind., Small Urban	.001	.001	.001	.001	.0	.0	.0	.0	.001	.004	.0	.002	.0	.0
7. Small-Scale Ind., Large Urban	.0	.0	.0	.0	.0	.0	.0	.0	.002	.005	.0	.001	.0	.0
8. Transportation	.046	.050	.062	.061	.120	.180	.120	.0	.160	.062	.029	.031	.095	.027
9. Small-Scale Trade	.059	.063	.076	.075	.220	.230	.256	.172	.0	.0	.0	.075	.0	.0
10. Construction	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.013	.029	.079	.011
11. Mining	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. Large-Scale Manufacturing	.0	.0	.0	.0	.0	.036	.040	.022	.004	.006	.016	.0	.036	.036
13. Utilities	.0	.0	.0	.0	.0	.012	.012	.005	.004	.004	.003	.019	.0	.004
14. Large-Scale Trade & Services	.0	.0	.109	.0	.009	.009	.009	.002	.153	.059	.0	.072	.107	.0

[1]Each coefficient, a_{ij}, in the table shows the amount of commodity i required for production of one unit of commodity j.

Sources: Constructed from various sources. These include primary sources Liedholm and Chuta (1976), Spencer and Byerlee (1976) and secondary sources Government of Sierra Leone, National Development Plan, 1974/75 to 1978/79 and Esaeson (1974)

factor scarcities within a ± 10 percent range of variation around the Engel curve.[1]

Import for consumption by population group, M_y^c, is determined in an analogous manner to domestic consumption and is given by the following general equation:

$$\frac{M_y^{ct}}{N_y^t} = \sum_{j=2}^{14} \frac{M_{jy}^{co}}{N_y^o} \left[1 + u_{jy} \left(\frac{\frac{C_y^t}{N_y^t} - \frac{C_y^o}{N_y^o}}{\frac{C_y^o}{N_y^o}} \right) \right]$$

where u_{jy} is the elasticity of import of consumer goods with respect to expenditure and is specific for population groups.

The per capita consumption is then basically a function of the population, income and expenditure elasticities of each class of consumers. The population is assumed to grow at an average annual growth rate of 2.6 percent but because of migration which is determined endogenously in the migration model, the rural population grows at 1.8 percent. Due to the difference in immigration in urban areas by size, the large urban population grows at 7.2 percent while the small urban grows at 3.6 percent annually. Income by classes of consumers is determined endogenously in the macro-model. The expenditure elasticities used in calculating consumption are shown in Table 16. The relevant data for rural population were derived from a rural consumption study by Byerlee and King (1976). The survey was designed to obtain a detailed breakdown of rural household expenditures on individual commodities by small-scale and large-scale sectors and origin. Thus it was possible to distinguish

[1] See Bruno (1966).

TABLE 16
AVERAGE EXPENDITURE ELASTICITIES BY POPULATION GROUPS
FOR DOMESTIC AND IMPORTED COMMODITIES, 1974

Commodities	Population Group		
	Rural	Urban Small	Urban Large
A. Domestic			
Agriculture			
1. Rice	.90	.82	.77
2. Other Food Crops	1.39	1.23	1.07
4. Residual Agric.	.68	.81	.90
Small-scale Nonagric.			
5. Small-scale Ind., Rural	1.02	1.22	1.33
6. Small-scale Ind., Small Urban	.12	.81	1.13
7. Small-scale Ind., Large Urban	.96	1.68	1.70
8. Transportation	1.45	1.38	1.40
9. Small-scale Trade	.73	.86	.87
Large-scale Nonagric.			
12. Large-scale Manuf.	1.33	1.33	1.33
13. Utilities	--	.71	.73
14. Large-scale Trade & Services	.90	.86	.87
B. Imported			
2. Other Food Crops	.66	.66	.66
12. Large Scale Manuf.	.90	1.07	1.19

Sources: Adapted from survey reported in Byerlee and King (1976) and Central Statistics Office, Household Survey (1971)

between those commodities produced by small-scale firms and those produced by large-scale firms or imported. It was also possible to distinguish whether it originated from rural, small urban or large urban areas. Since reliable data for urban areas were not available, the expenditure elasticities for urban population were assumed to be the same as the

ones for higher income group in the rural areas from Byerlee and King (1976) study. Where there was no statistically significant difference in the elasticities between the different income groups in rural area, the same elasticity was used for all three population groups.

Overall consumption balance for each population group is then given by:

$$M_y^c + \sum_{j=1}^{14} C_{jy} = C_y.$$

It is a definitional equation stating that total consumption, C_y, should equal the consumption of imported commodities, M_y^c, plus the total consumption of domestically produced commodities,

$$\sum_{j=1}^{14} C_{jy}.$$

Government consumption of goods and services is given exogenously and is assumed to grow at an average annual rate of 4.9 percent per annum reflecting the recent historical trend in government consumption.

Investment

For simplication, a linear capacity increase $(X_j - X_j^0)/t$ between the base year 0 and the projection year t is assumed. Using a sectoral specific marginal capital-output ratio k_j, the average annual investment I_j is computed as:

$$I_j = (X_j - X_j^0)k_j/t$$

Investment is not disaggregated by private or government investment. Inventories and replacement investments are assumed to be a fixed proportion of the total gross investment which are reflected in the marginal capital-output ratios. These marginal capital-output ratios are shown in Table 17 and were estimated as the change in capital per unit of output

TABLE 17
CAPITAL-OUTPUT RATIOS BY SECTOR, 1974

Sector	Capital-Output Ratio
Agriculture	
1. Rice	3.092
2. Other Food Crops	2.800
3. Export Crops	2.945
4. Residual Agric.	2.650
Small-Scale Nonagric.	
5. Small-scale Ind., Rural	.204
6. Small-scale Ind., Small Urban	.180
7. Small-scale Ind., Large Urban	.131
8. Transportation	7.263
9. Small-scale Trade	.795
Large-Scale Nonagric.	
10. Construction	.544
11. Mining	4.933
12. Large-scale Manuf:	1.712
13. Utilities	31.668
14. Large-scale Trade & Services	7.474

Sources: Computed from Leidholm and Chuta (1976) and Government of Sierra Leone, National Development Plan 1974/75 to 1978/79

in each sector. The data on investment in the large-scale sectors were obtained from the National Development Plan, 1974/75 to 1978/79, and for small-scale industries from a study by Leidholm and Chuta (1976). The marginal capital-output ratios are higher for large-scale sectors compared to small-scale nonagricultural sectors. Though private investment in agricultural sectors is neglible, the relatively high marginal capital-output ratios in these agricultural sectors are due to government investment. Since the investment data were obtained from the plan, these capital-output ratios tend to be overestimated as some investment has a longer payoff period and there may be a tendency to overestimate investment.

The investment demands by each sector are translated into demands for capital goods from each sector by the use of B_{ij} matrix shown in Table 18. Each coefficient b_{ij} shows the requirements for capital goods produced in the sector i generated by one unit of investment in sector j. Only two domestic sectors are of relevance, namely construction and large-scale manufacturing, the remaining investment requirement being imported.

Import Balances

Imports are classified either as noncompetitive or competitive. Noncompetitive imports are those goods for which no domestic capacity exists and for which no substitution by domestic output is possible, at least in the short run.

The noncompetitive imports are further divided into two groups--namely, intermediate and investment goods. The model determines endogenously the import requirements of intermediate goods and investment goods.

TABLE 18
COEFFICIENTS OF INTERSECTORAL CAPITAL FLOWS-THE B MATRIX, 1974

Sector of Origin of Capital	Destination Sectors													
	Agriculture				Small-Scale Nonagriculture					Large Scale Nonagriculture				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Construction	.415	.414	.414	.414	.364	.452	.436	.248	.424	.160	.243	.253	.374	.469
Large-Scale Manufac.	.378	.378	.379	.378	.536	.448	.464	.131	.459	.240	.220	.257	.153	.508

Sources: Constructed from Esaeson, E. (1974) and
Government of Sierra Leone, National Development Plan, 1974/75 to 1978/79

Noncompetitive imports of intermediate goods are related to output levels by a fixed coefficient, m_j^X, which is the import requirement of intermediate goods per unit of output of sector j, and is given by:

$$\sum_j m_j^X X_j = M^X$$

where M^X is the total import of intermediate goods. The import of intermediate goods coefficient are shown in Table 19 and were taken as the value of imported intermediate goods and services per sector, divided by the gross output of that sector. The large-scale sectors have high import requirements for intermediate goods.

Noncompetitive imports of investment goods are related to investment levels in the sector by a fixed coefficient, m_j^V, which is the import requirement of investment goods per unit of investment in sector j, and is given by:

$$\sum_j m_j^V I_j = M^V$$

where M^V is the total import of investment goods. The import of investment goods coefficients are also shown in Table 19 and were taken as the value of imported investment goods per sector, divided by gross investment in that sector. Most of these sectors have high import requirements of investment goods with large-scale sectors having the highest requirements. The high import requirements of agricultural sectors is due to public investment which is mostly imported (e.g., tractors and other machinery).

Exports

Exports are regarded as exogenous variables in the model. They are predominantly minerals and agricultural commodities and to lesser

TABLE 19
INTERMEDIATE AND INVESTMENT IMPORT COEFFICIENTS
BY SECTORS, 1974

Sector	m_j^{x} [1] Intermediate Import Coefficients	m_j^{v} [2] Investment Import Coefficients
Agriculture		
1. Rice	.045	.207
2. Other Food Crops	.045	.208
3. Export Crops	.047	.207
4. Residual Agric.	.047	.208
Small-scale Nonagric.		
5. Small-scale Ind., Rural	.0	.100
6. Small-scale Ind., Small Urban	.030	.100
7. Small-scale Ind., Large Urban	.033	.100
8. Transportation	.037	.591
9. Small-scale Trade	.056	.117
Large-scale Nonagric.		
10. Construction	.201	.600
11. Mining	.093	.537
12. Large-scale Manuf.	.254	.490
13. Utilities	.124	.473
14. Large-scale Trade & Services	.042	.023

[1] m_j^{x} is the import requirement of intermediate goods per unit of output $_j$ in the sector.

[2] m_j^{v} is the import requirement of investment goods per unit of investment in the sector.

Sources: Computed from Esaeson, E. (1974)
Liedholm and Chuta (1976)
Government of Sierra Leone, National Development Plan 1974/75 to 1978/79

extent large-scale manufactured goods. The growth rate of these exports is shown in Table 20 and reflects recent past performance,

$$E_j = \bar{E}_j.$$

Foreign Exchange Constraint

Foreign exchange constraint represents export and import activities linking the domestic economy with the external sector and is given by:

$$\sum_{y=1}^{3} M_{1y} + \sum_{y=1}^{3} M_y^C + M^X + M^V - E \leq \bar{F}.$$

The above equation requires that total imports, i.e., import of rice, $\sum_{y=1}^{3} M_{1y}$; import of noncompetitive consumption goods, $\sum_{y=1}^{3} M_y^C$; imports of intermediate goods, M^X; and import of investment goods, M^V, should not exceed the foreign exchange availability, $\bar{F}$, as determined by the total amount of exports, E; foreign aid, private foreign investment and whatever changes in reserve that will be tolerated. The latter three components, lumped together, are designated foreign capital inflow, $\bar{F}$, and is specified exogenously. For most of the solutions the value of Le 30.0 million is set. The shadow price of this foreign exchange constraint will give the marginal productivity of foreign exchange.

Labor Force and Employment

The total labor force is disaggregated by region and educational level. Government employment, $\bar{E}_z^G$, specific by education is exogenous. From this total government employment a certain policy determined proportion, g_y, is taken to indicate the distribution of government employment by three geographical areas:

$$E_{yz}^G = g_y \bar{E}_z^G$$

TABLE 20
EXPORTS IN 1974 and
PROJECTED RATE OF GROWTH BY SECTORS

Sector	Level of Export in 1974 (Le.'000)	Av. An. Growth Rate Assumed 1974-81 (%)
Export Crops	26,000	2.5
Mining	81,900	3.1
Large-Scale Manuf.	7,500	5.0

Source: Compiled from Government of Sierra Leone, National Development Plan, 1974/75 to 1978/79

where E^G_{yz} is employment in public administration in region y specific by educational level. Total employment in government administration is assumed to grow at an average annual rate of 4.7 percent from 50,000 in 1974 to 66,450 in 1981, and reflects the recent historical growth rate of government employment.

Sectoral employment, specific for educational level is given by:

$$E_{jz} = l_{jz} X_j$$

where E_{jz} is employment in sector j specific for educational level z. The labor input coefficients, l_{jz}, were taken as the total number of persons employed in each sector multiplied by the proportion of each education level employment in the sector and dividing it by gross output of that sector. The proportion of employment by educational level is shown in Table 21. In small-scale sectors, uneducated persons dominate, while in large-scale sectors the educated are in higher proportion. The labor input coefficients by education level are shown in Table 22. Agricultural

TABLE 21
SECTORAL EMPLOYMENT BY EDUCATION,[1] 1974

Sectors	Uneducated	Educated
Agriculture	.95	.05
Small-Scale Nonagric.	.75	.25
Large-Scale Nonagric.	.40	.60
Government	.50	.50

[1]Proportion of employment in the sector by education level.

