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Income Distribution, Poverty, and Consumer Preferences in Cameroon

Sarah G. Lynch

CORNELL FOOD AND NUTRITION POLICY PROGRAM



INCOME DISTRIBUTION, POVERTY, AND CONSUMER PREFERENCES IN CAMEROON

Sarah G. Lynch

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ABBREVIATIONS

AEU	Adult Equivalent Unit
CFAF	CFA Franc
EBC	l'Enquete Budget-Consommation
LSMS	Living Standards Measurement Study
OLS	Ordinary Least Square

FOREWORD

Despite being one of the richest countries in sub-Saharan Africa, poverty remains a serious problem in Cameroon. In order to gain some insights into the dimensions of the problem, its causes and characteristics, this working paper by Sarah Lynch analyzes the Household Budget Survey of 1983/84. The results show ample regional disparities in income and living standards. The marked differences in income between urban and rural households, and the disproportionate number of subsistence oriented farmers who are poor, begin to provide a basis of orienting policy and targeting programs to alleviate poverty. Furthermore, the multivariate analysis of the determinants of incomes and of the decomposition of income inequality begins to elucidate various options that may be available to policymakers, including the importance of education.

While the results contained in this paper are indeed important and interesting in their own right, the major purpose for the undertaking was to contribute to the overall research project designed to determine how structural adjustment in sub-Saharan Africa has affected poverty and income distribution. With funding from the Africa Bureau and Cameroon Mission of the Agency for International Development, this paper contributes to the larger objectives through defining the functional classification of income that was used in developing the social accounting matrix (SAM) for Cameroon, which was reported in Working Paper 4. In addition, the available data from the household budget survey, as discussed in this paper and incorporated into the SAM, is an essential input into the construction of the computable general equilibrium model that will be discussed in future CFNPP working papers.

Washington, DC
December 1991

David E. Sahn
Deputy Director, CFNPP

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1. INTRODUCTION

BACKGROUND TO PROBLEM

The formulation of good policy requires good information. Lack of information can have consequences more devastating to the well being of members of society than the initial conditions motivating policy intervention. In addition, policy interventions are not neutral with respect to distributional issues. There are winners and losers. Understanding the distributional consequences of policy intervention is fundamental to good policy analysis.

Policy interventions that influence the distribution of income or relative prices of commodities facing consumers affect the basic well being of members of society. While many factors determine the level of welfare of individuals in society, income and prices have the strongest effect. Thus, knowledge of how individuals respond, in terms of their demand for goods and services, to changes in income and prices is an important component of policy analysis and design (Alderman 1986). In addition, given the importance of food expenditures in many household budgets, food policy can have a significant impact on household welfare.

While the interplay between changes in income and prices and consumer preferences has been long established, recent research has begun to explore the differences in consumer response by income class. Since the pioneering work of Engel, much research has been conducted on how income elasticities differ as the level of income changes. Recent research has focused on whether rich and poor households respond differently to changes in relative prices of important commodities, especially food (Alderman 1986; Timmer 1981; Pinstrup-Andersen 1985; Williamson-Gray 1982; Sahn 1988).

The focus on differences between rich and poor households is motivated by several factors. First, the number of poor households is increasing, along with the attendant problems of malnutrition, poor health, and lack of access to educational and employment opportunities. The sheer number of impoverished people makes this problem more significant. Second, recent research indicates that rich and poor households respond differently to changes in prices and income, and they possess distinct socioeconomic characteristics. This is often evident in food expenditure patterns. Finally, budget constraints faced by governments necessitate more stringent targeting of beneficiaries of public programs.

An understanding of the structure of consumer demand is particularly important in developing countries. Many developing countries lack this information, yet the high incidence of poverty puts many more households on the brink of survival, making them more vulnerable to adverse consequences of changes in income or prices. In addition, many developing countries face severe budget constraints, leaving policymakers with little margin for error. To be successful, programs oriented toward providing minimal access by poor households to better health, nutrition, and educational opportunities require that target groups be well identified.

Understanding the likely effects of policy interventions on different groups in society allows for the possibility of fine tuning or developing mitigative actions. Alderman (1986) discusses various ways consumer preference according to income class can be used to fine tune policy. He cites the design of efficient transfer and subsidy programs, the projection of effects of development strategies on the nutrition of vulnerable groups, the estimation of sectoral linkages (multiplier effects) between one sector of the economy and another, guidance in setting priorities for research, and the development of mitigative actions as examples.

CASE STUDY OF CAMEROON

The need for this kind of information is especially critical in the west African country of Cameroon for several reasons. First, there is a paucity of existing information on Cameroon. Little is known about Cameroon's socioeconomic characteristics and the structure of consumer preferences for food and nonfood commodities. Some fragmentary household budget data were obtained from regional surveys conducted in the early 1970s, but this information is incomplete and obsolete. A national nutrition study done in 1978 is the most recent work in this area. The most recent socioeconomic data available is from the national population census of 1976. An agricultural census conducted in 1984 provides aggregate level data on the rural sector and issues relating to agricultural production.

Second, there is great diversity in agroclimatic conditions, agricultural productivity, and ethnic custom in Cameroon. The four major agroclimatic typologies found in Africa are also found in Cameroon: tropical rain forests, grassy highlands, savannah, and desert. The agroclimatic diversity generates significantly different agricultural production possibilities. Ethnic, religious, and colonial differences among regions are as dramatic as are agroclimatic variation. There are more than 200 different ethnic groups and three major religions in Cameroon. Different colonial experiences between northern and southern Cameroon have left different legacies of education, infrastructure, and economic opportunity.

Third, Cameroon's dire economic circumstances make information on the population's socioeconomic characteristics and structure of demand extremely valuable. Like many African countries, Cameroon is facing a severe economic crisis. Cameroon's economic difficulties are primarily the result of the

precipitous decline in revenue due to the fall of international prices in the mid- and late 1980s for Cameroon's primary exports: oil, cocoa, coffee, and cotton.

The severe economic straits in which Cameroon is now suffering is forcing decisionmakers to introduce significant economic policy reforms. Some of the proposed policies could have a profound impact on income distribution and the prices for goods and services throughout the economy. While such substantial changes will have an impact on all segments of society, there is growing concern over the distribution of the costs and benefits of structural adjustment to different segments of society. In particular, there is apprehension that the most vulnerable groups in society will be more adversely affected by proposed reforms. Such reforms may affect the ability of households to purchase, produce, or otherwise avail themselves of food, health, education, housing, and other services. Changing a household's access to these so-called "basic" needs can significantly affect household welfare. Therefore, it is essential that decisionmakers clearly understand the characteristics of vulnerable groups in terms of location, socioeconomic status, income level, and revenue sources.

STUDY OBJECTIVES

The objective of this study is to examine the socioeconomic characteristics of Cameroon according to income class and region and to estimate demand parameters useful in policy analysis. The underlying hypothesis is that differences in income class and region result in a different expenditure structure for food and nonfood commodities. In addition, consumer response to changes in income and prices differs by income classification. Different income classes have identifiable characteristics that can be influenced by policy.

