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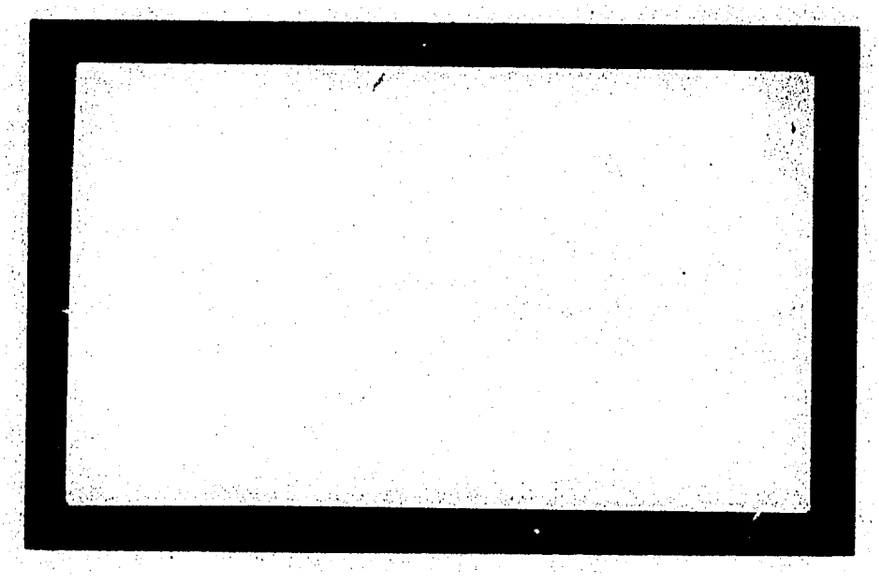

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EMPLOYMENT-OUTPUT CONFLICTS, FACTOR PRICE DISTORTIONS AND CHOICE OF TECHNIQUE: EMPIRICAL RESULTS FROM SIERRA LEONE

by

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EMPLOYMENT-OUTPUT CONFLICTS, FACTOR PRICE DISTORTIONS AND CHOICE OF TECHNIQUE: EMPIRICAL RESULTS FROM SIERRA LEONE†

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FOREWORD

The African Rural Economy Program was established in 1976 as an activity of Michigan State University's Department of Agricultural Economics. The African Rural Economy Program is a successor to the African Rural Employment Research Network which functioned over the 1971-1976 period.

The primary mission of the African Rural Economy Program is to further comparative analysis of the development process in Africa with emphasis on both micro and macro level research on the rural economy. The research program is carried out by faculty and students in the Department of Agricultural Economics in cooperation with researchers in African universities and government agencies. Specific examples of ongoing research are, "Poor Rural Households, Income Distribution and Technical Change in Sierra Leone and Nigeria," "Rural and Urban Small-Scale Industry in West Africa," "Dynamics of Female Participation in the Economic Development Process in West Africa," and "The Economics of Small Farmer Production and Marketing Systems in the Sahelian Zone of West Africa."

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I. INTRODUCTION

The purpose of this paper is to bring empirical evidence from a recently completed, comprehensive, micro-level survey of the major economic sectors of Sierra Leone[1] to bear on issues relating to the debate on the employment-output conflict. With the surge of interest in employment issues in developing countries in the 1970s, there has been considerable discussion of the extent to which there is a conflict between the employment and output objectives in the design of development strategies.[2] Much of this debate has centered on the question of choice of technique within the industrial sector and on whether or not factor price distortions have favored the choice of more capital-intensive techniques and reduced employment.[3]

There are several issues that are central to the debate on the employment and output trade-off. One of these issues is whether or not there is an array of alternative techniques or processes in use or potentially available within each sector or subsector of the economy. Factor price distortions, for example, only become relevant to the employment-output debate if alternative techniques of production are found to exist.

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[1]Sierra Leone is a small West African country of about three million people with an agriculturally-based economy employing over 70 percent of the population and generating 32 percent of the GNP. Mining is a second important sector, accounting for 17 percent of GNP; this sector is not examined in this study because of the difficulties of obtaining reliable information on diamond mining where illegal mining operators are common. The manufacturing sector consists of a few large-scale firms usually producing for import substitution and a wide range of small-scale firms. Historically, government policy has implicitly emphasized expansion of the large-scale sectors.

[2]See the reviews by Baer and Hervé (1966), and Morawetz (1974), and more recently, by White (1978). See also the discussions by Pack (1974), Steel (1970), and Stewart and Streeten (1971).

[3]See, for example, the reports of the ILO employment missions to Columbia and Kenya (ILO, 1970, 1972).

There have been two main approaches used to examine this particular issue empirically. One of these approaches has been to measure, by means of econometric estimations of aggregate production functions, the elasticity of substitution between capital and labor. Although most such studies have concluded that considerable substitution possibilities do exist (Gaude, 1975), there are serious methodological difficulties with most of these studies due to the aggregate nature of the variables used and to the use of functional forms which assume a constant elasticity of substitution (Morawetz, 1974 and O'Herlihy, 1972). Moreover, only techniques currently in use can be examined by this approach.

A second approach has been to delineate the main production techniques and processes in a given industry by using micro-level data to estimate the labor intensity of both existing and potential production techniques.[4] These studies have generally shown a potential array of techniques of varying labor intensity although the most labor-intensive techniques are not always the most efficient users of capital (e.g., Bhalla, 1965; Baron, 1975). However, almost all of these studies have been confined to the industrial or processing sectors with little attention to other sectors of the economy, particularly agriculture. Moreover, within the industrial sector, the role of the more labor-intensive small-scale industries, particularly those in rural areas, has largely been overlooked (Morawetz, 1974).