Sources: Estimated from: Migration Survey (1976)
Central Statistics Office, Household Survey (1971)

sectors are the most labor-intensive sectors followed by small-scale nonagricultural sectors. Large-scale sectors use very little labor.

Implicitly then employment in any sector j grows at the same rate as the output in that sector with an adjustment for productivity increases. The productivity is assumed to increase at a historical rate of 2 percent for large-scale sectors, where there is a greater opportunity for capital-labor substitutions compared to small-scale sectors. The productivity can also increase due to other factors such as on-the-job training.

For location, employment by government, E^G_{yz}, in each location has to be added and the equation is set as a constraint as follows:

$$\sum_j l_{jz} X_j + \sum_j l_{jz} r_y X_j + E^G_{yz} + U_{yz} \leq \bar{L}_{yz}.$$

where $\bar{L}_{yz}$ is the labor force available in region y specific for educational level z. The first term on the left hand side of the equation refers to

TABLE 22
LABOR INPUT COEFFICIENTS BY SECTOR, 1974[1]

Sectors	Labor Input Coefficients	
	Uneducated	Educated
Agriculture		
1. Rice	.00536	.00028
2. Other Food Crops	.00512	.00027
3. Export Crops	.00500	.00026
4. Residual Agric.	.00487	.00026
Small-Scale Nonagric.		
5. Small-scale Ind., Rural	.00191	.00063
6. Small-scale Ind., Small Urban	.00055	.00018
7. Small-scale Ind., Large Urban	.00057	.00019
8. Transportation	.00039	.00013
9. Small-scale Trade	.00083	.00027
Large-Scale Nonagric.		
10. Construction	.00030	.00044
11. Mining	.00016	.00024
12. Large Scale Manuf.	.00003	.00004
13. Utilities	.00027	.00041
14. Large-scale Trade & Services	.00010	.00016

[1]Man years per thousand Leone of gross output.

Sources: Computed from: Leidholm and Chuta (1976), Spencer and Byerlee (1976), and Government of Sierra Leone, National Development Plan, 1974/75 to 1978/79

employment in sectors that are exclusively in region y while the second term refers to employment in overlapping sectors where r_y is the breakdown of sectors among geographical areas. U_{yz} is unemployment in region y specific by educational level z. The equation states that the available labor force can either be employed in private sectors, government or remain unemployed.

The breakdown of sectors among geographical areas is shown in Table 23. Most of the value added from agricultural sectors is from rural areas with a small proportion (5 percent) from small urban areas. Also, rural areas contribute more to total value added in small-scale nonagricultural sectors. There are no large-scale sectors in rural areas. For large-scale sectors most of the value added is contributed by large urban areas.

The labor force available in each location is disaggregated into two educational groups: those with less than four years of education and those with four or more years of education. Table 24 shows the proportion of uneducated and educated labor force in each location. The educated group forms a higher proportion of the labor force in urban areas than in the rural areas.

National and Sectoral Accounting

The accounting equations will measure the level of macro-variables when aggregate GDP is maximized. It will give GDP, investment, consumption, imports, and exports.

Government value added: Since expenditure in the solution represents only consumption by government, value added in government must be added in calculating regional and national value added.

TABLE 23
GEOGRAPHICAL DISTRIBUTION OF SECTORS AND GOVERNMENT EMPLOYMENT,[1] 1974

Sectors	Rural	Small Urban	Large Urban
Agriculture Sectors	.95	.05	-
Small-Scale Nonagric. Sectors			
Transportation	.60	.20	.20
Small-Scale Trade	.55	.20	.25
Large-Scale Nonagric. Sectors			
Construction	-	.50	.50
Mining	-	-	1.00
Large-Scale Manuf.	-	.25	.75
Utilities	-	.34	.66
Large-Scale Trade & Services	-	.25	.75
Government Employment	.10	.45	.45

[1]Proportion of the sector as measured by valued added in each location.

Sources: Estimated from census of industry and manufacturing

TABLE 24
COMPOSITION OF LABOR FORCE BY EDUCATION LEVEL, 1974

Area	Uneducated[1]	Educated[2]
Rural	.90	.10
Small Urban	.70	.30
Large Urban	.50	.50

[1]Less than four years of education.

[2]Four or more years of education.

Source: Estimated from: Migration Survey (1976) and Central Statistics Office, Household Survey (1971)

Current public expenditure on goods and services, $\overline{A}$, is exogenously determined. Total public wages and salaries, PWS, is then given by:

$$PWS = \overline{A} - \sum_{j=1}^{14} G_j$$

where G_j is the government consumption of commodity j. Current public expenditure on goods and service is assumed to grow at an average annual

rate of 6.5 percent from Le 50 million in 1974 to Le 72.7 million in 1981. Total public wages and salaries then amount to Le 51.7 million, which is the difference between current public expenditures on goods and services and public consumption of goods and services. This total government value added V_y^G is distributed among the regions by g_y, the proportion of the wage bill in the public sector spent in each location y.

$$V_y^G = g_y \text{ PWS}.$$

Sectoral value added, V_j is computed as the value of total output for that sector X_j, minus the value of intermediate purchase of inputs from other sectors $\sum_{i=1}^{14} a_{ij}$ and is given by:

$$V_j = (1 - \sum_{i=1}^{14} a_{ij})\, X_j.$$

This sectoral value added is aggregated by type of output and scale of operation.

For location, value added by government, V_y^G, in each location has to be added and the equation is set as follows:

$$\sum_j X_j (1 - \sum_{i=1}^{14} a_{ij}) + \sum_j X_j r_y (1 - \sum_{i=1}^{14} a_{ij}) + V_y^G = V_y$$

where V_y is value added in region y. The first term on the left hand side of the equation refers to value added in sectors that are exclusively in region $_{ij}$, while the second term refers to value added in overlapping sectors, where V_y is the breakdown of sectors among geographical areas.

Investment by sector was explained earlier. The model also computes investment by locations in similar fashion as value added by locations, except that investment is not disaggregated by government and private sources.

At the national level, the model also computes:

Total consumption: which is the sum of consumption (both domestic and imported commodities) of the population in each region;

Total imports: which is the sum of imports of rice, other consumption commodities, intermdiate and investment goods; and

Total exports: which is the sum of exports by agricultural sector, mining and large-scale manufacturing.

Objective Function

Ideally, the objective function should be a social welfare function. Since this is unknown, aggregate gross domestic product, GDP, which is potentially one of most important determinants of welfare, is explicitly maximized:

$$\text{maximize GDP} = \sum_{y=1}^{3} V_y$$

which is the sum of value added in each region. Though the objective function embodies only one criterion, other goals can be enforced by way of constraints in the model. A goal which is imposed by way of a constraint is equivalent to one that has an infinite weight in the objective function until the constraint is satisfied, after which the weight is zero. For example, in this model, though flexibility in the consumption of individual commodity is allowed, for total consumption there is a minimum consumption constraint. This is incorporated by the use of the savings constraint which reflects the limit of the population to save. Alternatively it is possible to solve the model by maxmizing different objective functions. In this study an alternative objective function maximizing employment will be tried and the results will be compared to those in which GDP is maximized.

Migration Model

The purpose of the migration model is to provide an analysis of population distribution between the regions since migration is the principal linkage between the rural and urban labor markets. The theoretical framework for the construction of the model was developed in Chapter II. In the econometric analysis of migration in Chapter IV, the elasticities of migration with respect to expected wage differentials were derived. It was observed that these elasticities were significantly different between the two educational groups.

Migration Function

The model is based on Todaro's (1969) model, but improved upon by explicitly introducing:

1. The traditional small-scale sectors in urban areas and nonagricultural small-scale sectors in rural areas, and
2. The differential job market conditions in modern large-scale (or organized) urban and traditional small-scale (or unorganized) urban sectors.[1]

The migration function is formulated in terms of an expected income differential which is the difference between the expected urban income and the rural income and is expressed as:

$$R_{yz} = \left[R_{(0)yz} + m_{(1)yz} \ \Delta \ (W^e_{yz} - W^r) \right] * N^r_z$$

$$y = 2, 3$$
$$z = 1, 2$$

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[1]Will be referred to as large-scale and small-scale sectors respectively.

where y is region (2 = small urban, 3 = large urban) and z is educational level (1 = uneducated, 2 = educated). R_{yz} is the rate of migration to urban region y, specific for education level z. $R_{(0)yz}$ is the rate of migration of rural population to urban region y, specific for eductional level z in the base run. $m_{(1)yz}$ is the elasticity of rural-urban migration with respect to the expected wage differential specific by educational level z. W^e_{yz} is the expected urban wage in region y specific for educational level z. W^r is the rural wage rate. N^r_z is the rural population specific by educational level z.

Expected Urban Wage

Mention has been made of the dual labor market in urban areas, i.e., the traditional small-scale and modern large-scale sectors. There are, thus, three possibilities open to a migrant in the urban region. He may find employment in the small-scale sector or in the large-scale sector or remain unemployed. The expected urban wage is then the weighted sum of wages in the two sectors of the urban labor market, the weights being the probability of finding employment in each sector, and is given by:

$$W^e_{yz} = P^S_{yz} W^S_{yz} + P^L_{yz} \overline{W}^L_{yz}$$

and W^e_{yz} is the expected wage in urban region y, specific by educational level z. P^S_{yz}, P^L_{yz} are the probabilities of finding a job in urban region y, specific by educational level z in small and large-scale sectors respectively. W^S_{yz}, $\overline{W}^L_{yz}$ are the wage rates in urban region y, specific by educational level z in small and large-scale sectors respectively.

Probabilities of Finding Employment

To compute expected urban income the probabilities of finding urban jobs are needed. These probabilities will depend on assumptions about job turnover in the labor market. Earlier in Chapter II, it was observed that entrance into the traditional small-scale sectors is relatively easy in that the capital requirement, both human and physical, is low and there is high job turnover. In contrast, the turnover of jobs in the modern large-scale sectors is relatively low and people already employed retain their jobs. Accordingly, for the small-scale sector a high job turnover is assumed, in which case the probability of finding an urban job in small-scale sector is given by

$$P^S_{yz} = \frac{E^S_{yz}}{L_{yz} - E^L_{yz,\ t-1}}$$

where P^S_{yz} is the probability of finding a job in small-scale sector in urban region y, specific by educational level z. E^S_{yz} is employment in small-scale sector in urban region y specific by education level z. L_{yz} is labor supply in urban region y specific by education level z. $E^L_{yz,\ t-1}$ is employment in large-scale sector in the base period in urban region y specific by education level z. P^S_{yz} then is essentially the rate of employment in small-scale sector, specific by urban region and educational level.

For the large-scale sector a low job turnover is assumed in which case the probability of finding an urban job in large-scale sector is given by:

$$P^L_{yz} = \frac{\Delta E^L_{yz}}{L_{yz} - E^L_{yz,\ t-1}}$$

where P^L_{yz} is the probability of finding job in large-scale sector in urban region y, specific by educational level z. E^L_{yz} is the employment in large-scale sector in urban region y, specific by education level z. $E^L_{yz,\ t-1}$ is employment in large-scale sectors in the base period in urban region y specific by education level z. L_{yz} is labor supply in the urban region y specific by education level z. P^L_{yz} is then the ratio of the number of additional jobs created to the number of job seekers and those already employed in the large-scale sector retain jobs. Large-scale sector employment also includes government employment. This is in line with observations about the importance of government employment in the total employment in the urban large-scale sector, and hence it affects the probability of finding a job there.

Wage Rates Determination

Wage rate in rural area is determined as:

$$W^r = \frac{V^r}{E^r} * P^r$$

where W^r is the wage rate in the rural area; V^r is value added (both agricultural and small-scale nonagricultural) in the rural area; E^r is total employment (both agricultural and small-scale nonagricultural) in the rural area; P^r is the proportion of value added accruing to labor in the rural area. Wage rate in rural area is thus implicitly determined by rural-urban migration (since migration affects the supply of rural labor), rural productivity and by demand for rural products. This wage rate is more meaningful because it also takes nonagricultural activities into account.

Observation was made in Chapter II about wage rate determination in small and large-scale sectors in urban areas. In small-scale sectors

wages are competitively determined while in large-scale sectors they are determined by such factors as government minimum wage legislation and the relative bargaining strength of trade unions. Accordingly wage rates in the small-scale sector in urban areas are determined as:

$$W^S_{yz} = \frac{V^S_{yz}}{E^S_{yz}} * P^S_{yz}$$

where W^S_{yz} is the wage in the small-scale sector in the urban region y specific by educational level z. V^S_{yz} is value-added in the small-scale sector in the urban region y specific by educational level z. E^S_{yz} is employment in the small-scale sector in the urban region y specific by educational level z. P^S_{yz} is the proportion of value-added accruing to labor in the small-scale sector in the urban region y specific by educational level z. W^S_{yz} is thus determined by productivity in the small-scale sector in urban areas and by demand for small-scale sector products.