This analysis will be based on a newly available data source of information on Cameroon's socioeconomic characteristics. The data were collected during the National Budget Survey (EBC) conducted in 1983/84 by the Ministry of Plan in Cameroon. Lynch's (1991) study was the first analysis of this important comprehensive data source on household budgets.

PLAN OF WORK

The following section briefly describes Cameroon's geography, history, and economy, as well as further details on the data source and variable specification. Then, from these data, general descriptive information on socioeconomic characteristics according to region and income class is offered. Next a relative poverty line is defined and detailed information on the characteristics of those below this poverty line is provided. Differences in consumer demand for various food and nonfood products according to income class and region are explored. The results of this analysis are presented in sections 3 and 4. In section 5, an "Almost Ideal Demand System" is estimated to derive a demographically augmented Engel curve. Using this model specification, the expenditure elasticities are calculated for important categories of food and

nonfood commodities. In addition, the influence of certain demographic variables on income levels and consumer preferences is examined. In section 6, the estimated demand parameters are used to assess the income effect on different income classes of a 10 percent decrease in household income and a 10 percent increase in food prices. Conclusions and policy implications are presented in section 7.

2. BACKGROUND INFORMATION ON CAMEROON AND DATA SOURCES

GENERAL DESCRIPTION OF CAMEROON

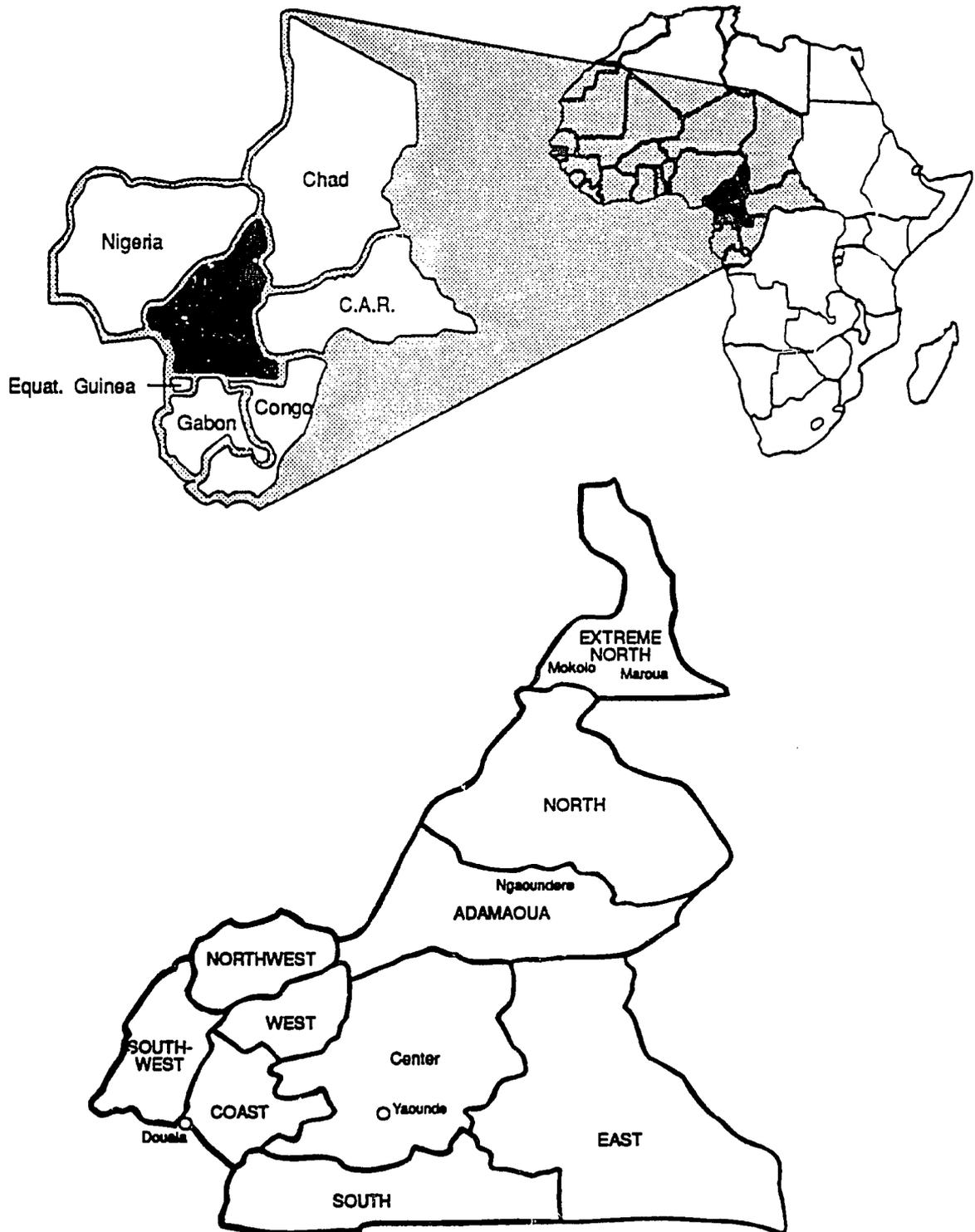
Cameroon is located on the west coast of Africa between west and central Africa (Figure 1). It is bordered by Equatorial Guinea, Gabon, and the Congo to the south, Chad and the Central African Republic to the north and east, and Nigeria to the west. With 200 kilometers of coastline along the Atlantic Ocean and an area of 475,000 square kilometers, Cameroon is roughly the size of the New England and Mid-Atlantic states combined. Cameroon is divided into 10 provinces. The three provinces of Adamoua, North and Extreme North, are commonly grouped together and referred to as northern Cameroon. The remaining 7 provinces – East, Central, Coast, Southwest, Northwest, West, and South – comprise southern Cameroon.

The Germans were the first European colonists of Cameroon. The German Kamerun Protectorate lasted from 1884 to 1916. After the First World War, the League of Nations divided Cameroon between the French and British. Western Cameroon, administered by the British, comprised the Mount Cameroon area and a stretch of land running along the Nigerian border (now the Southwest and Northwest provinces). The French administered the remainder of what is now the Republic of Cameroon. Francophone Cameroon won independence from the French in 1960 and the anglophone provinces joined the independent United Republic of Cameroon a year later.

Cameroon is officially bilingual (French and English), reflecting its dual colonial heritage. Roughly 80 percent of the population speaks French and is predominately located in the provinces that were part of the French colonial empire. The Anglophone population represents an estimated 20 percent of the population and is centered in the Northwest and Southwest provinces, which were part of the British empire.

Cameroon's agricultural production, both food and export crops, varies significantly by region. In the southern central part of Cameroon (the Center, South, Coast, and East provinces) the major export crops are cocoa and to a lesser extent tobacco, while manioc and other roots and tubers are the primary food crops. The Southwest and Coast provinces devote large areas to plantation agriculture, particularly rubber, oil palm, and pineapple. In the West and Northwest provinces coffee is the major export crop. Maize and plantain are the primary staples in these regions. In northern Cameroon, particularly in the North and Extreme North, millet and sorghum are the major staple foods and cotton is the main export crop.