Another issue bearing on the employment-output trade-off relates to the choice of product mix. Two questions are important in this regard. Firstly, there is the extent to which there exists an adequate consumer demand for products of labor-intensive industries. Some theoretical analyses argue that, in

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[4] See Bhalla (1975) and White (1978) for a collection of these types of studies.

fact, the demand elasticities for small-scale industrial products are low, if not negative (e.g., Hymer and Resnick, 1969). Secondly, a hypothesis underlying much recent literature on development strategies is that lower income groups consume more labor-intensive commodities — that is, a development strategy that promotes a more equitable income distribution increases the demand for labor-intensive commodities, and hence promotes employment. To date, the empirical evidence on both of these questions is limited and inconclusive (Soligo, 1972). Most studies have used aggregate commodity groups which do not delineate products produced by small-scale labor-intensive methods from similar products produced in large-scale sectors or abroad (Morawetz, 1975).

Finally, in a dynamic framework there are other issues bearing on the employment-output conflict. Analyses of both the question of choice of technique and product mix need to consider indirect as well as direct employment effects, since interindustry linkages vary with the type of product and production technique. Furthermore, if increased employment helps improve the income distribution of the poor, then there may be a reduction in savings rates and hence future output. There is, however, very little evidence concerning savings rates among different income groups in developing countries.

An understanding of all these issues is fundamental to the relative emphasis that should be given to the labor-intensive small-scale sectors or activities versus more capital-intensive, large-scale sectors or activities in designing development strategies to promote both output and employment. Consequently, in this paper, the micro-level data are analyzed within a sectoral disaggregation which preserves the small-scale and large-scale dichotomy in the economy. A small-scale activity or enterprise is defined as one employing less than fifty persons.

The analysis of these issues using Sierra Leone data is developed in the following sequence. First, we analyze rural demand patterns to determine the demand outlook for products from labor-intensive sectors and the variation of these demand patterns by income group. This analysis is based on a commodity classification using as a criterion the labor intensity of production method. We then turn to an examination of factor price distortions prevailing in the economy with particular reference to the variation in interest rates, wages, and tariffs between the small-scale and large-scale sectors. This leads to an examination of existing production techniques in agriculture, agricultural processing, fishing, and manufacturing sectors to analyze variations in labor intensity and efficiency of capital and foreign exchange use. The sensitivity of the choice among these techniques to changes in factor prices is analyzed by budget and linear programming methods. Finally, the dynamic questions of indirect employment linkages and savings rates are briefly discussed.

1.1. Sources of Data

Data employed in this analysis were collected through a nationwide survey in Sierra Leone during 1974/75.[5] In this survey, five hundred rural households were interviewed twice weekly over a twelve month period to obtain daily information on farm and nonfarm production and household consumption. In addition, some 60 firms in rice milling, the major agricultural processing sector, and 120 small-scale and large-scale firms in the fishing sector, another important rural sector, were interviewed twice weekly over the year. Finally, 250 small industrial firms in both rural and urban areas were surveyed by similar intensive procedures and, together with secondary data on

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[5]All values are expressed in the Sierra Leone currency, Leone, where 1 Leone = $ U.S. 1.10 at the time of the survey.

large-scale industries, provide an overview of production techniques in the industrial sector.

II. FACTOR INTENSITIES OF RURAL CONSUMER DEMAND PATTERNS

Demand patterns have potentially important implications for both employment and output.[6] On the one hand, if the demand for labor-intensive commodities is low, there may be a serious constraint on an employment-oriented strategy which stresses the development of labor-intensive sectors. On the other hand, the demand for labor commodities may be affected by the pattern of income distribution. A widely accepted hypothesis is that high income households tend to consume more capital-intensive goods and imports while low income households favor consumption of domestically produced labor-intensive commodities (e.g., ILO, 1970).

Expenditure elasticities for rural households in Sierra Leone were estimated using a ratio semi-log inverse model which allows the income elasticity to vary by income level and also preserves additivity of the marginal propensity to consume at each income level.[7] Estimates of expenditure elasticities together with labor/capital ratios for specific commodities are shown in table 1. At the mean income level, there is a tendency for the more labor-intensive food and small-scale industry products to have a lower elasticity of demand than the more capital-intensive items such as transport and large-scale manufacturing. However, these differences are not large and, in fact, most important labor-intensive commodities such as the staple food items

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[6]For more detailed reports, see Spencer and Byerlee (1976), Linsenmeyer (1976), Liedholm and Chuta (1976), Spencer et al. (1976), King and Byerlee (1978), and Byerlee et al. (1977).

[7]Mathematically, the ratio semi-log inverse is expressed as

$$\frac{C}{Y} = a + b_1 \ln Y + \frac{b_2}{Y}$$

where C is consumption and Y is income. In the final equation variables for household size and subsistence ratio were included (see King and Byerlee, 1978).

TABLE 1

AVERAGE PROPENSITIES TO CONSUME AND EXPENDITURE ELASTICITIES BY INCOME CLASS FOR COMMODITY GROUPS OF DIFFERENT LABOR INTENSITIES

Commodity	Labor/ Capital Ratio[a]	Average Propensity to consume[b]	Mean Income Level	Expenditure Elasticity By Income Class: Lowest Income Decile	Second & Third Decile	Fourth & Fifth Decile	Sixth & Seventh Decile	Eighth & Ninth Decile	Highest Income Decile
Rice	750.0	.394	.95	1.23	1.07	.98	.94	.91	.88
Other cereal and root crops	974.0	.082	.82	2.89	1.41	.98	.79	.61	.34
Fruits and vegetables	582.0	.029	.83	1.11	.94	.86	.80	.75	.68
Palm oil	306.0	.075	1.08	1.71	1.31	1.14	1.08	1.04	.99
Meat and livestock products	282.0	.016	1.84	.74	.30	1.23	1.92	2.03	1.87
Fish	23.0	.084	.81	1.43	1.07	.89	.80	.71	.60
Rural beverages and tobacco	635.0	.019	.58	.20	.22	.18	.67	1.15	1.51
Small-scale industry products	33.0	.023	.88	.79	.83	.89	.88	.92	.90
Large-scale industry products	1.1	.134	1.02	1.56	1.22	1.07	1.01	.96	.92
Transport	3.7	.022	1.42	.57	1.09	1.38	1.44	1.46	1.43
Education	66.0	.014	.67	.06	.10	.44	.68	.98	1.26
Services and ceremonial	435.0	.043	2.38	1.05	.37	2.32	2.37	2.15	1.90

SOURCE: King and Byerlee (1978).