Wage rates in large-scale sectors, $\overline{W}^L_{yz}$ are exogenous and are assumed to increase at a rate of 2.5 percent per annum. Table 25 shows the wage rates in large scale sectors in 1974.

With the exception of wage-rates in the large-scale sector (which are exogenous) and migration elasticity (which is derived from the migration function fitted in Chapter IV) all the data needed to compute wages specific by region, educational level and scale of operation are obtained from the macro economic model where they are determined endogenously.

Model Linkages

Though separate, the macro and migration models are interdependent in the sense that exogenous variables of one model are endogenous variables of another. An economy-wide evaluation of output, employment, and

TABLE 25
WAGE RATES IN LARGE-SCALE SECTORS, 1974

Education Level	Small Urban	Large Urban
	(Leones per month)	
Uneducated	39.74	52.20
Educated	53.27	68.93

migration requires a provision for consistency checks between the two models. Linkages between the macro model and the migration model are shown in Figure 5. For example, the expected rural urban wage differentials derived from the macro model must be consistent with migration, and migration must be consistent with the labor force distribution between the regions assumed in the macro model. The variables transferred between the macro model and migration model are shown in Table 26. Variables are transferred iteratively between the macro and migration model to ensure consistency. This was done by repeating model calculations until the inconsistencies were within an acceptable range. No formal iteration algorithm that could lead to automoatic convergence was built; an informal adjustment by hand appeared more appropriate and sufficient.

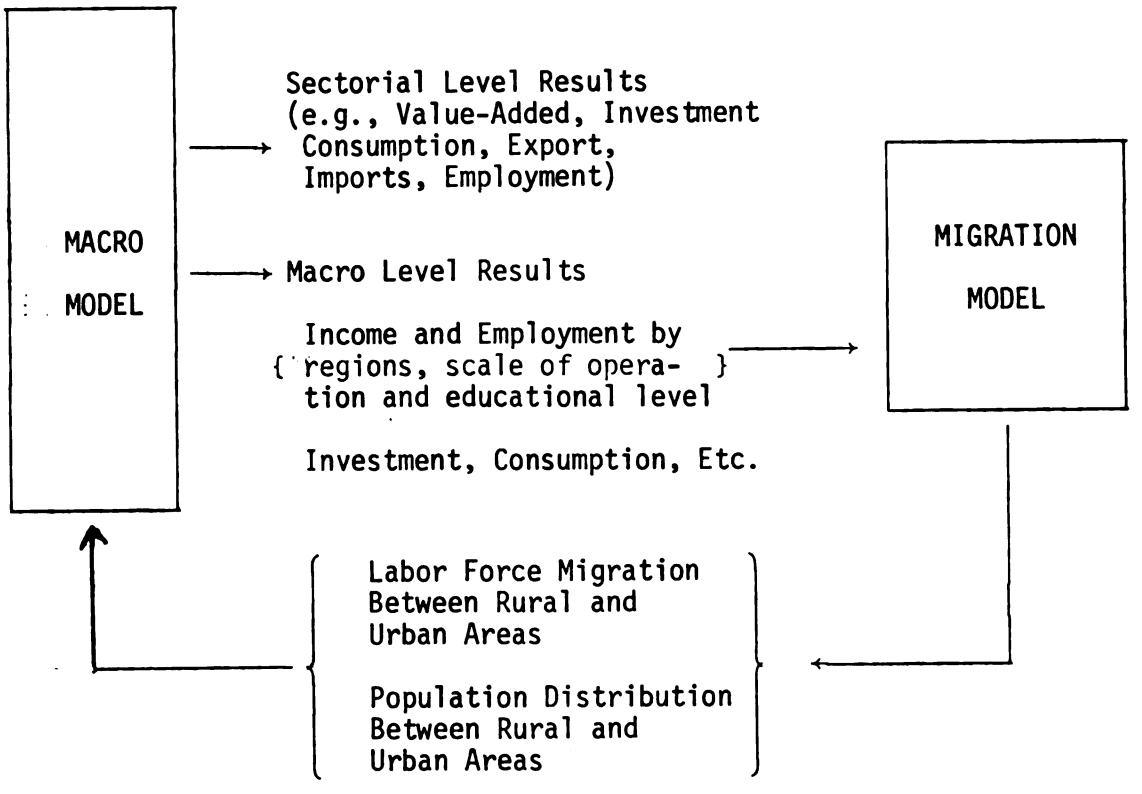

FIGURE 5

LINKAGES BETWEEN MACRO AND MIGRATION MODEL

Summary and Model Limitations

In constrast to conventional macro models, the models have a higher degree of disaggregation in both the product and factor markets and take explicitly into account interactions in both the product and factor markets. This emphasis on intra-sectoral and inter-sectoral relationships as they affect output, employment and migration adds strength to the results.

The macro and migration models are useful in analyzing output, employment and migration at macro level. They are also useful for sector-specific policy analysis, because they can run simultaneously with detailed sector models and sector specific policies can be analyzed within

TABLE 26
TYPES OF VARIABLES TRANSFERRED BETWEEN THE MACRO MODEL AND MIGRATION MODEL

Variables Transferred From Migration Model To Macro Model	Variables Transferred From Macro Model to Migration Model
1. Number of migrants from rural region to urban areas by size of urban areas and education level.	1. Wages in rural areas. 2. Wages in small-scale sectors by urban size and education level. 3. Employment by urban size, education and scale of operation.

a broader macro framework. However the models running independently of sector models have considerable value in analyzing output, employment and migration at the macro level. The macro economic model is also useful in identifying bottlenecks in the economy.

Although the models are applied to Sierra Leone they are of general applicability to other developing economies. The degree of disaggregation determines the data requirements of the models. In case of the macro model corresponding to each component is a key set of parameters e.g. input-output coefficients of the production component and income elasticities of demand of the consumption component. An issue frequently raised in connection with the use of models is whether the information available in developing countries is sufficient in quantity and quality to justify the use of models. In the case of Sierra Leone a comprehensive

set of aggregated data generated from field surveys were available for the small scale sectors. Data for the large scale sectors were available from secondary sources and were fairly reliable. In other developing countries input-output tables are becoming increasingly available in developing countries. Similarly, data for other components will not usually be a limiting factor, although disaggregation by rural and urban regions may not always be possible. Such a modelling does demonstrate the need for this type of information and may lead to increased efforts to collect data that might otherwise be ignored.

Some of the most important limitations of the models should be kept in mind. First, there are no prices in the model. The macro model essentially allocates real resources optimally with respect to a given objective function. The optimizing process under linear programming system generates shadow prices which are resource costs in terms of the objective function. There are no market prices. Shadow prices usually differ from real prices not only because of imperfections in the market that are not included in the model, such as monopolies and government regulations but also because shadow prices reflect the models' structure. However some sort of pricing is still needed to give relative weights to sectors and for aggregation. Hence though the market prices have no role, all goods and services are expressed in value terms instead of real quantities.

Secondly, the production functions are homogenous of the first degree i.e. they show constant returns to scale and have fixed input coefficients. For short-run projection where the technical coefficients are not expected to change, this may not be a severe limitation. The problem of changing technical coefficients can be handled within the existing model by means of statistical revision of the input-output table.

In addition, all production relationships are accounted for directly in inputs and outputs, so there are no external economies or diseconomies. These limitations should be kept in mind when assessing the empirical results.

VI. MODEL SOLUTIONS

The models are deisgned to provide a framework within which to examine, quantitatively, the potential of the economy and impact of different policies on output, employment and migration at the macro level. First the results of basic runs which are made for two time periods, 1974 and 1981 are presented. This is followed by policy runs. The objectives of the basic runs are:

(I) to analyze the results of optimization and examine the output, employment and migration potential of the economy, and

(II) to use the base run 1981 as a bench-mark for analyzing implications of different policies on output, employment and migration.

Base Run Projection, 1974-1981

The basic projection was run under a set of assumptions about the values of exogenous variables discussed in Chapter V and reflect recent historical trends. Government consumption and employment is exogenous. Exports and foreign exchange available from sources other than exports also are assumed exogenous. Total population is exogenous but the labor force distribution between rural and urban areas is determined endogenously in the migration model. The rate of migration in response to expected rural-urban wage differential was estimated for each educational subgroup in Chapter IV. The sectoral composition of employment by education is assumed constant. However, labor productivity changes are assumed in the

large-scale sectors. Wages in the large-scale sectors are exogenously determined and are assumed to increase over time. While wages in the small-scale nonagricultural sectors in urban areas and rural wage rate are related to productivity growth. These assumptions, together with the limitations, particularly the problem of changes in parameter values over time discussed in Chapter V, should be kept in mind.

National Account Statistics

Table 27 shows the level and growth rate of national accounts. GDP is projected to grow at an average annual rate of 4.7 percent, from Le 446.2 million in 1974 to Le 593.1 million in 1981. This projected rate of GDP is higher than the historical rate of 4.2 percent for the period 1964-1971. Assuming that the population grows at 2.6 percent per annum, the GDP per capita will grow from Le 163.2 in 1974 to Le 183.6 in 1981 or at an average annual rate of 1.8 percent. Table 28 shows the rate of growth of GDP by regions. Though the GDP for the country as a whole is projected to grow at 4.7 percent per annum, the rural area will be growing at less than this average, while the urban areas will be growing at the same rate or higher than the national average. The growth rate of GDP in rural areas is projected at 4.4 percent compared to 5.4 percent for small-urban and 4.7 percent for large-urban. The projected distribution of GDP between the regions will change very little during the period.

Investment is projected to grow at an average annual rate of 5.2 percent from Le 64.6 million in 1974 to Le 88.3 million in 1981. The share of investment in GDP is projected to increase from 14.5 percent to 14.9 percent during the projection period.

Consumption is projected to grow at an average annual rate of 3.9 percent from Le 353.0 million in 1974 to Le 449.1 million, in 1981.

TABLE 27
NATIONAL ACCOUNTS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

National Account Component	Base Runs		Av. Annual Growth Rate in % 1974-1981	Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	1974	1981						
				(Unit - Le '000 at constant 1974 prices)				
GDP	446,185	593,138	4.7	597,332	600,149	593,986	595,200	602,422
Consumption	353,017	449,134	3.9	452,005	455,527	449,844	450,540	456,555
Investment	64,568	88,321	5.2	91,732	86,981	88,547	86,941	95,043
Imports	141,225	170,347	2.9	173,077	170,347	170,347	170,347	176,347
Exports	115,400	140,347	3.1	143,077	140,347	140,347	140,347	140,347

TABLE 28
GDP BY REGIONS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Runs		Av. Annual Growth Rate in %, 1974-1981	Run 1 Agricul. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	1974	1981						
				(Unit - Le '000 at constant 1974 prices)				
Sierra Leone	446,185	593,138	4.7	597,332	600,149	593,986	595,200	602,422
Rural	176,357	230,350	4.4	230,478	237,115	230,837	230,575	231,271
Small Urban	76,857	105,713	5.4	107,012	106,136	105,899	106,198	108,417
Large Urban	192,972	257,075	4.7	259,842	256,898	257,251	258,427	262,734

Assuming growth of population at 2.6 percent per annum, consumption per capita will increase from Le 129.2 in 1974 to Le 139.0 in 1981, representing an average annual growth in per capita consumption at 1.0 percent. Since the growth rate of consumption is less than the rate of growth of GDP, the share of consumption in GDP is projected to decline from 79.1 percent to 75.7 percent during the period.

The average annual growth rate of imports is projected at 2.9 percent from Le 141.2 million in 1974 to Le 170.3 million in 1981. The model projects the share of consumer goods imports in total imports to decline from 54.6 percent to 51.6 percent; while the share of intermediate goods inputs is projected to increase from 32.0 percent to 35.1 percent during the projection period. The share of investment goods imports is projected to remain stable at around 13.0 percent.

There are no competitive imports of rice and the model prefers to produce rice domestically rather than import due to foreign exchange constraint. All available foreign exchange is required for noncompetitive imports.

Sectoral Level Results

Value-Added. Value added by different sectors is shown in Table 29. The average annual rate of growth of the agricultural sector as a whole, in terms of value added, is projected at 3.9 percent, from Le 122.0 million in 1974 to Le 155.1 million in 1981. It is the slowest growing sector compared to other sectors. Due to this slow growth rate, the sector's contribution towards total GDP is projected to decline from 27.3 percent to 26.1 percent.