Figure 1 - Map of Cameroon



Ethnic diversity is extremely strong in Cameroon. There are some 200 different ethnic groups with different languages, customs, and social systems. Unlike many other African countries, however, none of the ethnic groups dominate in terms of size or power. The largest group, the Bamiléké, comprises roughly 15 percent of the population. Animism, Christianity, and Islam are the three major religions of Cameroon, practiced by roughly 60 percent, 35 percent (20 percent Roman Catholic), and 5 percent of the population, respectively. Christians are found predominantly in southern Cameroon, Moslems in northern Cameroon, and animists are found throughout the country.

The mid-1987 estimate of Cameroon's population was 11 million (Economist Intelligence Unit 1989). The population growth rate, roughly 2 percent per year in the 1970s is now higher than 3 percent. Although estimates vary, Douala, the main coastal commercial city, probably has a population of roughly 1 million. The country's largest port, located near the offshore oil reserves, Douala has experienced rapid growth since the late 1970s. Yaoundé, the administrative capital and second largest city, probably has a population of 750,000. A number of secondary cities, such as Nkongsamba, Bamenda, and Bafoussam in the Littoral, West and Northwest provinces, and Maroua and Garoua in the Adamoua and North provinces, have populations between 75,000 and 100,000. Rural population densities vary considerably. In the fertile areas of western Cameroon and the extreme north, the density ranges between 65 and 95 persons per square kilometer, while in the southern forest zone and arid northern areas it is as low as 4 persons per square kilometer.

Differences Between North and South

One of the country's striking features is its tremendous ecological and climatic diversity. The most noticeable differences occur between southern and northern Cameroon. Southern Cameroon contains a wide range in agroclimatic conditions. Starting from the coast and moving north, southern Cameroon's topography encompasses primary tropical forests, high rainfall and volcanic soils, and fertile hilly regions. Where the South and the North merge, the land levels out into a vast savannah. Moving to the North and Extreme North provinces, the grasslands of the savannah are replaced by semiarid desert.

In addition to the agroclimatic differences between the North and South, there are important historical, geographical, and infrastructural differences. The North, by virtue of its location, remained somewhat isolated from the colonial penetration by the Germans, British, and French in the 19th and 20th centuries. This had at least two important effects. First, most of the economic development during the last century took place in southern Cameroon, especially within the triangle formed by Yaoundé, Douala, and Bafoussam. Over time, migration, increased trade, and economic growth began to link the different regions in the South through the new economic ties and infrastructure (roads, schools, telecommunication, etc.). The North, was mostly cut off from this development. Even today, while air and rail connect the North and South, there are no paved roads linking the two regions. Second, Christian missionaries did not penetrate the North as they did the South, establishing in their wake a

primary and secondary education system for southern Cameroonians. As a result, the North lacks the strong tradition of education found in southern Cameroon. The North's isolation from southern Cameroon permitted the maintenance of historical ethnic links between Islamic/Fulani groups in neighboring countries such as Nigeria and Chad. As a result the Islamic religion and culture still influence the North more than the South.

The Economy

Before the discovery of oil in the mid-1970s, the Cameroonian economy was dominated by agriculture. The agricultural sector generates employment for more than 75 percent of the population, particularly through production of cocoa and coffee and, to a lesser extent, cotton and forestry products. Combined, these account for more than 80 percent of total exports. The smallholder agricultural sector produces most of these export crops. In addition, the traditional agricultural sector offers Cameroon self-sufficiency in food production. Large-scale, highly capitalized production units generate only a small proportion of the value of Cameroon's agricultural exports.

In 1978, Cameroon began exploiting its offshore oil reserves. Over the next 8 years revenue from oil exports increased steadily. Oil exports' share of the value of total exports were negligible at the end of the seventies. However, by 1985 oil exports accounted for 36 percent of total exports. This rapid infusion of oil revenues into the economy stimulated an estimated 9 percent annual growth in the economy between 1980 and 1985 (Blandford and Lynch 1990).

However, in the late 1980s oil prices as well as world prices for some of Cameroon's agricultural exports declined. Despite policies that have sought to dampen the phenomenon of "Dutch disease," the windfall gains from oil production have distorted economic growth. Oil revenues allowed Cameroon to increase the size of its government bureaucracy, continue inefficient operation of its parastatals, and absorb the effects of declining per capita productivity in the agricultural sector.

The growing debt reflects the seriousness of Cameroon's economic problems. The structural adjustment loans from the World Bank give evidence to Cameroon's grave financial crisis. Dire economic straits are forcing the Cameroon government to consider a number of structural adjustment policies. These include a reduction in government expenditures, a decrease in input subsidies, and trade liberalization (Blandford and Lynch 1990).

DESCRIPTION OF THE DATA AND VARIABLE DEFINITIONS

The primary source of data for this study is the National Income and Expenditure Survey (l'Enquete Budget-Consommation, or EBC). The Direction of Statistics and National Accounts in Cameroon's Ministry of Plan and Regional Development implemented the EBC from September 1983 through August 1984. Roughly 5,500 households out of the then-estimated total population of 9 million were

included in the survey. A primary purpose of the survey was to collect information to update the calculation of price indices.

This section discusses the collection and organization of the data and variables used. The first three sections describe issues relating to sample selection, survey implementation, and the sample weights. The following section describes some of the variables used in this analysis.¹

Sample Stratification

The sample is stratified according to six agroecological zones (Figure 2). Two of these zones consist of the major urban areas, and the remaining four zones are differentiated by their agroecological characteristics. The six zones include:

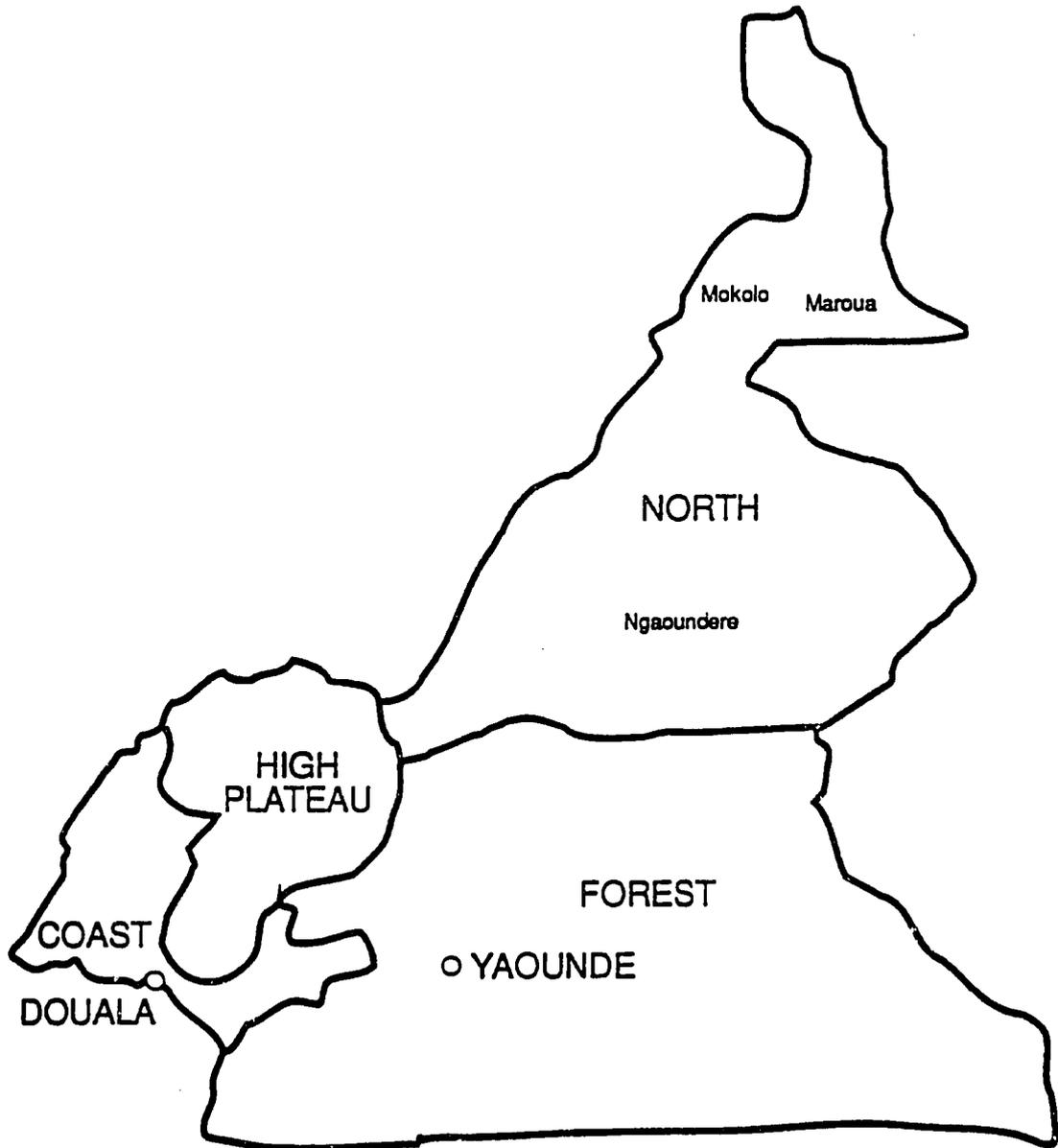
- 1) Yaoundé, the administrative capital and second largest city;
- 2) Douala, the country's major port and commercial center;
- 3) the Forest zone, primarily a tropical rain forest area, made up by the provinces of the Center, East, and South. The main export crops are cocoa and tobacco, and manioc is the major food crop;
- 4) the High Plateau zone, a rich agricultural area, made up of the fertile provinces of the Northwest, West, and part of the Coast. Coffee is the major export crop and maize and plantain are the major food crops;
- 5) the North, consisting of the three provinces in the north, the Extreme North, North, and Adamoua, is primarily Sahelian semidesert. Cotton is the principal export crop and millet and sorghum the major food crops; and
- 6) the Coastal zone, consisting of the Southwest and part of the Coast provinces, where plantation agriculture (oil palm, bananas, and rubber) dominates, and maize and root crops are the major food crops.

Each zone, except Yaoundé and Douala, is further divided into semiurban and rural areas based on the 1976 population census. Based on this stratified sample and supplemented by population characteristics, a sample of counties was selected and subdivided into segments. A random sample of segments was selected. From each segment a sample of 12 to 24 households was selected for inclusion in the survey population.²

¹ More details on the organization of the EBC data are provided by Buttel and Lynch (1991).

² For more details on survey methodology and implementation, see Ministry of Plan (1988).

Figure 2 – Agroecological Zones



For purposes of this study, a different aggregation of the data by region is used. Households are grouped into six regions: Yaoundé, Douala, semiurban North, semiurban South, rural North, and rural South. Two factors influenced the decision to focus on these six regions rather than the agroecological zones used in the survey. First, data on the household consumption of own production from the Coastal agroecological zone have serious quality problems. The consumption and expenditure characteristics of households in the South are broadly similar. Thus, the analysis may be more robust by aggregating the southern agroecological zones together, while maintaining the split between semiurban and rural areas.

Second, evidence suggests that differences between northern and southern Cameroon and the degree of urbanization create major socioeconomic differences in Cameroon in terms of employment, allocation of total expenditures, food consumption, and quality of life. Important agroclimatic differences between North and South Cameroon affect agricultural production and consumption patterns. Due to location, poor transportation and communications, and ethnic and religious differences, the North has been and continues to be somewhat isolated from the South.

There are disparities in employment, infrastructure, and educational facilities between urban and rural areas. These differences are obscured by using the existing agroecological zones, which combine rural with semiurban households. The six regions used in this analysis allow these important differences to be highlighted.

Survey Implementation

The survey year is divided into four quarters consisting of three months each: Quarter 1 (September through November); Quarter 2 (December through February); Quarter 3 (March through May), and Quarter 4 (June through August). Each household was interviewed four times per quarter, on the same day for four consecutive weeks. Throughout the year, each household was interviewed 16 times. One-week recall periods were used to obtain information on food and other frequent expenditures. Information on expenditures on infrequently purchased items was collected in both a two-month recall questionnaire, administered once each quarter, as well as the weekly questionnaire administered four times each quarter. Household demographic information and the inventory of household possessions were collected only once during the first household interview. It was assumed that this information remained constant over the course of the survey year.

Sample Weights

Sample weights were derived in the design phase of the survey based on the sample selection methodology used to draw the nationally representative sample. Sample weights permit the use of sample estimates to generate national statistics. Separate weights are calculated for urban and rural areas within an agroecological zone. In all, 10 different weights are used to "blow up" the

sample to represent national averages. In the descriptive part of this analysis and in deriving the means of the budget shares used in the calculation of the expenditure elasticities, the weighted sample is used. In the regression analysis, the unweighted sample is used.

Household Consumption and Expenditure Data

Information on six categories of household consumption and income were collected. These categories included (1) monetary expenditures on both food and nonfood items; (2) the quantities consumed of food products produced by the household; (3) the quantities of food products given as gifts by the household to nonhousehold members; (4) household revenue; (5) household demographic information; and (6) an inventory of housing stock and the possession of certain durable goods. The disaggregated list of expenditure categories is given in Appendix A.

Data were collected on the quantities of own production consumed by rural households. These data were not collected in the urban and semiurban areas. In order to more accurately estimate total household expenditures, the value of food products produced and consumed by the household was estimated. This was accomplished by multiplying the quantity estimates of home production consumed by the household by the disaggregated regional quarterly market price described above. This estimated value of the consumption of home production is a component of total household expenditures.

Price Data

Household-level price data were not collected. Price data for a limited number of food products were collected during parallel surveys of markets adjacent to urban and rural sample areas during each quarter.³ Market enumerators were instructed to purchase food products from three different vendors after bargaining, then weigh and record the unit price. Price data for approximately 60 food products were aggregated by quarter and agroecological zone. Separate prices were calculated for rural and urban markets. These prices were used to value the household's consumption of own production.