[a]Actual man-hours labor input/Leone annual cost of capital.

[b]Average propensities to consume do not add to 1.00 because of the omission of minor and miscellaneous items.

have an expenditure elasticity approaching unity. Furthermore, for many of these labor-intensive commodity groups, particularly rice, fish, and small-scale industry products, there are substantial quantities of competing imports which further raises the potential for increased demand through import substitution.

To determine to what extent higher income households favor more capital-intensive and imported items, consumers were stratified into six income groups and expenditure elasticities computed by income group. Commonly consumed foods such as rice, root crops, palm oil, and fish do show falling expenditure elasticities as incomes rise, while "luxury" goods such as meat, transport, services, and ceremonies and education, all of which are generally more capital-intensive, have increasing expenditure elasticities (see table 1). As shown in table 2, marginal labor requirements decline and foreign exchange requirements increase as incomes increase in conformance with the hypothesized relationship between income and factor intensities. Capital requirements, however, fall slightly as incomes increase, a result that is the opposite of what is expected. To some extent, the drop in capital requirements can be explained by the fact that high income groups with a higher marginal propensity to consume imports, substitute imported goods for capital-intensive domestic goods. Moreover, since capital requirements are quite small, relative to foreign exchange, the total requirements for the scarce factors, capital and foreign exchange, increase over the income range in the order of 10-20 percent — much less than observed in other studies in Pakistan (Soligo, 1973). In large part this reflects a relatively equal income distribution in Sierra Leone, where the overall Gini coefficient in rural areas was .32.

Our analysis of rural consumption patterns suggests that employment-output conflicts embodied in the structure of consumption demands are minimal and, in fact, employment and output objectives are likely to be complimentary under a

TABLE 2

MARGINAL LABOR, CAPITAL AND FOREIGN EXCHANGE REQUIREMENTS FOR ADDITIONAL LEONE OF EXPENDITURE BY INCOME CLASS

	By Income Class						
	Lowest Income Decile	Second & Third Deciles	Fourth & Fifth Deciles	Sixth & Seventh Deciles	Eighth & Ninth Deciles	Highest Income Decile	Mean Income Level
Marginal Labor Requirements (Person hours/ Leone expended)	9.200	9.020	8.740	8.520	8.120	7.590	8.520
Marginal Capital Requirements (Leone annual cost/ Leone expended)	.051	.050	.049	.048	.047	.044	.048
Marginal Foreign Exchange Requirements (Leone/Leone expended)	.133	.137	.140	.142	.144	.147	.141

SOURCE: King and Byerlee (1978).

strategy to promote labor-intensive sectors and a more equitable income distribution. Moreover, these results do not consider urban consumption demands where, because of greater income disparities, the magnitude of these effects is likely to be greater.[8]

[8] A Gini coefficient of .56 was estimated for urban income distribution in Sierra Leone (see Eponou, 1978).

III. FACTOR MARKET DISTORTIONS

Analysts of employment issues have frequently cited "factor market distortions" as a major cause of unemployment. The price of capital is assumed to be lower than its opportunity cost because of subsidized interest rates and over-valued foreign exchange, while the price of labor is assumed to be higher than its opportunity cost because of institutionally fixed wages. Rarely do economists critically analyze these assertions and, in particular, disaggregate the economy to look at variation in factor prices within the economy. In this section, we examine factor prices prevailing in different economic sectors in Sierra Leone with emphasis on the small-scale/large-scale differentiation of the economy. The focus is on differences in prevailing factor prices rather than comparisons of actual and opportunity costs of a factor.

3.1. The Capital Market

At the time of our survey, we observed two distinct capital markets — the formal and informal markets. Formal lending institutions included commercial banks and the government operated National Development Bank. The private banks charged an interest rate of 12 percent on all loans, the maximum allowed by government regulation. Since the rate of inflation for the period was over 15 percent, the banks were actually charging a negative real interest rate. Not surprisingly, given these low returns, private banks lent largely to large-scale commercial firms on a short term basis although some loans were outstanding in the large-scale industrial sector. The National Development Bank also provided loans at low interest rates of 9 percent per annum but, at the time of the survey, the minimum loan offered by this bank was $7000.[9]

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[9]This limit has since been reduced to encourage application from more small-scale firms.

Again, the main recipients of these loans were firms in the large-scale sector with only a few recipient firms in the small-scale sector. In addition, large-scale firms, particularly foreign-owned, often had access to international sources of funding with interest rates of about 10 percent.

A few small-scale firms received loans at 9-12 percent interest rates through special credit agencies and agricultural development projects, but in our random sample of almost 1000 small-scale farmers, fishermen, rice processors, and small-scale industries, less than one percent had ever received a loan from a formal financial institution.

Small-scale firms depend largely on their own finances, loans from relatives and friends, and loans extended by traders on purchases. From the survey of small-scale fishermen, a detailed computation was made of the interest rate charged by private traders for the sale of outboard motors to fishermen (Linsenmeyer, 1976). The interest rate implicit in the terms of the sale was approximately 168 percent per annum. However, when adjustments are made for delayed or defaulted repayments, this interest rate reduced to 43 percent per annum.[10] Compared to an inflation rate of about 15 percent, this is not an unreasonable figure in a capital-short economy, but it is substantially higher than the interest rates paid by large-scale firms. In summary, small-scale firms paid substantially higher interest rates than did larger scale firms.