TABLE 29
VALUE ADDED BY SECTORS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

Sectors	Base Runs		Av. Annual Growth Rate in %, 1974-1981	Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	1974	1981						
				(Unit - Le '000 at constant 1974 prices)				
TOTAL[1]	446,185	593,138	4.7	597,332	600,149	593,986	595,200	602,422
Agriculture	121,957	155,138	3.9	154,801	163,280	154,709	155,178	154,909
Rice	45,578	53,267	2.4	52,772	59,644	52,778	52,887	53,161
Other Food	43,117	60,513	5.8	58,529	61,944	60,449	60,740	59,938
Export Crops	18,070	21,232	2.5	23,130	21,232	21,232	21,232	21,232
Resid. Agric.	15,192	20,226	4.7	20,370	20,460	20,250	20,319	20,578
Small-Scale Nonag.	92,821	125,370	5.0	126,373	123,836	127,087	125,881	127,657
Small-Scale Manuf.	19,775	26,833	5.1	27,056	27,283	27,852	26,940	27,401
Rural	11,388	15,529	5.2	15,622	15,865	16,117	15,580	15,773
Small-Urban	3,458	4,628	4.8	4,666	4,667	4,796	4,644	4,722
Large-Urban	4,929	6,676	5.1	6,768	6,751	6,939	6,716	6,906
Transport	40,683	55,240	5.1	55,664	52,854	55,575	55,437	56,173
Trade	32,363	43,297	4.8	43,653	43,699	43,660	43,506	44,083
Large-Scale Nonag.	190,808	252,833	4.6	256,484	252,934	252,519	254,449	260,179
Construction	22,282	31,104	5.7	32,031	30,912	31,141	31,055	32,909
Mining	69,287	84,323	3.1	84,323	84,323	84,323	84,323	84,323
Manufacturing	25,054	33,695	4.9	35,120	33,493	33,221	34,833	35,840
Utilities	3,252	4,109	3.8	4,166	4,101	4,109	4,144	4,235
Trade and Services	70,933	99,602	5.8	100,844	100,105	99,725	100,094	101,872

[1] Includes government value-added.

Within the agricultural sector, the fastest growing sectors are other food crops and residual agriculture.[1] Due to these differential rates of growth, the contribution of other food crops and residual agriculture towards total value added in agricultural sector is projects to increase from 35.3 percent to 39.0 percent for other food crops and from 12.5 percent to 13.0 percent for residual agriculture. The contribution of rice and export crops towards total value added in agricultural sector is projected to decline from 37.4 percent to 34.3 percent for rice and from 14.8 percent to 13.7 percent for export crops.

Value added in the small-scale nonagricultural sectors is projected to increase from Le 92.8 million to Le 125.4 million or at an annual average rate of growth of 5.0 percent. This is the fastest growing sector and its contribution towards total GDP is projected to increase from 20.8 percent to 21.1 percent. Within the small-scale nonagricultural sector, there is no difference in the rate of growth between different sectors. Transport and small-scale trade contributes 44.0 percent and 35.0 percent of value added towards total value added in small-scale nonagricultural sectors. Value added by small-scale manufacturing is around 21.0 percent. However, within the small-scale manufacturing sector, value added by location varies. The rural area accounts for 58 percent of the total value added in small-scale manufacturing while small-urban and large-urban accounts for 17 and 25 percent respectively.

Value added by large-scale sectors is projected to increase from Le 190.8 million to Le 252.8 million or at an average annual rate of growth of 4.6 percent. The growth rate in this sector is probably underestimated since the model assumes import coefficients to be constant in

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[1]This sector includes livestock, fisheries and forestry.

1981 as they are in 1974. If import substitution strategy is pursued successfully, the growth rate could be higher. Its contribution towards total value added is projected to remain stable around 43 percent and it is the largest contributor. Within the large-scale sectors, construction, manufacturing and large-scale trade and services are the fastest growing sectors.

The higher growth rate of nonagricultural sectors compared to the agricultural sector can be explained by demand linkages. On the demand side, as income increases demand for nonagricultural consumer goods increases due to higher income elasticity of demand for nonagricultural consumer goods compared to agricultural commodities. Since consumption is the largest component in the demand, this is probably the major factor for the differential growth rate between agricultural and nonagricultural sectors. This is reinforced by investment demand since almost all of the domestic investment goods are produced by the nonagricultural sectors. Finally, there is higher degree of interindustry demand linkages within the nonagricultural sectors particularly large-scale nonagricultural sectors.

Employment. Employment by sectors is shown in Table 31. Total employment is projected to increase from 1128.5 thousand to 1439.2 thousand or at an average annual growth rate of 3.9 percent during the projection period. This rate of growth of employment is less than the rate of growth of GDP at 4.7 percent per annum.

Employment is projected to grow fastest in the small-scale nonagricultural sectors and slowest in the large-scale sectors. This is due to a differential in growth rates and the labor intensity of small-scale vs. large-scale nonagricultural sectors. Small-scale nonagricultural sectors

TABLE 30
GROWTH RATE OF VALUE ADDED BY SECTORS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Run 1981	Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	(Percent per annum)					
Total[1]	4.7	4.8	4.9	4.7	4.8	5.0
Agric.	3.9	3.8	4.8	3.8	3.9	3.9
Small-Scale Nonagric.	5.0	5.2	4.8	5.3	5.1	5.4
Large-Scale Nonagric.	4.6	4.9	4.6	4.6	4.8	5.2

[1]Includes government value-added.

TABLE 31
EMPLOYMENT BY SECTORS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Runs		Av. Annual Growth Rate in %, 1974-1981	Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	1974	1981						
					(Unit - '000 persons)			
Total[1]	1,128.5	1,439.2	3.9	1,441.4	1,440.0	1,441.1	1,439.8	1,441.0
Agriculture	817.1	1,037.5	3.8	1.036.4	1,036.8	1,034.0	1,037.0	1,035.3
Rice	306.4	358.1	2.4	354.7	381.0	354.8	355.5	357.4
Other Food	279.7	392.5	5.8	379.6	381.6	392.1	394.0	388.8
Export Crops	136.8	160.7	2.5	175.0	152.7	160.7	160.7	160.7
Resid. Agric.	94.8	126.2	4.7	127.1	121.5	126.4	126.8	128.4
Small-Scale Nonag.	173.7	234.9	5.0	236.7	236.5	240.3	235.8	239.1
Small-Scale Manu.	88.8	120.8	5.1	121.7	123.3	125.4	121.3	123.1
Rural	73.1	99.7		100.3	101.9	103.5	100.0	101.3
Small-Urban	6.4	8.5		8.6	8.6	8.8	8.6	8.7
Large-Urban	9.3	12.6		12.8	12.8	13.1	12.7	13.1
Transport	27.8	37.7	5.1	38.0	36.1	37.9	37.8	38.3
Trade	57.1	76.4	4.8	77.0	77.1	77.0	76.7	77.7
Large-Scale Nonag.	87.1	100.4	2.2	101.9	100.3	100.4	100.6	103.2
Construction	25.4	30.7	3.0	31.6	30.5	30.7	30.6	32.4
Mining	32.8	34.9	0.9	34.9	34.9	34.9	34.9	34.9
Manufacturing	3.9	4.5	2.2	4.7	4.5	4.4	4.6	4.9
Utilities	4.0	4.3	1.1	4.3	4.2	4.3	4.3	4.4
Trade & Services	21.0	26.0	3.4	26.4	26.2	26.1	26.2	26.6

[1]Includes government employment.

are faster growing and have higher labor/output ratios compared to large-scale sectors. Also due to productivity increases in large-scale sectors, employment in this sector does not increase as fast as output.

Though the agricultural sectors as a whole account for about 27 percent of total value added, they are the major source of employment. Employment in the agricultural sector is projected to grow at an average annual rate of 3.8 percent, and its contribution towards total employment is projected to be stable around 72.0 percent.

The small-scale nonagricultural sector is the second major source of employment. Total employment in this sector is projected to increase from 173.7 thousand to 234.9 thousand or at an average annual rate of growth of 5.0 percent.[1] The sector's contribution towards total employment thus increases from 15.4 percent to 16.3 percent due to the high growth rate of employment in this sector. There is not much differential in the rate of growth of employment between different sectors in the small-scale nonagricultural sector. The small-scale manufacturing sector is the major contributor of employment in the small-scale nonagricultural sectors accounting for about half of the total employment. Within the small-scale manufacturing sector, employment varies by location. Of the total employment in small-scale manufacturing, employment in rural area accounts for 82 percent of the total employment, small urban area 7 percent and large urban 10 percent.

Though large-scale sectors account for about 43.0 percent of total GDP, they contribute only about 7.0 percent towards total employment.

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[1]The rate of growth of employment in agricultural and small-scale nonagricultural sectors is probably overestimated as there is no increase in labor productivity in these sectors. Growth rate of employment higher than the rate of growth of labor force is possible due to slack labor in the base run 1974. An alternative run is made (discussed later on) in which agricultural sectors labor productivity is increased.

Also the rate of growth of employment in this sector is lowest. Total employment in this sector is projected to increase from 87.1 thousand to 100.4 thousand or an average annual rate of growth of 2.2 percent. Consequently its contribution towards total employment is projected to decline from 7.7 percent to 7.0 percent during the projection period. Construction, mining and large-scale trade and services are the major contributors of employment in the sector.[1] Within the large-scale sectors there is quite a difference in the growth rate of employment. Mining and utilities have the lowest growth rate of employment as they are relatively less labor-intensive.

Urban Employment, Migration and Unemployment

Employment. Table 33 shows employment, migration and unemployment in urban areas. Total urban employment is projected to increase at an average rate of 3.9 percent per annum.[2] The growth rate of employment for uneducated persons is higher than for educated. Employment of uneducated people is projected to increase at an average annual growth rate of 4.1 percent compared to 3.6 percent for educated.

This higher rate of growth of uneducated persons is due to the fact that the rate of growth of employment in small-scale nonagricultural sectors, where a relatively higher proportion of uneducated compared to educated are employed, is highest. These relatively high employment growth rates of uneducated vs. educated people assumes that the proportion of uneducated/educated employed does not change. For short-run projection the constant proportion assumption may not be limiting. However to the

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[1]Government employment given exogenously is also a major contributor of employment in large-scale sector.

[2]Includes Government employment.

TABLE 32
GROWTH RATE OF EMPLOYMENT BY SECTORS IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Run 1981	Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	(Percent per annum)					
Total[1]	3.9	4.0	3.9	4.0	3.9	4.0
Small-Scale Nonagric.	5.0	5.2	5.2	5.5	5.1	5.4
Large-Scale Nonagric.	2.2	2.4	2.2	2.2	2.2	2.6

[1]Includes government and agricultural sectors.

TABLE 33
URBAN EMPLOYMENT, MIGRATION AND UNEMPLOYMENT IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Runs						Run 1 Agric. Exports Promotion			Run 2 Increased Agric. Productivity			Run 3 Small-Scale Industry Promotion			Run 4 Labor Intensive Technique in Large-Scale Industry			Run 5 Increased Foreign Capital Inflow		
	1974			1981																	
	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban	Total	Small Urban	Large Urban
Urban Employment ('000)																					
Total	223.6	106.7	116.9	285.3	130.1	155.2	287.4	130.9	156.5	285.1	129.9	155.2	286.4	130.4	156.0	285.9	130.3	155.6	289.5	131.7	157.8
Uneducated	135.0	75.5	59.5	174.1	94.0	80.1	175.2	94.4	80.8	173.9	93.8	80.1	174.9	94.2	80.7	174.5	94.1	80.4	176.3	94.8	81.5
Educated	88.6	31.2	57.4	111.2	36.1	75.1	112.2	36.5	75.7	111.2	36.1	75.1	111.5	36.2	75.3	111.4	36.2	75.2	113.2	36.9	76.3
Rural-Urban Migration ('000)																					
Total	53.9	8.8	45.1	49.1	7.9	41.2	51.0	9.2	41.8	48.1	7.1	41.0	49.6	8.3	41.3	49.9	8.5	41.4	52.8	10.5	42.3
Uneducated	28.7	6.2	22.5	25.0	5.2	19.8	25.7	5.5	20.2	25.4	4.8	19.6	25.4	5.5	19.9	25.2	5.3	19.9	26.6	6.0	20.6
Educated	25.2	2.6	22.6	24.1	2.7	21.4	25.3	3.7	21.6	23.7	2.3	21.4	24.2	2.8	21.4	24.7	3.2	21.5	26.2	4.5	21.7
Urban Unemployment (Percent)																					
Total	15.9	15.3	16.5	20.8	17.1	23.6	20.2	16.6	23.0	20.6	17.0	23.4	20.5	16.9	23.3	20.8	17.2	23.6	19.6	16.1	22.3
Uneducated	14.6	14.4	15.0	17.1	14.5	19.9	16.6	14.2	19.2	16.9	14.4	19.6	16.7	14.3	19.3	17.2	14.7	19.9	16.0	13.8	18.4
Educated	17.3	17.4	18.0	26.0	23.1	27.2	25.3	22.3	26.6	25.8	23.0	27.1	25.8	22.9	27.1	26.0	23.2	27.3	26.4	21.4	26.0

extent that the ratio changes in favor of educated as observed by Sabot (1975)[1] in Tanzania, the rate of growth for educated people is underestimated while for uneducated it is overestimated. If confined to the large-scale sectors this "filtering" down process would have little affect on estimates projected. Though employment of uneducated persons accounts for 60.0 percent of total urban employment while employment of educated persons accounts for 40.0 percent in 1981 there is variation in this distribution by urban size. The proportion of uneducated vs. educated people is about 3 to 1 for the small-urban area compared to one to one for the large-urban area. This higher proportion of uneducated employment in small-urban compared to large-urban is due to the relative distribution of small- vs. large-scale sectors in each urban location. In small urban areas, a relatively higher proportion of value added is from small-scale sectors which employ a higher proportion of uneducated persons.