Estimating the Service Value of Housing Stock

Included in the household inventory was information on the quality, size, and rent paid for housing. However, for much of the sample, particularly in the rural areas, households own their homes. Consistent data on the value of housing stock owned by the household were not collected during the survey. As housing

³ In the original plan of work for the EBC, price surveys were planned for Yaoundé and Douala. However, during the course of the survey year, the collection of price data from these regions was eliminated.

is a major factor influencing household welfare, a value for these services should be included in the calculation of total expenditures. Two different procedures were used, one for the rural areas and one for the urban and semiurban areas, to assign a monetary value to housing services.

In the urban and semiurban areas, a two-step procedure was used to correct for selectivity bias. This bias exists if there are factors that determine if a given household will rent or own (Heckman 1979; Heien and Wessells 1990). The use of this two-step procedure assumes that a latent variable influences the household's decision to rent or buy a home. In the first step, the probability of a household renting or owning is modeled, using a dichotomous choice model that captures the influence of the latent variable. In the second step, by including a variable derived from the first step, the problem of selectivity bias is eliminated and ordinary least squares can be used to estimate a rent function. The predicted rent for households living in the urban and semiurban areas is derived using the ordinary least square (OLS) coefficients (see Appendix B for more details).

Most rural households own their homes. Given the limited sample size of renters in the rural areas, it was not possible to estimate a rent equation using the same approach as in the urban areas. Instead, the budget share for rent allocated by the small sample of rural households that rented was calculated. On average, rent represented 7 percent of total household expenditures. Thus, the rental value of households in the rural areas who own their own home to be 7 percent of their total expenditures was estimated. This amount was then added to rural households' estimate of total expenditures.

Other Data Considerations

The data on the quantities of food given by the household as gifts to nonhousehold members and the source and amount of revenue earned by the household are not used in this analysis. In the case of the data on gifts, only one side of the transaction was collected. No information was collected on the gifts received by the household from nonmembers. Although gifts given and received can have important consequences on total household income, the lack of data on gifts received by the household left a distorted picture of the effect of inter-household food transfers. It was therefore assumed that the net effect of food gifts given and received by the household over the course of the survey year equaled zero.

3. SOCIOECONOMIC CHARACTERISTICS OF HOUSEHOLDS IN CAMEROON BY REGION

As described in the preceding section, the EBC data set is rich in information on the socioeconomic characteristics of Cameroon's population. Later in this study, data on total household expenditures are used to explore income inequality and poverty in Cameroon. Before beginning that analysis, some descriptive information on regional differences and similarities among households in Cameroon is presented. The objective of this section is to provide a regional analysis of household characteristics to establish the context for interpreting the subsequent analysis based on income distribution.

Tables 1 through 9 present data on regional household characteristics derived from the weighted EBC sample. The weighted sample enables the generation of descriptive statistics representative of the entire population of Cameroon. The descriptive data presented in these tables represents only a small fraction of the available information. Tables are selected in order to demonstrate the influence of key regional and demographic variables on household choices with respect to expenditures, food consumption, employment, and quality of life.

In the following section general information on characteristics of the households, heads of households, quality of housing, possession of durable goods, and expenditures is presented. Major differences in household characteristics between the rural and urban areas and between the North and South are summarized.

DESCRIPTIVE ANALYSIS BY REGION

Distribution of Population

Cameroon's total population in 1983/84 as estimated by the EBC weighted sample is 8.8 million people (Table 1). Each region's share of total population is given in parentheses at the bottom of Table 1. Roughly 72 percent of the population is located in rural areas, 18 percent in semiurban areas and 11 percent in the two major cities. Cameroon has an estimated 1.5 million households. Regional allocation of households is roughly similar to total population shares by region. Eleven percent of all households are in the major cities, 17 percent are in semiurban areas, and 72 percent are in rural areas.

The North and High Plateau regions each represent a third of Cameroon's total population (34 and 32 percent respectively). The remaining third of the households are divided among the Forest region (17 percent), Coastal region (6 percent), Yaoundé (5 percent), and Douala (6 percent). The shares of households

Table 1 – Population Distribution by Agroecological Zone

Agroclimatic Zone	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon	Percent of Total Population
1,000 Households								
Forest	0.0	0.0	0.0	39.3	0.0	229.1	268.4	17.0
High Plateau	0.0	0.0	0.0	138.4	0.0	349.7	488.1	32.0
North	0.0	0.0	57.6	0.0	462.9	0.0	520.5	34.0
Coast	0.0	0.0	0.0	22.5	0.0	74.0	96.6	6.0
Yaoundé	80.8	0.0	0.0	0.0	0.0	0.0	80.8	5.0
Douala	0.0	85.9	0.0	0.0	0.0	0.0	85.9	6.0
Cameroon	80.8 (5%)	85.9 (6%)	57.6 (4%)	200.2 (13%)	462.9 (30%)	652.9 (42%)	1,540.3 (100%)	100.0
Total Population 1,000								
Total population	480.3 (5%)	500.8 (6%)	321.6 (4%)	1,224.9 (14%)	2,438.9 (28%)	3,821.9 (44%)	8,788.3 (100%)	

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

located in each of the agroecological zones is presented in the far right column of Table 1.

Household Characteristics by Region

There is little variability in household size among the six regions (Table 2). Households in Cameroon as a whole, as well as in each of the regions, average six members, except in the rural North, where households average five members. While average household size varies little across regions, the distribution of household size varies considerably within regions. Urban and semiurban areas, Yaoundé in particular, have higher than average percentages of households at both extremes: single person households and households with 10 or more members. This reflects two important characteristics of urban migration in Cameroon. First, single people migrate to urban areas looking for employment. Second, children are sent to live with extended family members in urban areas in order to have access to educational opportunities not available in rural areas. These urban migrants contribute to the ranks of both single person and larger households.

Rural areas in the North and South differ significantly in household size distribution. The rural areas of the North have a small percentage of households at the extremes, single member and households larger than ten persons. While the national average for these types of household is 9 percent and 13 percent, respectively, these households represent only 5 percent and 9 percent, respectively, of the households in the North. Roughly 86 percent of the rural North's households include between two and nine persons. In the rural South the distribution is closer to the national average.

The age distribution of household members supports the claim that the rural exodus is resulting in an older rural population (Ministry of Agriculture 1980; World Bank 1989). Within each of the regions the share of children from 0 to 15 years is roughly similar, representing some 50 percent of each region's total population. However, the cohort of individuals from 16 to 45 years of age is large in Yaoundé and Douala, representing almost half of those regions' populations. Only a small percentage of individuals in the two major urban centers, 8 percent or less, are 46 years of age or older. In contrast, the 16-to-45 age group is smaller in the semiurban and rural areas, representing a third of their populations. These four regions generally have a larger share of persons 46 and older, ranging from 11 to 18 percent of the total, depending on the region.