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[10]The formula Linsenmeyer employed was to solve for the rate of interest, r, in the equation:

$$P = (1 - d) \frac{A_1}{(1 + \frac{r}{12})} + \frac{A_2}{(1 + \frac{r}{12})^2} + \ldots + \frac{A_n}{(1 + \frac{r}{12})^n} + dgE$$

where P is the principle of the loan extended, A is the monthly repayment, d is the default rate, g is the probability of repossession if there is a default, E is the value of the motor at the time of the default, and n is the number of months to repay.

3.2. Import and Export Tariff Structure

Sectors which import equipment or intermediate inputs, or export their output, are affected by both the price of foreign exchange and tariffs and subsidies on imports and exports. In Sierra Leone, a small open economy with a small industrial base, almost all sectors are affected by these trade policies.

The import tariffs in table 3 show that small-scale firms pay substantially higher tariffs on imported inputs than large-scale firms pay. For example, tariff rates for sewing machine parts and outboard motors were on the order of 35 percent, which is similar to the rate for most noncompetitive imported consumer goods. On the other hand, large-scale firms enjoy low or zero tariffs on imported inputs through a Development Ordinance which allows duty-free imports of equipment and raw materials. Moreover, large-scale firms receive a high degree of protection with effective tariffs on competitive imports sometimes in excess of 100 percent. Finally, the government itself has duty-free privileges which encourages the use of imported equipment and inputs for its own activities.

Moreover, small-scale firms account for the bulk of production of agricultural exports such as coffee, palm oil, and cocoa. However, these small-scale firms pay a high tariff on exports. In 1974, the price paid by the Sierra Leone Produce Marketing Board to farmers was only 45, 48, and 75 percent respectively of the f.o.b. world market price for coffee, cocoa, and palm kernels. Some of this difference is due to transportation and marketing costs of delivering produce to the port, but a large part represents an implicit tariff on exports produced by small farmers.

At the time of the 1974 survey, foreign exchange was not rationed and there was no black market for foreign exchange. However, the tariff structure

TABLE 3

IMPORT DUTIES ON RAW MATERIALS AND EQUIPMENT AND COMPETITIVE IMPORTS FOR MAJOR INDUSTRIES IN SIERRA LEONE

Industry	Duties on Raw Materials and Equipment	Duties on Competitive Imports
Small-Scale Agriculture	Hand tools - 3%	Rice - Free Palm Oil - Free
Small-Scale Fishing	Nets - 36% Outboard Motors - 36%	Fish - 10%
Small-Scale Manufacturing		
Cloth and Clothing	Cotton Fabric - 22%* Needles, Buttons, Thread - 36% Sewing Machines - 16% Dyestuff - 36%	Dyed Cloth - 20%
Woodwork	Plywood - 36% Nails, Formica, Polish - 35%	
Metalwork		Hand Tools - 3%
Large-Scale Manufacturing		
Brewing	Most firms covered by Development Ordinance Act which allows duty-free imports of raw materials and equipment.	Beer-Stout - 127%*
Biscuits		Biscuits - 60%
Sandals (plastic)		Sandals - 35%
Soap		Toilet Soap - 36%
Suitcases		Suitcases - 45%
Flour Milling		Flour - 167%

SOURCE: Published Tariff Schedules of Sierra Leone Government.

*Specific tariff converted to ad valorem rate based on current f.o.b. prices.

does represent an implicit foreign exchange overvaluation. Using the Harberger-Schydlowsky method to compute this implicit overvaluation, we estimated that the Leone was overvaluated by approximately 15 percent (Harberger, 1965; Schydlowsky, 1968).[11] Although all sectors pay the same price for foreign exchange, this overvaluation provides a greater benefit to large-scale producers, who import a larger proportion of their equipment and inputs. Large-scale industry, for example, requires Le 25 of imported inputs to produce Le 100 of output while agriculture and small-scale industry require only Le 4.5 of imported inputs per Le 100 of output (Fatoo, 1977).

3.3. The Labor Market

The wage rate for unskilled labor follows the same dichotomy between small-scale and large-scale sectors that we observed in the capital and foreign exchange markets. The structure of wage rates shown in table 4 indicates that, in urban areas, the wage rate for uneducated labor in large private firms is about double the wage in small-scale sectors. The government maintains a minimum wage policy but this wage is only about 20 percent higher than the unskilled wage rate in small-scale sectors. Large private firms are apparently paying a higher wage rate than dictated by either a competitive market or by government minimum wage legislation. However, large private firms employed less than 10 percent of urban unskilled labor.

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[11] The Harberger-Schydlowsky method estimates the implicit foreign exchange overvaluation as the weighted average tariff rate on imports and exports (subsidies are treated as negative tariffs) where the c.i.f. and f.o.b. value of imports and exports are the weighting factors. The resulting estimate approximates the extent to which the exchange rate differs from the exchange rate that would prevail in a free trade situation.

TABLE 4

COMPARISON OF RURAL AND URBAN WAGE RATES FOR PERSONS WITH NO FORMAL EDUCATION, SIERRA LEONE 1974

Rural Areas		Urban Areas	
Category	Wage (Le/hr)	Category	Wage (Le/hr)
Lowest wage region -Northern Plains	.07	Employed in Government	.19
Highest wage region -Scarcies	.13	Employed in private large-scale sector	.38
		Employed in small-scale sector	.15
Average rural wage	.08	Average urban wage (Persons without education)	.25

SOURCE: Byerlee et al., 1976.