There is also quite a variation in the growth rate of employment by education and urban size. The highest rate of growth is for the uneducated in the large urban areas while the lowest is for the educated in small-urban areas. The growth rates for various categories are:

uneducated/small-urban	3.5 percent
uneducated/large-urban	4.9 percent
educated/small-urban	2.2 percent
educated/large-urban	4.4 percent

[1]See Sabot (1975) who observed in Tanzania the trend in large-scale sectors to employ persons of increasingly higher levels of education for jobs which were previously held by less educated--resulting in higher rate of growth of employment for more educated persons.

Migration. Total urban migration is projected to decline from 53.9 thousand to 49.1 thousand during the period 1974-1981. Migration to large-urban areas decreases most. Migration is a positive function of expected wage differentials, which is the difference between expected urban wages and rural wage. The expected urban wage is the wage in the urban area taking into account the probability of finding an urban job. In Chapter IV, it was observed that the elasticity of migration with respect to expected wage differential is higher for the educated. There is also a differential in the expected urban wage by education and urban size (see Table 34). This differential is more by urban size than by educational level.

The expected urban wage differentials especially in large urban areas, are projected to decline for both educational levels. This decrease in expected wages in large urban areas is due to decreased probability of finding a job in both small- and large-scale sectors due to the increased labor supply in the large urban area competing for jobs which are increasing slower than labor supply. While employment in large urban areas (in both the small-scale and large-scale sectors) is growing at 4.7 percent, labor supply is growing at 6.4 percent annually. This decline in expected urban wages in large urban areas coupled with increasing wages in rural areas, reduces the expected wage differential particularly for large-urban areas. This decreases migration to urban areas.

In spite of this decrease, there is still quite a differential in rural and urban wages especially in the large-urban areas in 1981. In small-urban areas expected urban wages are about one and one-half times the rural wage, while expected wages in large-urban areas are three times the rural wage. This relative differential in expected urban wages by

TABLE 34
RURAL AND URBAN WAGES IN 1981 UNDER ALTERNATIVE DEVELOPMENT STRATEGIES

	Base Runs		Run 1 Agric. Exports Promotion	Run 2 Increased Agric. Productivity	Run 3 Small-Scale Industry Promotion	Run 4 Labor Intensive Technique in Large-Scale Industry	Run 5 Increased Foreign Capital Inflow
	1974	1981					
	(Leones per month at constant 1974 prices)						
Rural Wage Rate	11.5	13.2	13.2	13.6	13.3	13.2	13.3
Expected Urban Wage							
Small Urban							
Uneducated	21.6	22.6	22.8	22.7	22.8	22.7	23.3
Educated	17.6	19.6	21.1	19.3	19.8	20.3	22.6
Large Urban							
Uneducated	47.0	41.5	42.5	41.2	41.8	41.8	43.6
Educated	55.5	43.5	45.3	43.3	43.6	43.9	47.1
Expected Wage Diff.							
Small Urban							
Uneducated	10.1	9.4	9.6	9.1	9.6	9.5	10.0
Educated	6.1	6.4	7.9	5.7	6.5	7.1	9.3
Large Urban							
Uneducated	35.5	28.2	29.2	27.6	28.6	28.5	30.3
Educated	44.0	30.2	32.0	29.7	30.4	30.6	33.8

urban size partly explains why a higher proportion (83.9 percent) of migrants go to large-urban areas compared to small-urban areas (16.1 percent).

Taking migration into account, the labor supply in urban areas grows at 5.2 percent per annum. There is a differential in growth rate of labor supply by size of urban area and educational level due to a differential in migration. In small-urban areas, labor supply increases at 3.9 percent per annum while in large-urban areas it increases at 6.8 percent per annum due to a higher proportion of migrants. Labor supply of the uneducated increases at 4.6 percent per annum while the educated supply increases at 5.8 percent per annum. The average annual rate of growth of the urban labor supply by different categories are:

uneducated/small-urban	3.4 percent
educated/small-urban	3.6 percent
uneducated/large-urban	6.6 percent
educated/large-urban	7.0 percent

Unemployment. The unemployment rate in urban areas is due to differences in the rate of growth of urban labor supply (from natural growth and migration) and rate of growth of employment. The rate of urban unemployment as a whole is projected to increase from 15.9 percent in 1974 to 20.8 percent in 1981 and the reduction in migration is not large enough to reduce unemployment. Though urban employment as a whole is increasing at an average annual rate of 3.6 percent, urban labor supply (due to natural increase in urban population and rural-urban migration) is increasing at an average annual rate of 5.1 percent.

There is quite a differential in the rate of unemployment by urban size and education. The rate of unemployment is lower in small-urban areas compared to large-urban areas. For small-urban areas the rate of unemployment is projected to increase from 14.6 percent in 1974 to 17.1 percent

in 1981. Unemployment in small-urban areas is increasing because though the small-urban employment (both small-scale and large-scale sectors) is increasing at 3.1 percent, labor supply in this region is increasing at an average annual rate of 3.6 percent. The rate of unemployment in the large-urban area is projected to increase from 15.4 percent in 1974 to 26.2 percent in 1981. Employment in the large urban (in both small-scale and large-scale sectors) is growing at 4.7 percent while labor supply is increasing at 6.8 percent resulting in a high rate of unemployment.

The unemployment rate is lower for the uneducated in both periods and this is true in both the small and large urban areas. The rate of unemployment for the uneducated is projected to increase from 14.6 percent to 17.1 percent while for the educated the rate is projected to increase from 17.8 percent to 26.0 percent during the projection period. This higher rate of unemployment for the educated is due to higher rate of growth of educated labor supply, which is growing at 5.7 percent per annum compared to rate of growth of educated employment which grows at 3.6 percent per annum. The lowest rate of unemployment is for the uneducated in small-urban and highest rate is for educated in large urban.

The overall result predicted by the model under current policies indicates that though the economy is projected to grow at a favorable rate, and migration is projected to decline slightly, unemployment is still high and increasing. The growth rate of employment and reduction in migration is not sufficient to reduce urban unemployment in 1981.

Alternative Base Run Projection Maximizing Employment

An alternative base run projection was made in which the objective function was to maximize total employment instead of total GDP. The

results obtained under the alternative run were almost identical to the base run projection in which total GDP was maximized. In both runs, level and distribution of GDP, employment, migration and unemployment were identical. Given the structural formulation of the models the results are consistent. In the base run where total GDP was maximized, the macro level constraint to output in rural area is labor supply while for urban areas the constraint is foreign exchange. When employment is used as a maximand labor supply in rural area is already constraining while in urban areas employment could not be expanded due to the foreign exchange constraint. This arises in large part because labor-intensive sectors are also more efficient users of scarce foreign exchange and capital.

Policy Runs

The models have value in making general projections of output, employment and migration at the macro level which are internally consistent. The models are also useful for sector-specific policy analysis, because they can run simultaneously with detailed sector models and sector-specific policies can be analyzed within a broader macro framework. For example, agricultural exports are assumed exogenous in the macro model while in a detailed agricultural sectoral analysis exports can be computed endogenously. Here the models are run independently since the sector-specific models (of Agriculture by Spencer and Byerlee (1976) and Small-Scale Industry by Chuta (1976)) are not yet at a stage where they can be incorporated into the models.

However the models running independently of sector models have considerable value in analyzing output, employment and migration at the macro level. The macro economic model is also useful in identifying bottlenecks in the economy. In this section the impact of various policies

of concern to Sierra Leone (and other developing economies) discussed in the last section of Chapter III will be analyzed.

The policies examined can be broadly classified into three groups. In the first group, the impact of various agricultural development strategies such as agricultural exports promotion and increased agricultural productivity will be examined. In the second group, the impact of strategies to promote labor-intensive nonagricultural sectors such as small-scale industry promotion and a switch to labor-intensive techniques of production in large-scale industry will be examined. Lastly, the impact of relaxing foreign exchange constraint by increasing foreign capital inflow will be examined. In the policy runs the relevant parameters are changed from the base run to represent the particular policy. For example, in the case of agricultural export promotion policy, agricultural exports are exogenously increased from the base run.

Results of Agricultural Development Strategies

It is recognized that agricultural development is a means to increase employment and also to promote more equitable income distribution between rural and urban areas. This will also help to reduce urban unemployment by slowing down rural-urban migration.

Agricultural Exports Promotion Policy

An increase in export crops can be brought about by increasing investment in agricultural sector or simply by increasing the official producer's price of export crops as a proportion of the world market price. A study in Sierra Leone by Saylor (1967) showed that farmers were responsive to primary producers' prices for palm kernels and cocoa, and in no cases were perverse producer reactions to price changes observed.

In this run agricultural exports were increased from Le 30.5 million in basic solution to Le 33.3 million or an increase in average annual growth rate of export crops from 2.5 percent to 4.0 percent during the period 1974-1981.

The rate of growth of GDP under this strategy increases from Le 593.1 million to Le 597.3 million or an increase in GDP from 4.7 percent under base run to 4.8 percent per annum. The strategy does not have much impact on GDP in rural areas. GDP in both urban areas increases. The growth rate of GDP increases from 5.4 percent to 5.6 percent per annum in small- urban and from 4.7 percent to 4.9 percent in large-urban.

This strategy does not have any impact on value added in the agricultural sectors as a whole, and remains stable at around Le 155.0 million. However, within the agricultural sectors, value added by other food crops declines. The decline in output of other food crops will increase the market price of other food crops. However the detailed impact on the extent of the price increase cannot be analyzed by the models. The availability of labor in rural areas sets a limit to total production and the labor force is redistributed from other food crops to export crops. This can be explained by the use of shadow price for labor in rural area which increases from Le 153.5 in the base run to Le 157.3, indicating that the rural labor supply is more constraining under this strategy.

Value added in the nonagricultural sectors increases and this increase is more for large-scale sectors. This increase is due to both supply and demand linkages. On the supply side increase in exports increases foreign exchange availability for investment in large-scale sectors. On the demand side increase in income, especially of large-urban population, increases consumption demand for large-scale nonagricultural

consumer goods since the urban population has a higher income elasticity for the output of large-scale nonagricultural consumer goods. The increased output in small-scale nonagricultural sectors is also partly due to higher intermediate demand of export crops for transport and trade compared to other agricultural sectors.

The foreign exchange constraint is still binding, and the shadow price of this constraint reduces a little from Le 1.56 under base run to Le 1.54. Though agricultural exports were increased by Le 2.73 million, GDP increased by Le 4.2 million from the base run. Hence the marginal productivity of foreign exchange expressed as:

$$\frac{\Delta GDP}{\Delta E_3} = \frac{4.194}{2.73}$$

is 1.54. In other words, each additional Leone of foreign exchange (in this case due to increased exports) increases aggregate GDP by Le 1.54 which is the shadow price of foreign exchange.

The differential impact of this strategy on value added in the agricultural vs. the nonagricultural sector explains the impact on GDP by regions. Since agricultural value added, which is the major source of GDP in rural area, is not affected, GDP in rural area does not change. GDP in urban areas increases because of an increase in value added in nonagricultural sectors, particularly large-scale sectors.

Average annual rate of growth of total employment is increased from 3.9 percent in the base run to 4.0 percent. Total employment in the agricultural sectors is not affected and labor is only reallocated from other agricultural sectors to export crops. Employment in nonagricultural sectors is increased due to increased output in these sectors. The growth rate of employment in small-scale nonagricultural sectors increases from

5.0 percent to 4.2 percent per annum and in large-scale sectors from 2.2 percent to 2.4 percent per annum.

Employment in urban areas in increased from 285.3 thousand in the base run to 287.4 thousand or an increase in average annual growth rate of urban employment from 3.9 percent to 4.1 percent. Though this increase occurs in both urban areas, the increase is greater in the large-urban area because of employment increases in both the small and large-scale sectors and the large-scale sectors are located predominantly in large-urban areas.