The education of household members by region demonstrates the regional disparities in access to education. Seventy percent of the population in the semiurban North and 86 percent of the population in the rural North have had no education. The bulk of the remaining individuals have had only a primary education. This is in contrast to the semiurban South and rural South, where 38 and 47 percent of their populations, respectively, have had no education. The share of noneducated individuals is lowest in Yaoundé and Douala, where only a

Table 2 – Household Characteristics by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
Percent of Households							
Household size							
1	14	11	12	9	5	11	9
2-5	39	38	49	44	54	43	46
6-9	31	36	24	32	32	31	32
10 +	17	15	15	15	9	15	13
Total	100	100	100	100	100	100	100
Average size	6	6	6	6	5	6	6
Percent of Individuals							
Household age distribution							
0-5	21	19	20	21	21	21	21
6-15	26	26	27	30	26	30	29
16-25	24	24	16	19	15	13	16
26-45	23	23	21	19	23	18	20
46-65	5	7	12	9	11	14	11
66 +	1	1	4	2	4	4	3
Total	100	100	100	100	100	100	100
Education of household members							
None	25	27	70	38	86	47	55
Primary	46	46	26	46	14	47	37
Secondary	20	21	3	13	0	4	6
Vocational	5	5	1	2	0	1	1
University	3	1	0	0	0	0	0
Total	100	100	100	100	100	100	100
Relationship to head of household							
Head of household	17	17	18	16	19	17	18
Spouse	12	13	19	15	22	16	17
Children	48	50	41	48	45	46	46
Parents	0	1	2	1	3	2	2
Other	23	18	21	20	11	19	17
Total	100	100	100	100	100	100	100

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

quarter of the population has had no education. Most of the university-educated people reside in Yaoundé and Douala, the two major urban centers.

There are two points to note in looking at the relationship of the head of household to other household members. First, while polygamy is practiced throughout Cameroon, it is more prevalent in the North. This is reflected in the slightly higher share of spouses to heads of households in the semiurban and rural North. Second, the phenomenon of the extended family is such that because of the greater educational and employment opportunities, households in urban areas can be large. This is reflected in the large share of household members classified as *other* in both the semiurban and urban areas, particularly Yaoundé. This category consists of non-nuclear family household members living in the household for longer than six months at the start of the survey.

Head of Household Characteristics by Region

Most households in Cameroon are headed by males (Table 3). Females head an average of only 18 percent of all households, though this varies considerably by region. In the rural areas of both the North and South, more conservative marriage practices and fewer employment opportunities reduce the female-headed households to only 9 percent of the total in those regions. In the South, female-headed households are more common, ranging from 17 percent to 23 percent of all households.

Single-member households are more common in the large urban areas than in the semiurban or rural areas (Table 3), comprising 25 percent of the heads of households in Yaoundé and 18 percent of those in Douala. Single person households are rare in the rural North, representing only 2 percent of all households. Monogamous households make up roughly half of all households in all regions. Polygamous households are more prevalent in the semiurban and rural areas of the North, representing over 20 percent of households in these areas. In the South, 20 percent of rural and semiurban households practice polygamy. However, in the major urban areas this share drops to less than 13 percent. In the semiurban and rural South widows head between 15 and 18 percent of the households, a considerably higher proportion than in the other regions. Divorced persons head only 4 percent of all households in Cameroon.

The breakdown by age of household heads reconfirms earlier observations that rural areas have a larger share of older people (Table 3). In Yaoundé and Douala, heads of households range between the ages of 26 and 45 in more than 60 percent of all households, while persons in the 46-plus age category head between 22 and 30 percent of the urban households. In contrast, in the semiurban and rural areas, household heads are in the 26-to-45 age category in 38 to 51 percent of the households, and in the 46 + group in 43 to 58 percent of the households.

The educational level of the heads of household follows the geographical pattern seen in Table 2. In the North, between 78 and 92 percent of the heads of households have had no education. Only 7 to 15 percent have had some primary

Table 3 – Head of Household Characteristics by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Sex of head of household							
Male	79	81	83	77	91	91	82
Female	21	19	17	23	9	9	18
Total	100	100	100	100	100	100	100
Marital status head of household							
Single	25	18	9	11	2	8	8
Monogamous	50	58	52	51	58	51	53
Polygamous	3	11	23	20	25	21	21
Widowed	21	19	20	21	21	21	21
Divorced	6	4	6	3	5	3	4
Total	100	100	100	100	100	100	100
Age of head of household							
16-25	9	8	8	6	5	4	5
26-45	68	63	44	51	48	38	46
46-65	20	27	38	37	35	46	39
66 +	2	3	10	6	11	12	10
Total	100	100	100	100	100	100	100
Education of head of household							
None	15	22	78	44	92	57	62
Primary	38	39	15	38	7	36	27
Secondary	23	24	2	10	0	4	6
Vocational	14	11	3	6	0	3	3
University	11	3	1	1	0	0	1
Total	100	100	100	100	100	100	100

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

education. Throughout the South, the percentage of heads of households who have had no education is significantly lower.

Employment of the Head of Household by Region

There is a strong correlation between region and employment by job category and sector (Table 4). In both the rural North and rural South farming is the dominant source of employment. More than three-fourths of the heads of households in rural areas are engaged in smallholder agriculture. Few other full-time employment opportunities appear to exist in rural areas. However, the survey only captured primary occupation. Three percent or less of the heads of households in the rural North and rural South are employed as agricultural workers. Between 6 and 9 percent of rural household heads are self-employed.

A breakdown of employment by sector confirms the impression given above: 90 percent of the households in the rural North and rural South are involved in the agricultural sector. The commerce and transport, and service sectors provide most of the remaining employment in the rural areas. In the semiurban areas agriculture continues to be an important source of employment for heads of households, generating 37 percent of the employment in these regions. Workers and the self-employed, usually in commerce and transportation or crafts, comprise one-half of the head of all household heads in the work force in the semiurban areas. These trends are reflected in the data on sector of employment since construction, commerce and transport, and service sectors generate roughly 60 percent of the employment in the semiurban areas.

In the major urban areas of Yaoundé and Douala, formal sector jobs in the public and private sector predominate. A comparison of head of household employment in Yaoundé and Douala reveals some key differences between the two largest cities. Yaoundé is the administrative center of the country, hence a large percentage of the heads of households are employed in the service sector, which includes public sector employment. Douala, the main port and commercial hub of the country, is close to Cameroon's offshore oil industry. These activities are reflected in the importance of the industry, energy, construction, and commerce and transportation sectors among heads of households in Douala.

Housing Characteristics by Region

Housing characteristics vary significantly by region (Table 5). These dissimilarities reflect regional differences in income and in the physical and infrastructural characteristics of a particular region. For example, electricity and piped water are more accessible in the urban areas; certain types of water sources are only available in certain regions. Access to clean water, electricity, and improved sanitation facilities are important factors influencing household health and well being and thus, are important indicators of general quality of life.