The wage rate in rural sectors is on average 55 percent of the wage in urban small-scale sectors. When considered in the light of the higher cost of living in urban areas, this difference does not seem to be unduly high (see Byerlee, Tommy, and Fatoo, 1976). The largest wage differentials appear in urban areas between the large-scale and private sector and the small-scale industrial services sector, rather than between rural and urban areas.

IV. VARIATION IN PRODUCTION TECHNIQUES

The variation in factor prices noted above has potential implications for choice of production technique only if there exists a range of production techniques of varying factor intensities. This issue was analyzed by computing for each production technique in each sector the relevant economic ratios: labor-capital, output-capital, and output-labor.

The labor-capital ratio is used as a measure of the labor intensity of production, where both labor and capital are expressed in annual flows.[12] Labor is measured as actual flows of labor inputs while capital is converted to annual flows through the capital recovery factor.[13] This method avoids problems with the standard stock measures of labor and capital although it is still limited by the assumption of full capacity utilization. Moreover, following Morawetz (1974), capital is valued at a shadow interest rate estimated at about 35 percent to facilitate comparisons across firms operating under different factor prices.

The output-capital ratio is used as a measure of the "efficiency" of the production technique with respect to the scarce factor, assumed to be capital. Consequently, to minimize output-employment conflicts, techniques or processes are required which are both labor-intensive (i.e., high L/K ratio) <u>and</u> which are efficient users of capital (i.e., high O/K ratio).

Table 5 lists the computed ratios for production techniques in the agricultural, agricultural processing, fishing, and manufacturing sectors.

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[12]See Bhalla (1976) for a discussion of the limitations in using this ratio as a measure of labor intensity.

[13]That is, $R = rV/(1 - (1 + r)^{-n})$ where R is the annual capital service flow, V is the original value of the asset, r is the discount rate, and n is the life expectancy of the equipment.

TABLE 5

OUTPUT-CAPITAL, OUTPUT-LABOR, AND LABOR-CAPITAL RATIOS FOR SELECTED PRODUCTION TECHNIQUES AND INDUSTRIES IN SIERRA LEONE, 1974[a]

Industry and Production Technique	Output-Capital	Output-Labor	Labor-Capital
Rice Production[d]			
Hand Cultivation	114.00	.18	637.00
Tractor Cultivation	.16	.06	2.70
Rice Milling[d]			
Hand Pounding	40.90	.06	638.00
Small Steel Cylinder Mills	1.83	1.46	1.25
Small Rubber Roller Mills	.97	1.35	.72
Large Rubber Roller Mills[b]	1.20	10.00	.12
Fisheries[e]			
Canoe 22 ft - Ring Net	8.75	.47	19.90
- Set Net	8.73	.43	17.80
Boat 30 ft - Beach Seine	5.42	.32	16.73
Boat 30 ft - Ring Net	7.66	.37	20.60
Boat 40 ft - Ring Net < 26 HP Eng	8.47	.36	23.80
- Ring Net > 26 HP Eng	5.50	.30	18.20
Trawler (large)	1.51	1.03	1.46

[a]Output measured in Leones of value added, capital measured in annual costs at 35 percent opportunity cost and labor in man hours.

[b]Potential Technique

[c]Small-scale manufacturing refers to enterprises with fewer than fifty persons.

[d]SOURCE: Spencer and Byerlee (1976); Spencer et al. (1976).

[e]SOURCE: Linsenmeyer (1976).

Table 5 Continued

Industry and Production Technique	Output-Capital	Output-Labor	Labor-Capital
Manufacturing			
Clothing[f]			
Rural, small tailor nonelectric sewing machine	8.30	.50	16.60
Rural, small tailor electric sewing machine plus	7.60	.60	12.50
Urban, small tailor electric sewing and embroidery machine	2.60	.60	4.30
Urban, large clothing factory	1.70	.80	2.20
Baking[g]			
Rural, small mud oven traditional	19.00	.50	38.00
Urban, small peel oven	15.00	1.00	15.40
Urban, small multiple deck oven	3.20	.60	5.30
Urban, small reel oven	4.50	1.00	4.50
Urban, large tunnel oven	2.60	1.00	2.60

[f]SOURCE: Liedholm and Chuta (1976).

[g]SOURCE: Chuta (1979)

In the agricultural sector, the greatest difference in production techniques with respect to capital-labor substitution is the use of tractors to replace hand labor for land preparation in rice production in two regions where the government operates a tractor hire scheme. Tractors are substantially more capital intensive (i.e., lower L/K ratio), particularly when the value of capital services is computed using the unsubsidized tractor rental rate as in table 5.[14] In rice milling there are very sharp variations in capital intensity, ranging from hand pounding up to large disc sheller mills capable of processing two tons of rice per hour. Both hand pounding and small mills are privately owned and operated while large mills, because of the large initial investment, are government owned and operated. For both agriculture and rice milling, the small-scale more labor-intensive processes (i.e., hand cultivation and hand pounding) also generated higher output-capital ratios than their larger, more capital intensive counterparts.

In the fishing subsector, a wide range of techniques was identified depending on the type of boat, net, and propulsion equipment. Since outboard motors have been adopted by many small-scale fishermen, the total investment of small-scale firms is sometimes as high as Le 10,000. Other fishermen employ dugout canoes and paddles valued at less than Le 100. Despite this variation in total investment, there is strikingly little variation in the output-capital and output-labor ratio. In large part this arises because the mechanized boats are able to travel further to sea, operate in rougher weather, and hold a larger catch so that total output and employment is also substantially increased. However, large-scale fishing firms (which operate trawlers) are considerably

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[14]The extent of subsidy on the cost of tractor cultivation is estimated to be about 85 percent (Spencer and Byerlee, 1976).

less labor intensive than small-scale firms and also have a lower output-capital ratio.