Migration to urban areas increases from 49.1 thousand in the base run to 51.0 thousand or an increase of 3.9 percent in migration over the base run. Though migration of both groups is increased, it has more impact on the migration of educated persons. Under this strategy output from the large-scale sectors is increased due to increased availability in foreign exchange brought by increased agricultural exports. Since the large-scale sectors employ proportionately more educated people, the probability of finding employment particularly for the educated increases, which increases the expected urban wage. Since the rural wage does not change, this increases the expected urban wage differential, particularly for educated. The expected urban wage differential for the educated increases from Le 6.4 in the base run to Le 7.9 in small-urban and from Le 30.2 to Le 32.0 in large-urban. The expected urban wage differential for uneducated does not change from the base run to significantly affect migration.

Urban unemployment goes down from 20.8 percent in the base run to 20.2 percent. Though migration increases, urban employment also increases and there is a small net increase in urban unemployment.

The overall result indicates that since the increase in agricultural exports favors large-scale sectors, this strategy is not effective in reducing migration. In fact it increases migration especially for the educated group. However, by increasing employment in urban areas more than migration, this strategy does reduce urban unemployment.

Increased Agricultural Productivity

Agricultural output can be increased by either increasing the number of acreage under cultivation or by increasing output per unit of constraining resource. In the case of Sierra Leone, labor in rural areas is a constraint to increased output. Government can increase labor productivity by increasing investment and improving skills. Government also can encourage the adoption of modern farm inputs such as higher yielding varieties, fertilizer and insecticides. In this run labor productivity in agricultural sectors is increased by 5 percent over the base run. According to Spencer's (1975) study of rice production in Sierra Leone, the productivity increase is equivalent to about 20 percent of the rice farmers using fertilizer.

Total GDP under this strategy increases from Le 593.1 million in the base run to Le 600.1 million or an increase in the rate of growth of GDP from 4.7 percent to 4.9 percent per annum. Most of this increase in GDP is in the rural area where the rate of growth of GDP increases from 4.4 percent to 4.9 percent per annum. GDP in the small-urban areas increases a little while in the large-urban areas GDP is stable.

This strategy has the greatest impact on value added in the agricultural sector which increases from Le 155.1 million in the base run to Le 163.3 million, or an increase in average annual growth rate of value added from 3.9 percent to 4.8 percent. This increase in labor productivity

in the agricultural sectors helps to alleviate the labor supply constraint in rural area. The shadow price of unemployment labor in rural area decreases from Le 153.5 in the base run to Le 137.7 under this strategy.

Within the small-scale nonagricultural sector, small-scale manufacturing value added in all regions increases and can be attributed to both demand and supply linkages. On the demand side consumption demand for the small-scale manufacturing sector increases due to an increase in income of rural population. An increase in output in the agricultural sector increases intermediate demand for small-scale manufacturing output. On the supply side, the increased labor productivity in agricultural sectors partly releases some labor for the rural small-scale manufacturing sector.

Value added in large-scale sectors is unaffected. On the supply side the constraint to increased output is foreign exchange. The shadow price of foreign exchange increases from Le 1.56 in the base run to Le 1.65, indicating that foreign exchange is more constraining under this strategy. On the demand side, there are very few interindustry linkages between the agricultural sector and the large-scale nonagricultural sectors. Hence, though agricultural output increases, it does not increase interindustry demand for large-scale nonagricultural output. Since the large-scale sectors contribute most towards large-urban GDP, this explains why this stategy has no impact on the rate of growth of GDP in large-urban area.

Average annual rate of growth of total employment is the same in the base run. It has no impact on employment in the agricultural sectors. Increased labor productivity makes it possible to increase agricultural output. Small-scale nonagricultural employment increases due to an

increase in employment in the rural small-scale manufacturing sector. An increase in employment in the small-scale manufacturing sector in rural area is made possible by reducing migration from rural areas. The strategy has no impact on employment in the large-scale sectors since output in this sector does not expand.

This strategy does not have a significant impact on urban employment, since employment in the large-scale sectors does not increase. Increases in employment in the small-scale nonagricultural sector are confined mostly to small-scale rural manufacturing.

Migration to urban areas decreases from 49.1 thousand to 48.1 thousand or a decrease of 2 percent in migration from the base run. Although migration of both educational levels is reduced, most of the reduction is due to reduced migration to small-urban areas. This strategy increases rural wages from Le 13.2 in the base run to Le 13.6 due to the increase in labor productivity in the agricultural sectors. Since the expected urban wage is not affected, this reduces the expected wage differential for both educational levels and both urban regions. However the relative change in expected wage rate differential is small for the large-urban area because this differential is larger than in the small-urban area and most of the reduction in migration is due to decreased migration to small urban areas.

Unemployment in urban areas decreases particularly for the small-urban area. Unemployment in small-urban area decreases for both educational levels due to decreased migration to small-urban area. Since employment and migration do not change for the large-urban area, the unemployment rates are the same as in the base run. By increasing income

in rural area this strategy is effective in reducing migration and unemployment, particularly in the small urban areas.

Results of Strategies to Promote Labor-Intensive Nonagricultural Sectors

Employment can be generated by encouraging labor-intensive sectors. For example, small scale industries which are labor-intensive can be promoted, or production techniques in large-scale industry can be switched to utilize more labor.

Small-Scale Industry Promotion Policy

Small-scale industry can be promoted by increasing demand for its output. For example, government purchases of furniture and school uniforms can be produced in the small-scale sectors. In this run half of the government purchases of large-scale manufacturing products, or Le 2.5 million, are transferred to small-scale manufacturing.

This strategy increases total GDP very little. Value added by agricultural sectors is reduced slightly from Le 155.1 million in the base run to Le 154.7 million. This reduction in the agricultural sector's value added occurs because this policy does not alleviate the labor supply constraint in rural areas. Where a higher proportion of small-scale manufacturing products is from rural areas, this strategy reallocates labor from agricultural production to small-scale industry production.[1] The shadow price of labor in rural area increases from Le 153.5 in the base run to Le 157.3 indicating the labor supply is more constraining.

[1]Though the model shows competition between agricultural and nonagricultural activities in rural areas for labor, this is minimized by their complementarity in seasonal labor demands since the small-scale industry in rural areas employ labor in the agricultural slack season. This illustrates the importance of running the model with detailed agricultural sector and small-scale industry sector models which disaggregate labor demands by seasons (or months).

Value added by the small-scale nonagricultural sector increases from Le 125.4 million in the base run to Le 127.1 million or from an average annual growth rate of 5.0 percent under base run to 5.3 percent. This increase is due to increased government consumption of the small-scale manufacturing sector's output.

Value added by the large-scale sectors is reduced very little compared to the base run solution. It is interesting to note that though the government consumption from large-scale manufacturing is reduced by Le 2.5 million, the large-scale manufacturing sector's output is decreased by only Le 0.5 million. This is because the increased output in small-scale manufacturing, through linkages with large-scale sectors, compensates by increasing intermediate demand of the large-scale sector's output. The foreign exchange is still constraining. The shadow price of foreign exchange, however, decreases from Le 1.56 in the base run to Le 1.54 since the import requirements of small-scale sectors are less than large-scale sectors.

This policy increases the growth rate of employment from 3.9 percent in the base run to 4.0 percent per annum. Most of this increase is in the small-scale nonagricultural sectors when the average annual rate of growth of employment is increased from 5.0 percent in the base run to 5.5 percent. Within the small-scale sectors, most of the employment increase is directly in small-scale manufacturing where the average annual rate of growth of employment increases from 5.1 percent in the base run to 5.9 percent. There is also an increase in employment in other small-scale nonagricultural sectors indirectly due to linkages between small-scale manufacturing and other small-scale sectors. Employment in large-scale sectors does not change much, though there is a slight decline in

employment in large-scale manufacturing. Since large-scale manufacturing is relatively less labor-intensive, its contribution towards total employment is so small that it has no impact on the large-scale sector's employment.

Urban employment increases due to increased employment in the small-scale nonagricultural sectors (including small-scale trade and transport). Though employment increases for both educational groups, it increases more for the uneducated. This is because most of the expansion in employment is in the small-scale nonagricultural sectors which employ a higher proportion of uneducated compared to educated persons.

Migration to urban areas increases very little from 49.1 thousand in the base run to 49.6 thousand. Most of the increased migration is by uneducated persons. Under this policy employment in the small-scale nonagricultural sectors, which hire proportionately more uneducated compared to educated, is increased. This increases the probability of finding a job in small-scale sectors and increases the expected urban wage compared to the base run. However the expected urban wage increases very little because wage for small-scale nonagricultural sectors is low. Since rural wage rate does not change, the expected wage differential increases, particularly for the uneducated.

Urban unemployment goes down from 20.8 percent in the base run to 20.5 percent. However, the reduction in the unemployment rate for the uneducated is more than for the educated. This is because most of the increase in employment is in the small-scale nonagricultural sectors which employ a higher proportion of uneducated persons. Increase in uneducated employment more than compensates for the increased migration of the uneducated.

Switch to Labor-Intensive Techniques of Production in Large-Scale Industry

In this run the capital/labor ratio in the large-scale manufacturing sector is reduced to represent a switch to more labor-intensive techniques in establishing new manufacturing plants.[1]

Total GDP increases from Le 593.1 million in base run to Le 595.2 million. Most of the increase in GDP is in the urban areas. Value added in the agricultural sectors is unaffected since this strategy does not increase labor supply in rural areas, which constrains output of agricultural sectors. Value added in both small- and large-scale nonagricultural sectors increases, though most of the increase is in the large-scale sectors. This increased output in the nonagricultural sectors, particularly in the large-scale sectors, is due to a lowering of investment requirements in the large-scale manufacturing sector. This releases some foreign exchange because of decreased imports of the investment goods required in large-scale manufacturing.

Total employment in this run is increased very little. Employment in the agricultural sectors is not affected. Employment in both small- and large-scale nonagricultural sectors increases, though most of the increase is in the small-scale sectors. Though the value added in the small-scale nonagriculture sectors increases relatively less than the increase in the large-scale nonagricultural sectors, the more labor-intensive nature of production in the small-scale nonagricultural sectors causes employment to increase there. Increases in large-scale manufacturing employment due to increased labor-intensive techniques do not have

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[1]Capital/output ratio is decreased and labor/output ratio is increased by 20 percent over the base run.

significant impact on total large-scale sector employment since the relative contribution of large-scale manufacturing employment towards total employment in the large-scale sectors is small.

Employment in urban areas increases very little from 285.3 thousand in the base run to 285.9 thousand or an increase in average annual growth rate of urban employment from 3.9 percent to 4.0 percent. Employment increases for both educational groups, though it is slightly more for the uneducated since most of the employment expansion is in the small-scale sectors.

Migration to urban areas increases from 49.1 thousand in the base run to 49.9 thousand. Migration to the small urban area increases most. This strategy increases employment in the small-scale sectors and increases the probability of finding an urban job. Thus the expected urban wage increases, particularly in the small-urban area where employment increases more than in the large-urban area. The rural wage does not change and therefore the expected wage differential, particularly in small urban area, increases. Thus migration increases, especially of the educated. Migration of the educated to small urban area increases from 2.7 thousand in the base run to 3.2 thousand.

Urban unemployment is practically the same as in the base run because, though employment increases, there is also an increase in migration and the unemployment situation does not change.

Results of Increased Foreign Capital Inflow

Where foreign exchange is a constraint to output and employment, increased foreign capital inflow can allow the economy to grow faster. Increased foreign exchange can result from a larger volume of bilateral and multilateral assistance or by increased private investment.

In this run foreign exchange was increased from Le 30.0 million in the base run to Le 36.0 million or an increase of 20 percent in foreign exchange over the base run, resulting from larger volume of foreign assistance.

Total GDP increases from Le 593.1 million in the base run to Le 602.4 million or an increase in annual average growth rate from 4.7 percent to 5.0 percent. Most of this increase in total GDP is in the urban areas. In the small-urban area GDP increases from Le 105.7 million in the base run to Le 108.4 million or an increase in annual average growth rate from 5.4 percent to 5.9 percent. GDP in the large-urban area increases from Le 257.1 million in the base run to Le 262.7 million or an increase in average annual growth rate from 4.7 percent to 5.2 percent.

There is no impact on growth rate of value added in the agricultural sectors, since the constraint on increased agricultural output is labor supply in the rural areas. The shadow price of labor in rural areas increases from Le 153.5 in the base run to Le 159.5 indicating that the labor supply constraint is more binding. The main impact of this policy is on value added in the nonagricultural sector. The small-scale nonagricultural sector's value added increases from Le 125.4 million in the base run to Le 127.7 million or an increase in average annual growth rate from 5.0 percent to 5.4 percent. Value added in the large-scale sectors increases from 252.8 million in the base run to Le 260.2 million or an increase in the average annual growth rate from 4.6 percent to 5.2 percent. This is so because, on the supply side, the constraint on output of the nonagricultural sectors is foreign exchange and the increased foreign exchange relaxes this constraint. However the foreign exchange constraint is still binding. On the demand side there is an increase

in consumption demand for large-scale nonagricultural consumer goods due to increased income of the large urban population who have higher income elasticity for products from the large-scale nonagricultural sectors.