Table 4 – Employment of the Head of Household by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Employment							
White collar	20	9	3	7	1	2	4
Worker	35	43	21	20	2	4	10
Self-employed	24	22	24	28	6	9	12
Farmer	1	0	31	31	83	76	62
Other	20	25	19	10	6	7	9
Total	100	100	100	100	100	100	100
Sector of employment							
Agriculture	2	3	37	37	91	87	71
Industry/energy	5	13	6	6	2	2	3
Construction	10	11	5	8	0	2	3
Commerce/transportation	27	35	20	25	3	4	10
Services/banks	56	39	33	24	4	5	13
Total	100	100	100	100	100	100	100

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

Table 5 – Housing Characteristics by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Status of occupation							
Owners	39	59	83	82	99	93	88
Renters	54	38	14	15	0	3	9
Lodged ^a	8	3	4	4	0	4	3
Total	100	100	100	100	100	100	100
Source of water							
Indoor faucet	46	17	8	4	0	5	7
Outdoor faucet	19	66	39	47	1	7	15
Well	23	12	38	25	55	14	29
Spring	3	4	4	17	14	38	23
River	1	1	8	7	29	35	25
Other	8	1	3	0	1	0	1
Total	100	100	100	100	100	100	100
Source of lighting							
Electricity	67	60	22	22	0	2	11
Kerosene lamp	33	39	75	77	51	98	73
Wood	0	0	2	0	47	0	14
Other	1	0	1	1	2	1	1
Total	100	100	100	100	100	100	100
Type of toilet							
Flush	12	9	3	2	0	1	2
Latrine	68	55	93	68	37	38	46
Other	20	36	4	30	62	61	52
Total	100	100	100	100	100	100	100

Source: Lynch (1991).

^a Lodging provided by employer or other, with or without household contribution.

Note: Percentages may not sum to 100 due to rounding error.

Almost all rural households, and most semiurban households, own their own homes. In rural areas of the North and South rental housing is practically nonexistent. Most rural families have access to land upon which to build their own homes through traditional land tenure systems, which do not require monetary payment. In the major urban areas, however, traditional land tenure systems have been forced to give way to a market system due to the breakdown of traditional land tenure relationships and rapid population growth. The latter factor has resulted in a rapid increase in land prices during the last decade. Many households cannot afford to purchase land and construct a home, and are forced to rent. A particularly strong rental market has developed in Yaoundé, where more than one-half of the households rent their homes. In addition, 8 percent of households in Yaoundé live in homes provided to them by their employer or relative. Lodging, at least in the oil boom days of the 1980s, was an important perquisite provided to government bureaucrats and high level administrators in the private sector.

Access to piped water and electricity is limited to the urban areas, particularly the large urban areas. While this is to be expected given the infrastructural costs of these services, the degree of the disparity is marked. Between 60 and 80 percent of the households in Yaoundé and Douala have access to piped water (indoor or outdoor), electricity, and some kind of improved sanitation facilities (flush toilets or latrines). In the semiurban areas roughly 50 percent of the households have access to piped water, 22 percent have electricity, and 70 to 96 percent have improved sanitation facilities, primarily latrines.

In contrast, in the rural areas these amenities are rare, except in the rural South where 12 percent of the households have access to piped water. It is striking that 44 percent of households in the rural North and 74 percent of the households in the rural South do not have access to sanitary water sources. They continue to rely on springs, rivers, and other water sources. More than 60 percent of the households in rural areas do not have access to any kind of improved sanitation facilities.

Kerosene lamps are the most common source of lighting in Cameroon. Roughly three-fourths of all households depend on this source. Rural households in the North depend on wood, which they presumably use for cooking, with light as a byproduct. Elsewhere in Cameroon, wood is seldom used for lighting. In the urban and semiurban regions, electricity is the most common alternative source of lighting.

Few Cameroonian households depend on wood for lighting, in contrast to other African nations where deforestation is a major problem. These statistics have to be carefully interpreted, however. The survey question specified the source of lighting and did not include sources of cooking or heating fuel. If the broader category had been asked the percentages of households dependent on wood for energy might be different.

Household Ownership of Durables by Region

Another indicator of wealth and relative well being is household possession of durable goods (Table 6). Three points need to be made. First, a larger proportion of households in Yaoundé and Douala possess these goods than do households in the other regions. This is because of the cost of these items and the concentration of wealth in the urban areas. Second, households in all regions of Cameroon, except in the rural North own radios. Third, the scarcity of material possessions in the rural North is striking. Only 22 percent of the rural North households own a radio, half of the proportion in the rural South. The only other common possession of these households is bikes or motor bikes.

Household Budgets by Region

Significant differences in mean per capita expenditures exist between the regions (Table 7). The differences in the allocation of total expenditure shares among nine categories of expenditures reflect these regional characteristics. The calculation of total mean per capita expenditures includes monetary expenditures, the value of imputed rent, and the value of home production consumed by households in the rural areas.

Total mean per capita expenditures are highest in Yaoundé and Douala, at CFAF 455,000 and CFAF 380,000, respectively. This reflects the greater concentration of formal sector employment opportunities in the large urban areas and their higher wages. Semiurban North and South have the next highest mean per capita expenditures: CFAF 218,000 and CFAF 161,000, respectively. The lowest level of total expenditures is found in the rural North, where the mean per capita expenditure is estimated at CFAF 99,000. This figure is slightly higher in the rural South at CFAF 114,000.

About one-half of all household expenditures in Cameroon (including the value of home production consumed by the household) are on food eaten at home. The share of expenditures on food eaten at home is highest in the rural North (71 percent) and semiurban North (58 percent). In the rural South, 54 percent of all household expenditures are on food eaten at home. In Yaoundé, Douala, and the semiurban South, this share drops to approximately 34 to 40 percent of total expenditures.

The regional shares of household budgets allocated to food expenditures given above may underestimate the true shares. As mentioned earlier, data on production for home consumption were collected only in rural areas. The underlying assumption that semiurban and urban households do not produce food for their own consumption is questionable. In addition, inconsistencies in the collection of data on home-produced food for consumption necessitated a reduction in the number of products included in the calculation of total expenditures. Also, during the survey year, 1983/84, Cameroon suffered a drought, which was particularly severe in the North. Food aid was required in the areas that were hit particularly hard, because household food production declined. These factors

Table 6 – Household Durables by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Household durables							
Radio	84	74	62	67	22	60	47
Bike or motor bike	6	26	37	21	25	22	23
Car	13	8	6	6	0	2	3
Refrigerator	27	27	6	6	0	1	4
Sewing machine	34	42	15	25	3	16	16
Electric/gas stove	29	23	3	9	0	2	5

Source: Lynch (1991).

Table 7 – Shares of Total Expenditures by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Expenditure categories							
Food ^a	34	37	58	40	71	54	55
Food and beverage ^b	8	12	5	10	7	9	8
Clothing and shoes	10	7	8	8	6	7	7
Rent and utilities	18	18	13	12	7	8	10
Household durables	7	4	5	6	3	5	4
Services and health	7	7	5	8	2	7	6
Transportation and communication	11	9	5	8	2	5	5
Education	4	4	1	5	0	3	3
Leisure and other	2	2	1	2	1	2	1
Value of total expenditures (CFAF 1,000)	454.5	380.0	217.7	160.6	98.8	113.8	152.0

Source: Lynch (1991).

^a Includes value of consumption of home production.

^b Food consumed away from home.

Note: Percentages may not sum to 100 due to rounding error.

contribute to possible underestimation of the value of home production and total food consumption.