Finally, a range of production techniques or processes was also found within each of the major lines of manufacturing activity in Sierra Leone. There were, for example, at least four clothing, five bread, five gara (tie-dye), three metal working, and three carpentry processes delineated, each of which possessed different factor proportions.[15] In carpentry and blacksmithing, substantial variations exist in the labor-capital ratios, largely because of the use of powered machines in the larger, urban enterprises compared with the smaller, rurally-based enterprises. In baking, production techniques vary from the traditional mud oven to electrically operated modern bakeries with investment exceeding Le 10,000, and there is a corresponding variation in the labor intensity across these techniques. Within the clothing industry, the techniques vary from rural tailors using nonelectric sewing machines to large urban clothing factories with modern equipment exceeding Le 100,000. It should be further noted that the small-scale, more labor-intensive process in these industries generated higher output-capital ratios than did their larger, more capital-intensive counterparts (see table 5).

These results indicate that there are a large number of production techniques in each of the main economic sectors of Sierra Leone. In particular, there are usually both small- and large-scale firms operating side by side within the same sector although, as shown previously, they are subject to different factor prices. Furthermore, there are often a range of techniques available within the small-scale sectors usually associated with replacement of hand tools by small machines. In most cases this leads to a greater capital

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[15]See Liedholm and Chuta (1976), and Chuta (1978) as well as table 5.

intensity as measured by the labor-capital ratio, although in the small-scale fisheries subsector the variation in capital intensity was quite small.

Most importantly, however, the results from each of the subsectors reveal that the smaller scale, more labor-intensive techniques (i.e., higher L/K ratios) were associated with higher output-capital ratios. Consequently, if capital is assumed to be the scarce factor, there is no conflict between output and employment since labor-intensive production, which promotes employment, will also maximize output by efficient use of the scarce factor, capital.

V. THE EFFECT OF FACTOR PRICES ON THE CHOICE OF TECHNIQUE

The availability of varying production techniques in each sector is only relevant to the question of employment-output conflicts in so far as the choice among these techniques is responsive to changes in factor prices. This sensitivity was investigated in each sector by a combination of budgeting and linear programming analysis. In all cases, the emphasis was placed on the effect of variation in the price of capital through changes in subsidies and tariffs and foreign exchange and interest rates — factors that are directly influenced by government policy.

In view of some important policy questions about the choice of techniques in the rice processing sector, in-depth research was carried out on the effect of factor prices.[16] As noted before, there are a number of existing and potential techniques in this sector, ranging from hand pounding to large government operated mills. The choice among these techniques was analyzed using a linear programming approach developed from the methodology of Timmer (1973). That is, a unit isoquant in value added was constructed for each of five techniques, taking into account the varying technical efficiency among the techniques and allowing the effect of changes in the price of capital to be easily analyzed. Moreover, in an important refinement of the Timmer approach, the costs of assembling raw materials from farmers prior to processing and costs of distribution of the processed product to consumers were explicitly incorporated. These costs are, of course, substantially greater for the large-scale mills compared to hand pounding.

[16]For more details see Spencer, May-Parker, and Rose (1976).

Table 6 shows the results of assumption of (1) continuation of low cost of capital (10 percent) to large mills, current foreign exchange rates and high rice prices, and (2) pricing capital at its opportunity cost (assumed to be 35 percent), a premium on foreign exchange (20 percent) and lower rice prices reflecting world prices. If present policies are continued, all hand pounding would be eliminated and small and large mills dominate. However, such a strategy eliminates 40,000 man/years of employment and incomes in rural areas and also increases foreign exchange costs. On the other hand, with prices reflecting opportunity costs, the amount of hand pounding is only slightly reduced from current levels and large mills are eliminated from the solution.

However, the model also showed that, in the case of rice processing, the choice of technique is more sensitive to rice prices than to factor prices (labor and capital) because of the variation in technical efficiency among the techniques.[17] Moreover, under most assumptions, one technique was not completely dominant, but rather a combination of techniques are in the solution depending upon the local wage rate, available marketable surplus, and local transportation costs in the particular region.

Analyses of choice of technique in other sectors again show similar effects of changing factor prices on output and employment. In the agricultural sector, the profitability of tractor cultivation was highly sensitive to the rate of subsidy implicit in the tractor hire scheme. Under subsidized prices for tractor hire, the cost of production with mechanical cultivation was 10 percent less than with hand cultivation. If subsidies on tractor hire were completely removed, however, the cost of production with hand cultivation was less than half the costs with mechanical cultivation. That is, once factor

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[17]More technically efficient processes are favored by higher rice prices since more clean rice is produced per unit of husked rice.

TABLE 6

PREDICTED NUMBER AND TYPE OF PROCESSING FACILITIES, EMPLOYMENT AND INCOMES IN RICE PROCESSING UNDER ALTERNATIVE POLICIES IN SIERRA LEONE, 1974

	Actual Situation (1974)	Current Policies continued[a]	Policy Reflecting opportunity costs of resources[b]
Number of firms	40,807.00	0.00	35,757.00
Hand pounding	40,807.00	0.00	35,757.00
Small steel mills	110.00	0.00	0.00
Large disc mills	0.00	0.00	0.00
Small rubber mills	30.00	498.00	236.00
Large rubber mills	0.00	36.00	0.00
Employment (000 man-days)			
Rural unskilled	12,242.00	0.00	10,727.00
Urban unskilled	1.00	34.00	2.00
Urban skilled	35.00	163.00	59.00
Total	12,278.00	197.00	10,789.00
Incomes (Le 000)			
Rural unskilled	4,774.00	0.00	4,185.00
Urban unskilled	1.00	35.00	1.00
Urban skilled	35.00	182.00	57.00
Total	4,810.00	216.00	4,243.00
Net Foreign exchange costs (Le million)	2.49	3.64	1.90

[a]10 percent interest rate, high rice prices

[b]35 percent interest rate, 20 percent premium on foreign exchange, rice prices at world prices.