The average annual rate of growth of total employment is increased from 3.9 percent in the base run to 4.0 percent. The average annual growth rate of employment increases from 5.0 percent in the base run to 5.4 percent in the small-scale nonagricultural sectors and from 2.2 percent to 2.6 percent in the large-scale sectors. This is because most of the increase in value added under this policy occurs in the nonagricultural sectors.

Employment in urban areas increases from 285.3 thousand in the base run to 289.5 thousand or an increase in the average annual rate of growth of urban employment from 3.9 percent to 4.2 percent. Though employment in both urban areas increases, the increase is more in the large-urban area. This is because under this strategy, employment increases in both the small-scale nonagricultural and large-scale sectors and a higher proportion of large-scale sectors is in large-urban area.

Migration to urban areas increases from 49.1 thousand in the base run to 52.8 thousand or an increase of 7.5 percent in migration above the base run. Though the strategy affects migration of both educational groups, there is a greater increase for migration of the educated. By increasing employment in the nonagricultural sectors, it increases the probability of finding an urban job in both the small-scale and large-scale sectors. This increased probability of finding an urban job increases expected urban wage. Since rural wage rate is unchanged, this increases the expected wage differential. Migration of educated persons increases more because, not only has the expected wage differential

increased, but also because the educated have a higher elasticity of migration with respect to expected wage differentials.

Urban unemployment goes down from 20.8 percent in the base run to 19.6 percent. The increase in employment more than compensates for increased migration. Unemployment decreases more in the large-urban area because employment increases more in that area.

Discussion of the Results

By explicitly considering intra- and inter-sectoral and regional interactions in both the product and factor markets as they affect output, employment and migration add strength to the model results. In addition to considering various interactions, a major strength of this study is that it is based on an aggregated information from a comprehensive set of primary data generated in field surveys, unlike most applied macro economic models which have depended on secondary data which are notoriously poor for small-scale sectors.

The projection of the Sierra Leone economy under current policies indicates that despite the favorable growth rate and a slight decrease in migration, urban unemployment will increase. This underscores the importance of development strategies designed to increase employment. In the policy runs, the impact of various development strategies were examined with emphasis on how they would affect output, employment and migration.

The impact of agricultural development strategies depend upon the type of agricultural policy adopted. The differential impact arises in part due to impact on supply and demand linkages between agriculture and other sectors of the economy. On the demand side, the intermediate demand

linkages between agricultural and nonagricultural sectors, particularly large-scale nonagricultural sectors are quite weak since agriculture uses relatively few purchased inputs. The strongest demand linkage occurs through consumption purchases by rural population particularly for small-scale nonagricultural products. There are also important linkages on the supply side through competition between agricultural sectors and nonagricultural sectors for capital, labor and foreign exchange. The export promotion strategy favored large-scale sectors as it increases foreign exchange availability which enables large-scale sectors to expand. Since migration is responsive to employment expansion in this relatively high wage urban sector, the policy increases migration. However, increase in urban employment more than offset increased migration and urban unemployment decreased. In contrast, increased agricultural productivity reduced migration by increasing rural income. However, the policy did not affect urban employment and urban unemployment was not significantly affected. This illustrates the importance of being explicit about the type of agricultural policy one is referring to when talking about agricultural development. The importance of understanding how various policies affect output, employment and migration was also demonstrated by other policies which were examined.

Lastly based on the policies examined, the results showed that there are no major conflicts between output and employment objectives at the macro level. In fact the results obtained under alternative projection run maximizing total employment indicated no trade offs between output and employment. This is largely because (a) on the demand side, the consumption demand by rural population have high income elasticities of demand for labor intensive sector products. This consumption demand

linkage is important because consumption is the largest component of total demand and rural consumers account for a very high proportion of total consumption and (b) on the supply side, the more labor intensive sectors are also efficient users of scarce capital and foreign exchange. Thus the potential for designing development strategy that increases both employment and output cannot be overemphasized.

VII. SUMMARY AND CONCLUSIONS

The objectives of this research were to develop an improved analytic framework for analysis of the relationship between output, employment and migration at the macro level, and to apply the framework to the Sierra Leone economy using primary data to examine both the growth, migration and employment prospects of the economy and the implications for output, employment and migration of a number of alternative development strategies.

The research was motivated by (i) current situation of increasing unemployment in the urban areas, with rural urban migration continuing in spite of high and rising unemployment, and (ii) a lack of an existing framework to analyze the problems of output, employment and migration at the macro level. The Sierra Leone economy was selected because of both the availability of data and the fact that the economy has many features common to developing countries. In the first section of this chapter a summary of the model framework is presented followed by conclusions on the effects of various development strategies on output, employment and migration. Some policy guidelines for increasing output and employment are given in the third section. Suggestions for future research are presented in the last section.

Summary of the Model Framework

In order to analyze output, employment and migration at the macro level, a realistic disaggregation of the economy is important. In this

study an improved framework is proposed which has a higher degree of disaggregation and takes into account explicitly interactions in both the product and factor markets. In contrast to conventional macro economic models, the product market is disaggregated by both the type of output (agriculture and nonagriculture) and by scale of operation (small- and large-scale). This disaggregation by type of output and scale of operation captures duality within duality, i.e., there is not only duality between agriculture and nonagriculture but also within the nonagriculture economy. That is, small-scale labor-intensive traditional firms exist together with large-scale capital-intensive modern firms. Hence it is possible to analyze interactions between agriculture (primarily small-scale), small-scale noangricultural, and large-scale nonagricultural sectors rather than agricultural/nonagricultural sectors as traditionally analyzed. The product market is further disaggregated by location into rural and urban areas to capture interactions between them. Urban areas are further disaggregated by size since the product and labor market conditions are different.

The proposed framework facilitates analysis of several types of linkages. On the supply side, the linkages arise through intra-regional competition for labor between the agricultural and nonagricultural sectors in the rural area, and through inter-regional competition for labor between rural and urban areas. There is also intersectoral competition between agriculture, small-scale nonagriculture and large-scale nonagriculture for capital and foreign exchange. On the demand side, there are intersectoral linkages between the agricultural and nonagricultural sectors (particularly small-scale sectors) due to demand for intermediate and investment goods and are represented by the input/output and investment/output matrix. Secondly, demand linkages through consumption

by different population groups are important and are represented by the income elasticities for sectoral outputs.

Particular attention also has been given to the modelling of the labor market. Based on disaggregation of the product market into small-scale and large-scale, the labor market is disaggregated into the small-scale sector where wages are determined competitively and the large-scale sector where wages are fixed exogenously. A further refinement is introduced into the labor market by disaggregating the labor force by educational levels to reflect different supply and demand conditions for different educational levels. The rural-urban disaggregation of the product market also facilitated the linkage between the macro model and migration model and, thereby, captures interactions in the labor market between regions. Migration between rural and urban areas occurs in response to the differential between competitively determined rural wage rate and expected urban wage.

The expected urban wage is defined as the sum of the weighted wage rates in small- and large-scale sectors in urban areas, the weights being the probabilities of finding an urban job in each sector. For computing probabilities of finding an urban job, a high job turnover is assumed in the small-scale sector, while a low job turnover is assumed in the large-scale sector. This emphasis on intra-sectoral and inter-sectoral relationships in both the product and factor markets as they affect output, employment and migration adds strength to model results.

Conclusions on the Effects of Various Development Strategies on Output, Employment and Migration

The models were run using an aggregated information from a comprehensive set of primary data generated by field surveys in contrast to most applied planning/policy models which have depended largely on

secondary data which are notoriously poor for small-scale sectors. The projection of the Sierra Leone economy under current policies indicates a favorable growth rate and a slight decrease in migration, but increased urban unemployment. This underscores the importance of development strategies which increase employment. In the policy runs the impact of various development strategies was examined with emphasis on how they would affect output, employment and migration.

The first group of policies examined were impact of agricultural development strategies. The impact differed depending upon the policies adopted. In the export promotion strategy the largest increase in output occurs in the large-scale nonagricultural sectors due to increased foreign exchange from increased agricultural exports. Employment increases in urban areas. As a result, migration to urban areas increases. However, the increase in urban employment more than offsets the increase in migration resulting in a slight decline in urban unemployment. In contrast, increasing agricultural productivity has the greatest impact on increasing output in the agricultural sector. The increased rural income reduces expected urban wage differentials resulting in decreased rural urban migration. Consequently, unemployment in urban areas decreases. This illustrates the importance of understanding how various agricultural development policies affect rural urban migration and urban unemployment.

The second group of policies included promotion of labor-intensive nonagricultural sectors. The impact again depends on the type of policy selected. In the case of small-scale industry promotion policy, output in the small-scale nonagricultural sector increases and output in the large-scale sector declines. Urban employment increases as a result of the transfer in demand to labor-intensive sectors. There is some

increase in migration. Overall urban employment increases more than migration resulting in a decline in urban unemployment. In the case of a policy to switch to labor-intensive techniques of production in large-scale industry, output in the large-scale sectors increases. There is a proportionate increase in both employment and migration, and the unemployment situation does not change in urban areas.

The increased foreign capital inflow increases the large-scale sector's output most. The increase in employment in urban areas increases migration. However the increase in urban employment is more than the increase in migration, resulting in a decline in urban unemployment especially for uneducated persons.

It was observed that the policies examined have different impacts on GDP by regions. However there was no trade-off between increasing incomes in rural and urban areas. Policies that increased GDP in one area either also increased incomes in other area or had no significant impact and did not reduce income in other areas. The policies also had different impacts on employment distribution and migration by urban size and education level. The results did indicate that there is no trade-off between increasing aggregate GDP and total employment. Policies that increase employment also increase aggregate GDP. In fact the results obtained under an alternative projection run which maximized total employment indicated no trade-offs between output and employment. This is largely because on the demand side, the consumption demand by the rural population have high income elasticities for labor-intensive products. This consumption demand linkage is important because consumption is the largest component of total demand and rural consumers account for very high proportion of total consumption. On the supply side, the more

labor-intensive sectors are also efficient users of scarce foreign exchange and capital.

Some Policy Guidelines for Increasing Output and Employment

The model results indicate that despite the favorable rate of growth of GDP and slight decline in migration, there is no relief from unemployment if current policies are continued. The results illustrate the need for policies that increase employment. An important finding of this study is that at the macro level there is no trade-off between increased output and employment and there is thus a great potential for designing development strategies which increase both growth and employment. Some policy guidelines for increasing output and employment, based on empirical evidence reviewed in Chapter II and the model solutions, are presented in this section. The main emphasis is on the type of industrial composition of the aggregate output and production technology utilized.

Agricultural Development

With a high rate of population growth and a projected decline in migration, the majority of the population will remain in the rural areas. Agricultural development strategy can be pursued to increase rural income per se.

The econometric analysis of migration in Chapter IV showed that the rate of migration is responsive to the rural-urban wage differential. Agricultural development by reducing rural-urban income differentials also should help in reducing migration. The econometric analysis of migration showed that there is a significant difference between educated and uneducated persons' response to changes in income. The rate of migration with respect to rural income is more inelastic for the educated.

Raising rural incomes is, therefore, not very effective in reducing migration, particularly of the educated. The policy analysis showed that different agricultural development policies have different impacts on migration. For example, the strategy of increasing agricultural productivity is effective in reducing migration in contrast to the export promotion strategy which is ineffective in reducing migration.

Increasing agricultural income would facilitate a product mix change, i.e., increasing the share of labor-intensive products in total output. The study showed strong consumption demand linkages between the rural population and the small-scale nonagricultural sector which can be exploited by agricultural development policies. For example, increasing agricultural productivity strategy by increasing incomes of the rural population increased consumption demand for small-scale nonagricultural output since rural populations have higher income elasticities for labor-intensive small-scale nonagricultural sector products. The increased output of small-scale nonagricultural products increased employment.

An added advantage of the agricultural development strategy, particularly increasing agricultural productivity, is reduced imports of basic food staples. Besides encouraging independence in food production, the strategy also would help alleviate foreign exchange constraint.

Small-Scale Industry in Rural Areas

The small-scale nonagricultural sector represents a vital part of the rural economy. This should be encouraged for employment generation particularly during the slack agricultural periods. If employment opportunities for trained manpower can be created and the rate of return to education in rural areas increased, this would help reduce migration of educated people.

Large-Scale Sectors

Experience has shown that the large-scale sectors using the existing capital-intensive technology cannot be relied upon to create significant employment. In Sierra Leone, though the large-scale sectors account for about 43.0 percent of total GDP, they contribute only about 7.0 percent towards total employment. The model projects the rate of growth of employment in this sector to be the lowest compared to other sectors. In spite of the favorable rate of growth of value added in this sector, which is projected to increase at an average annual rate of growth of 4.6 percent, employment in the sector is projected to increase at an average annual rate of 2.2 percent. However adjustments can be made to increase labor absorption in this sector. To do this policies which distort factor prices and work against labor intensity should be eliminated. For example, investment allowances and differential import tariffs on capital goods, which are at present imported duty free, should be abolished. In a policy run where capital-labor ratio in large scale manufacturing sector was reduced to represent a switch to more labor intensive technique in establishing new manufacturing plants, employment increased compared to base run.