SOURCE: Spencer, May-Parker, and Rose (1976, table 18).

prices are changed to reflect the opportunity cost of capital, the optimal production technique switches from mechanical to hand cultivation.[18] Moreover, employment is almost doubled when hand cultivation techniques are used.

The choice of technique was also analyzed in the fisheries sector through a linear programming model (Linsenmeyer, 1976). As expected, in view of the rather uniform labor-capital ratio among small-scale fishing technologies, there was little change in production techniques as a result of changing the cost of capital and reducing tariffs on materials and equipment to small-scale firms. However, if large-scale firms operating trawlers were charged the same factor prices as small-scale firms, there was a decline in output of large-scale firms and an increase in production in small-scale sectors.

In the small-scale manufacturing sector, choice of technique was also investigated using a linear programming model although no effort was made to analyze trade-offs between small-scale and large-scale sectors (Chuta, 1977). The results indicated that variation in the interest rate and tariffs have their largest effects in the baking and carpentry industries, where there are the widest variations in factor intensities among techniques.

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[18]However, it should be noted that the cost of mechanical cultivation in Sierra Leone is extremely high compared to similar schemes in other West African countries (Spencer and Byerlee, 1976).

VI. DYNAMIC CONSIDERATIONS IN THE EMPLOYMENT-OUTPUT CONFLICT

The analysis of the empirical evidence in this paper has been presented in a static framework. There is some limited evidence that even in a more dynamic framework employment and output will not necessarily be in conflict. The indirect employment effects of expanding output of the small-scale sectors, for example, are larger than for the large-scale sectors. In an input-output table developed for Sierra Leone from the micro-level surveys, Fatoo (1977) estimates that the small-scale nonagricultural sectors have the strongest backward linkages mostly to the other small-scale nonagricultural sectors and agriculture. The production of one unit of output in the small-scale nonagricultural sector requires .35 and .06 units of inputs from the small-scale and large-scale nonagricultural sectors respectively, while one unit of output from the large-scale sector requires .06 and .15 units of inputs from the same sources. Corresponding requirements for imported inputs and for capital equipment are much higher for the large-scale sectors. For example, small-scale sectors import only about 20 percent of capital goods requirements, while large-scale sectors import over 50 percent of their capital goods.

If savings and reinvestment rates are lower among low income groups, and particularly among small-scale sectors, however, there may be a longer run trade-off between output and employment. In this study, no effort was made to measure savings and reinvestment rates, an almost impossible task in a rural subsistence economy.[19]

There was some indirect evidence, however, to indicate that the savings and reinvestment of small rural enterprise may not be insignificant. The

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[19]Huddle (1974), in a recent study of Columbian artisans, however, found that the average savings rate of the rural artisan household was 16 percent, double that of the general population.

profit rate, an indication of potential savings, of the smaller manufacturing enterprises in Sierra Leone, for example, ranged from 20 percent for tailoring to 200 percent for gara dyeing. These profit rates were substantially above those generated by the larger manufacturing enterprises. In addition, the economic profit of the small fishing enterprises in Sierra Leone was five times that of the larger enterprises (Linsenmeyer, 1976, p. 97). Moreover, there was evidence that a large part of the initial and reinvested capital from small manufacturing enterprises was derived from savings. For manufacturing enterprises in Sierra Leone, for example, 60 percent of the initial capital came from agriculture or business and over 90 percent of the expansion capital came from reinvested profits. These results provide some indication that small-scale enterprises may have a savings and reinvestment potential that is not markedly below that of their larger counterparts; thus there may be no output-employment conflict even in the long run.

VI. CONCLUSIONS

In this paper, we have brought evidence to bear on the debate on employment-output conflicts using a unique set of data from a detailed nationwide survey of major economic sectors in Sierra Leone. The evidence was examined from both the demand and supply side. On the demand side, an important finding was the evidence of a favorable demand outlook for products of labor-intensive small-scale sectors both through increasing consumer incomes and also by import substitution. Moreover, demand for labor intensive commodities would be marginally favored by more equitable consumer incomes. On the supply side, we first examined factor prices and showed that distortions in wage rates and interest rates are largely confined to the large-scale sector. An important result with respect to the pricing structure is the dichotomy between large-scale and small-scale sectors with respect to the incidence of import and export taxes. Small-scale sectors pay higher duties on imported inputs and equipment and at the same time lack the tariff protection of competitive products enjoyed by large-scale sectors.

There is also ample evidence of use of a wide range of production techniques with varying capital and labor intensities in many subsectors of the Sierra Leone economy. In most cases, the differences were accentuated between small-scale and large-scale firms within each sector. However, within small-scale agriculture, rice processing, and small-scale manufacturing, there was also a range of factor intensities among production techniques. Moreover, a particularly important finding was the evidence that in all subsectors more labor-intensive techniques were also more efficient users of capital; consequently, the employment-output conflict, at least in a static sense, vanishes.

Finally, the evidence on factor prices and variation in production technique was combined to determine if changes in factor prices, particularly interest rates and tariffs, would affect the choice of technique. In most cases, these changes did produce a different mix of optimal technologies, particularly in the agricultural and rice processing sectors where policies to equalize factor prices of large- and small-scale sectors and to remove subsidies on capital-intensive techniques resulted in both lower costs of production and increased labor use.

In the long run, the evidence from Sierra Leone provides solid empirical support for a development strategy emphasizing small-scale sectors and labor-intensive technologies to promote both output and employment. Clearly such a strategy requires that fundamental changes be made in the allocation of expenditure and in the reorganization of institutions. In the short run, however, our Sierra Leone research indicates that both employment and output could be expanded by correcting the factor price distortions between the large- and small-scale sectors.