Small-Scale Industry in Urban Areas

This is the sector where a major portion of the urban society earns income and where there is potential for employment generation. Accordingly, this sector should be encouraged. The intermediate and investment demand linkages between the agricultural sector and the small-scale nonagricultural sectors which are weak at present should be strengthened. For example industries producing output demanded by the agricultural sector

as intermediate and investment inputs, such as small farm equipment, should be encouraged.

Suggestions for Future Research

There are many directions in which the model could be extended to make it more useful. In this study the labor force is disaggregated by educational level. A further disaggregation probably should include skill categories. Under a strong assumption that the educated are skilled and the uneducated unskilled, this may not be a major limitation. However the synonymity of the educated with skill seems unrealistic and the models could be improved upon by incorporating skill disaggregation.

The models also can be refined by incorporating income distribution within regions. Though the models are disaggregated by three geographical regions, population could be further disaggregated by income classes within each region. Income distribution within each region can be incorporated by means of a data relating the distribution of income generated to different classes of income groups in each location to sectoral output.

The models are useful for analyzing output, employment and migration at the macro level. However their real usefulness lies in their ability to interact with detailed sector-specific models for those interested in analyzing sectors in a broader, macro economic framework. It is suggested that the models be run with detailed sector specific models.

Lastly, although the models are applied to Sierra Leone, they are of general applicability to other developing economies. The models are limited to short- and medium-run policy analyses from 5 to 10 years. On the supply side of the labor market, total labor supply is determined by (a) a natural rate of growth of population, (b) population distribution

as determined by migration, and (c) the labor force participation rates. In this study, the growth rate of population is given exogenously. Labor force participation rates specific by age-sex cohorts are assumed constant between the two periods. Population distribution is determined endogenously in the migration model. Since the planning horizon is medium-term (seven years) constancy of the labor force participation rate is a safe assumption. In the short- and medium-run, labor supply is probably most affected by migration which is endogenously treated. For long-run analysis, population growth should be incorporated into the model.

BIBLIOGRAPHY

BIBLIOGRAPHY

Adelman, I. and E. Thorbecke. 1966. The Theory and Design of Economic Development, Johns Hopkins Press, Baltimore.

Barnum, H. N. and R. H. Sabot. 1975. Migration Education and Urban Surplus Labor, OECD Development Center, Paris.

Beals, R. E., M. B. Levi and L. H. Moses. 1967. "Rationality and Migration in Ghana," The Review of Economics and Statistics, 49(4).

Bruno, M. 1966. "A Programming Model for Israel," in The Theory and Design of Economic Development edited by I. Adelman and E. Thorbecke, Baltimore.

Byerlee, Derek. 1971. "Agricultural Development and Urban Unemployment: A Simulation Analysis of the Nigerian Economy," Unpublished Ph.D. dissertation, Oregon State University.

_____. 1972. "Research on Migration in Africa: Past, Present and Future," African Rural Employment Paper No. 2, Department of Agricultural Economics, Michigan State University, East Lansing.

_____. 1974. "Rural-Urban Migration in Africa: Theory, Policy and Research Implications," International Migration Review, Vol. 8.

Byerlee, Derek and Carl K. Eicher. 1974. "Rural Employment, Migration and Economic Development; Theoretical Issues and Empirical Evidence from Africa," Agricultural Policy in Low Income Nations (ed.) Nurual Islam. London: McMillan.

Byerlee, Derek and Joseph Tommy. 1975. "Rural-Urban Migration, Development Policy and Planning," Population Sourcebook for Africa. African Social Research Institute (forthcoming): Nairobi.

Byerlee, D., J. Tommy and H. Fatoo. 1976. "Rural-Urban Migration in Sierra Leone: Determinants and Policy Implications," African Rural Employment Paper No. 13, Department of Agricultural Economics, Michigan State University, East Lansing.

Chenery, H. B. and P. Clark. 1962. Interindustry Economics, New York, Wiley and Sons.

Chuta, E. and C. Liedholm. 1975. "The Role of Small Scale Industry in Employment Generation and Rural Development: Initial Research Results from Sierra Leone," African Rural Employment Paper No. 11, Department of Agricultural Economics, Michigan State University, East Lansing.

DeHaen, H., Derek Byerlee and D. S. Spencer. 1974. "Preliminary Formulations of Policy Models of the Sierra Leone Economy Emphasizing the Rural Sectors," African Rural Economy Working Paper No. 3, Department of Agricultural Economics, Michigan State University, East Lansing.

Diejomaoh, V. P. and W. A. T. Orimalade. 1971. "Unemployment in Nigeria: An Economic Analysis of Scop, Trends and Policy Issues," The Nigerian Journal of Economic and Social Studies, 13(2).

Eicher, Carl K., et al. 1970. "Employment Generation in African Agriculture," Research Report No. 9, Institute of International Agriculture, Michigan State University.

Essang, S. M. and A. F. Mabawonku. 1974. "Determinants and Impact of Rural-Urban Migration: A Case Study of Selected Communities in Western Nigeria," African Rural Employment Paper No. 10, Department of Agricultural Economics, Michigan State University, East Lansing.

Fei, J. C. H. and Ranis, G. 1964. Development of the Labor-Surplus Economy: Theory and Policy. Homewood, Illinois: Irwin, Inc.

Frank, C. R. 1967. "Industrialization and Employment Generation in Nigeria," Nigerian Journal of Economic and Social Sciences.

_____. 1971. "The Problem of Urban Unemployment in Africa," Employment and Unemployment Problems of the Near East and South Asia. Ridker R. and H. Lubell (eds.). Delhi: Vikas Pub.

Ghai, Dharam D. 1968. "Incomes Policy in Kenya: Need, Criteria and Machinery." East African Economic Review, 4(1).

Ghai, Dharam P. 1970. "Employment Performance, Prosepcts and Policies in Kenya, East African Journal, 7(1).

Greenwood, Michael J. 1969. "The Determinants of Labor Migration in Egypt," Journal of Regional Science, Vol. 9.

Hansen, B. 19699. "Marginal Productivity, Wage Theory and Subsistence Wage Theory in Egyptian Agriculture," Journal of Development Studies, 2(4).

_____. 1969. "Employment and Wage in Rural Egypt," American Economic Review, 59(3).

Harris, J. R. and M. Todaro. 1970. "Migration, Unemployment and Development: A Two Sector Analysis," The American Economic Review, 17(4).

Hazari, B. R. and J. Krishnamurty. 1970. "Employment Implications of India's Industrialization: Analysis in an Input-Output Framework," Review of Economic and Statistics.

ILO. 1970. Yearbook of Labor Statistics. ILO, Geneva.

ILO. 1971. Labor Force Projections, 1965-1985 Africa, ILO, Geneva.

ILO. 1973. Towards Full Employment: A Programme for Colombia, Geneva.

ILO. 1974. Employment, Incomes and Equity: A Strategy for Increasing Productive Employment in Kenya, Geneva.

Jorgenson, D. W. 1961. "The Development of a Dual Economy," Economic Journal, Vol. 71.

Kilby, Peter. 1967. "Industrial Relations and Wage Determination: Failure of the Anglo-Saxon Model," The Journal of Developing Areas, 1(4).

Knight, J. B. 1967. "The Determination of Wages and Salaries in Uganda," Bulletin of the Oxford University of Economics and Statistics, 29(93).

_____. 1971. "Measuring Urban-Rural Income Differentials," Paper presented to the Conference on Urban Unemployment in Africa, Institute of Development Studies, University of Sussex.

_____. 1972. "Rural-Urban Income Comparisons and Migration in Ghana." Bulletin of the Oxford University Institute of Economics and Statistics, 34(2).

Levi, J. F. S. 1973. "Migration from the Land and Urban Unemployment in Sierra Leone," Oxford Bulletin of Economics and Statistics.

Levy, M. and W. Wadycki. 1974. "Education and the Decision to Migrate: An Econometric Analysis of Migration in Venezuela," Econometrica Vol. 42.

Lewis, A. 1954. "Economic Development with Unlimited Supplies of Labor," Manchester School of Economics and Social Studies, Vol. 22.

Liedholm, Carl and E. J. Chuta. 1976. "Economic Analysis of Small-Scale Industry in Sierra Leone." African Rural Economy Working Paper No. 14, Department of Agricultural Economics, Michigan State University, East Lansing.

Linsenmeyer, Dean. 1976. "Economic Analysis of Alternative Strategies for the Development of Sierra Leone Marine Fisheries," Unpublished Ph.D. dissertation, Michigan State University.

Mabagunje, Akin. 1970. "Migration Policy and Regional Development in Nigeria," The Nigerian Journal of Economic and Social Studies, Vol. Vol. 12.

Mazumdar, D. 1968. "Size of Farm and Productivity: A Problem of Indian Peasant Agriculture," Economica, New Series, Vol. 32.

Norman, David W. 1973. "Economic Analysis of Agricultural Production and Labor Utilization Among the Hausa in the North of Nigeria," African Rural Employment Paper No. 4, Department of Agricultural Economics, Michigan State University, East Lansing.

Oshima, H. T. 1971. "Labor Force 'Explosion' and the Labor-Intensive Sector in Asian Growth," Economic Development and Cultural Change, 19(1).

Rempel, Henry. 1970. "Labor Migration into Urban Centers and Urban Employment in Kenya," Unpublished Ph.D. dissertation, Madison: University of Wisconsin.

Reynolds, L. G. 1969. "Economic Development with Surplus Labor: Some Complications," Oxford Economic Papers, 21(1).

Sabolo, Y. 1969. "Sectoral Employment Growth: The Outlook for 1980," International Labor Review, 100(5).

Sabot, R. H. 1971. "Urban Migration in Tanzania," Unpublished paper, Economic Research Bureau, University of Dar es Salaam, Tanzania.

_____. 1971. "Education, Income Distribution and Urban Migration in Tanzania," Unpublished paper, Economic Research Bureau, University of Dar es Salaam, Tanzania.

Sahota, Gian S. 1968. "An Economic Analysis of Internal Migration in Brazil," The Journal of Political Economy, 76(2).

Sandee, Jan. 1969. "A Programming Model for a Dual Economy," in E. Thorbecke (ed.), The Role of Agriculture in Economic Development, New York.

Saylor, R. G. 1967. The Economic System of Sierra Leone, Duke University Press, Durham, North Carolina.

Schultz, T. W. 1964. Transforming Traditional Agriculture, New Haven, Yale University Press.

Sierra Leone, Government of. "National Accounts of Sierra Leone, 1964/65-1970/71.

_____. Household Statistical Survey of Sierra Leone," Central Statistics Office, 1968, 1973.

_____. 1974. "Budget Speech by Minister of Finance, Honorable C. A. Kamara-Taylor," Government Printer, Freetown.

_____. 1974. "Ten Year Development Plan," Central Planning Unit, Ministry of Development and Economic Planning.

_____. 1974. National Development 1974/75 to 1978/79, Government Printer, Freetown.

Singh, S. K. 1969. Aggregate Employment Functions: Evaluation of Employment Prospects in LDC's, IBRD, Basic Research Center Working Paper.

Sjaastad, Larry A. 1962. "The Costs and Returns of Human Migration," Journal of Political Economy, 70(1).

Spencer, Dunstan. 1975. Economics of Rice Production in Sierra Leone 1. Upland Rice, Bulletin No. 1, Department of Agricultural Economics and Extension, Njala University College, Njala, Sierra Leone.

Spencer, D. and Derek Byerlee. 1976. "Small Farmers in West Africa: Employment, Productivity and Incomes in Sierra Leone," African Rural Economy Paper, Dept. of Agricultural Economics, Michigan State University, East Lansing.

Thorbecke E. and A. Stoutjesdijk. 1970. Employment and Output, A Methodology Applied to Guatamala and Peru, OECD Development Center, Paris.

Todaro, Michael P. 1969. "A Model of Labor Migration and Urban Unemployment in Less Developed Countries," The American Economic Review, 59(1).

_____. 1971. "Income Expectations, Rural-Urban Migration and Employment in Africa," International Labor Review, 104(5).

Turnham, D. 1970. The Employment Problem in Less Developed Countries: A Review of Evidence, OECD, Paris.

Vander Kamp. 1972. "Return Migration: Its Significance and Behavior." Western Economic Journal, 10(4).

Wery, R., G. B. Rodgers, and M. D. Hopkins. 1974. "Bachue 2: Version-I. A Population and Employment Model for the Philippines," WEP Research, Population and Employment WP No. 5, ILO, Geneva.

Yap, L. 1976. "Internal Migration and Economic Development in Brazil, Quarterly Journal of Economics, Vol. XC, #1.