REFERENCES

Baer, Werner, and Michael Hervé. 1966. "Employment and Industrialization in Developing Countries," Quarterly Journal of Economics, 80, (February): 88-107.

Baron, C. G. 1975. Sugar processing techniques in India," in Technology and Employment in Industry, ed. A. S. Bhalla (I.L.O., Geneva, 1975).

Bhalla, A. S. 1965. "Choosing Techniques: Hand Pounding Machine Milling of Rice: An Indian Case," Oxford Economic Papers 17 (1): 147-157.

_____. 1975. "The Concept and measurement of labour intensity," and "Lessons from the case studies," in Technology and Employment in Industry, ed. A. S. Bhalla (I.L.O., Geneva).

Byerlee, Derek, Carl Eicher, Carl Liedholm, and Dunstan Spencer. 1977. "Rural Employment in Tropical Africa: Summary of Findings," African Rural Economy Working Paper No. 20, East Lansing, Michigan.

Byerlee, Derek, Joseph L. Tommy, and Habib Fatoo. 1976. "Rural-Urban Migration in Sierra Leone: Determinants and Policy Implications," African Rural Economy Paper No. 13, Michigan State University, East Lansing, Michigan.

Chuta, Enyinna. 1977. A Linear Programming Analysis of Small-Scale Industries in Sierra Leone. Ph.D. thesis, Michigan State University, East Lansing, Michigan.

_____. 1979. The Bread Industry of Sierra Leone, Mimeograph, Michigan State University, East Lansing, Michigan.

Eponou, T. 1978. "The Size Distribution of Income in Sierra Leone," M.S. thesis, Michigan State University, East Lansing, Michigan.

Gaude, J. 1975. "Capital-labour substitution possibilities: A review of the empirical evidence," in Technology and Employment in Industry, ed. A. S. Bhalla (I.L.O., Geneva, 1975).

Habib, Fatoo. 1977. "Macro Economic Analysis of Output, Employment, and Migration in Sierra Leone," Ph.D. thesis, Michigan State University, East Lansing, Michigan.

Harberger, A. C. 1965. "Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation," paper presented at the United Nations Inter-Regional Symposium in Industrial Project Evaluation, Prague.

Huddle, Donald. 1977. "An Analysis of the Savings Behavior of a Group of Columbian Artisan Entrepreneurs," Rice University, Program of Development Studies Paper No. 81, Houston, Texas.

Hymer, Stephen, and Stephen Resnick. 1969. "A Model of an Agrarian Economy with Nonagricultural Activities," The American Economic Review: 59: 493-506.

International Labour Office. 1970. Toward Full Employment. Geneva: International Labour Office.

_____. 1972. Employment, Incomes and Equality. Geneva: International Labour Office.

King, Robert P., and Derek Byerlee. 1978. "Factor Intensities and Locational Linkages of Rural Consumption Patterns in Sierra Leone," American Journal of Agricultural Economics, 60 (2): 197-206.

Liedholm, Carl, and Enyinna Chuta. 1976. "The Economics of Rural and Urban Small-Scale Industry in Sierra Leone," African Rural Economy Paper No. 14, Michigan State University, East Lansing, Michigan.

Linsenmeyer, Dean A. 1976. "Economic Analysis of Alternative Strategies for the Development of Sierra Leone Marine Fisheries," African Rural Economy Working Paper No. 18, Michigan State University, East Lansing, Michigan.

Morawetz, David. 1974. "Employment Implications of Industrialization in Developing Countries: A Survey," in The Economic Journal: 491-542.

Marsden, Keith. 1969. "Toward a Synthesis of Economic Growth and Social Justice," International Labor Review 100 (5): 389-418.

O'Herlihy, C. St. J. 1972. "Capital/Labor Substitution and the Developing Countries: A Problem of Measurement," Bulletin of the Oxford University Institute of Economics and Statistics, 34 (August): 269-280.

Pack, Howard. 1974. "The Employment Output Trade-Off in L.D.C.s: A Microeconomic Approach," Oxford Economic Papers, 26 (1): 388-404.

Schydlowsky, D. M. 1968. On the Choice of a Shadow Price for Foreign Exchange, Economic Development Report No. 108, Development Advisory Service, Cambridge, Massechusetts.

Soligo, Ronald. 1973. "Factor Intensity of Consumption Patterns, Income Distribution and Employment Growth in Pakistan," Program of Development Studies Paper No. 44, Rice University, Houston, Texas.

Spencer, Dunstan S. C., Ibi I. May-Parker, and Frank S. Rose. 1976. "Employment and Efficiency and Income in the Rice Processing Industry of Sierra Leone," African Rural Economy Paper No. 15, Michigan State University, East Lansing, Michigan.

Spencer, Dunstan S. C., and Derek Byerlee. 1977. "Small Farmers in West Africa: A Descriptive Analysis of Employment, Incomes, and Productivity in Sierra Leone," African Rural Economy Working Paper No. 19, Michigan State University, East Lansing, Michigan.

Steel, William. 1977. Small-Scale Employment and Production in Developing Countries: Evidence from Ghana, New York, Praeger.

Stewart, F., and P. Streeten. 1971. "Conflicts Between Output and Employment Objectives in Developing Countries," Oxford Economic Papers, 23, # 2 (July): 145-168.

Timmer, C. Peter. 1973. "Choice of Technique in Rice Milling in Java," Bulletin of Indonesian Econmic Studies, 9 (2): 57-76.

White, Lawrence J. 1978. "The Evidence on Appropriate Factor Proportions for Manufacturing in Less Developed Countries: A Survey," Economic Development and Cultural Change, 27 (1): 27-59.

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