Beverages and food eaten outside the home represent an important share of household expenditures in the southern regions; Yaoundé, Douala, semiurban regions, and rural regions, ranging from 8 to 12 percent of total expenditures. This contrasts with the northern regions, semiurban and rural, where allocations for this category are less than 7 percent of total expenditures. This difference may reflect the Islamic influence in the North, where alcohol consumption and associated nightlife is discouraged.

While households in the major urban areas allocate a slightly higher share of expenditures to goods such as clothing and shoes, rent and utilities, household durables, services, health, and leisure, the shares across regions are largely similar. Transportation and communications command larger shares of expenditures in the South in general, particularly the large urban areas. This category of expenditures is important in the semiurban South as well, reflecting the better infrastructure and greater economic integration. The low budget share allocated to education in the semiurban and rural North, 1 percent or less, reinforces the impression obtained earlier that access to or interest in education is different in the North than in the South.

Food consumption patterns differ significantly by region (Table 8). As mentioned earlier there is tremendous regional variation in the composition of food production. The food staple in the North is millet and sorghum and to a lesser extent rice. Legumes, particularly groundnuts, are an important source of protein in the diets of northern households. Because of the hot dry climate of much of the North, the consumption of roots and tubers is limited by their higher rainfall requirements. In the South where rainfall is higher, food staples include roots, tubers, plantains, and maize. Rice, primarily imported, and bread are increasing in importance in urban and semiurban areas of the South. The data, particularly in the rural North and South, reflect these regional food production or availability patterns.

The effect of urbanization on consumption patterns is apparent. Both North and South semiurban food consumption patterns resemble those of Yaoundé and Douala more than they resemble the consumption patterns of the rural areas. The only significant difference in consumption patterns between urban and semiurban areas is observed in the semiurban North, where limited availability of roots and tubers due to production constraints result in higher levels of grain consumption than found in other urban areas.

In the rural areas of the North and South, roughly half of the value of the food consumed is from home production, though the importance varies by product (Table 9). As described above, data on the quantities of food produced at home for household consumption were collected only from rural households. Using regional prices the value of this consumption was calculated and added to total monetary expenditures. For the reasons stated above, these estimates of the value of home production may underestimate the importance of home production in total food consumption.

Table 8 – Shares of Food Expenditures by Region

	Yaoundé	Douala	North Semiurban	South Semiurban	North Rural	South Rural	Cameroon
	Percent of Households						
Expenditure categories^a							
Cereal and cereal products	15	16	32	16	47	14	25
Roots and tubers	17	19	3	14	1	26	16
Vegetables and fruits	11	11	10	10	11	11	11
Legumes and nuts	5	5	3	5	15	8	9
Dairy products and eggs	5	4	3	2	2	1	2
Cooking oils	8	9	7	16	3	15	10
Meat and fish	35	32	36	31	19	21	24
Sugar	1	1	4	1	2	1	1
Condiments	3	3	2	4	2	3	3
Total	100	100	100	100	100	100	100
Value of food expenditures (CFAF 1,000)	125.4	124.9	119.4	58.8	66.4	57.9	70.1

Source: Lynch (1991).

^a Includes value of consumption of home production.

Note: Percentages may not sum to 100 due to rounding error.

Table 9 – Share of Total Household Food Expenditures Provided by Home Production in Rural Households

	North Rural	South Rural	Cameroon
	Household Shares		
Expenditure categories ^a			
Cereal and cereal products	68	28	45
Roots and tubers	6	79	54
Vegetables and fruits	62	57	59
Legumes and nuts	58	52	55
Dairy and eggs	10	0	5
Cooking oils	0	28	18
Meat and fish	0	4	3
Sugar	0	6	4
Condiments	0	18	10
Total	54	48	50
Value of food expenditures (CFAF 1,000)	30.5	28.4	29.3

Source: Lynch (1991).

^a Auto-consumption data were only collected in rural areas.

Note: Percentages may not sum to 100 due to rounding error.

In the rural North, households produce 58 to 68 percent of the value of cereal and cereal products; vegetables and fruit; legumes and nuts consumed. Rural southern households produce 50 to 79 percent of the value of total food expenditures for roots and tubers; vegetables and fruits; and legumes and nuts. Households in the North rely primarily on the market to acquire roots, tubers, dairy products, eggs, oil, meat, fish, sugar products, and condiments. Markets are used primarily in the South to purchase cereal and cereal products, dairy products and eggs; cooking oil; meat and fish; and sugar products.

SUMMARY OF MAJOR REGIONAL HOUSEHOLD CHARACTERISTICS

From the above discussion of household characteristics, several regional differences between households in the North and those in the South and between urban households and rural households can be identified. The most striking difference between northern and southern households is in education. Roughly three-fourths of the total population of the North have had no education. An even higher percentage of heads of household, between 78 to 92 percent, have received no education. Only a small percentage of the northern population has obtained secondary or higher levels of education.

The South, with its long history of missionary schools, has considerably higher levels of education in both the urban and rural areas. Only one-half to one-fourth of the southern population has had no education; the same is roughly true of heads of households. In southern regions, one-half to three-fourths of the population have received primary or higher education. Individuals with university-level training are found in the two major cities.

Expenditures on food, food and beverages, and education differ between northern and southern households. Northern households allocate a larger budget share to food consumed in the home than do households in the South. Households in the North allocate a smaller share of their income to beverages and food eaten outside the home. These households also spend less on education than do southern households. The differences in food expenditures, reflecting the differences in the agroclimatic conditions of the North and South, are clearly revealed in food expenditure shares. Especially apparent is the greater dependence in the North on a cereal-based diet, while the southern diet includes roots and tubers as important staples.

Urban areas, and to a lesser degree semiurban areas, differ substantively from rural areas in their consumption, employment, and education possibilities. Urban versus rural differences in household characteristics are reflected in the greater household expenditures in urban areas and greater access to education, infrastructure, and housing. More urban households possess selected durable goods than do rural households. Urban heads of households are generally younger than their rural counterparts. This reflects the effects of urban migration of younger people for education and employment opportunities not available in the rural areas and the rural migration of retired urban workers to their native villages.

A very small percentage of rural heads of households are female. Ethnic customs and limited employment alternatives to agriculture limit the number of female-headed households. Ethnic customs similarly limit the number of single person households in rural areas. Few economic opportunities outside of agriculture exist for people in the rural areas.

The next section focuses on income distribution and the factors contributing to income inequality and poverty. In order to understand income inequality and poverty in Cameroon, the information presented above is essential. The analysis of the data by strata have clearly demonstrated some important differences between households living in the North and those living in the South and between urban households and rural households. These differences have important consequences for employment, education, and living standards.

4. WELFARE DISTRIBUTION IN CAMEROON

Data from the EBC can be used to examine the distribution of welfare in Cameroon. In the first part of this section the methodology used to analyze and compare household welfare is described. In the second section, households are divided into quintiles based on per capita income, and the household characteristics of each quintile are discussed. Based on this ranking a poverty profile is developed, which identifies the characteristics of the poorest households. Income inequality measures are presented in the final section, which summarize the nature of the distribution of income.

METHODOLOGY FOR MEASURING AND COMPARING HOUSEHOLD WELFARE

The Social Welfare Function and Money Metric Utility

The basis for measuring and analyzing household welfare is the social welfare function postulated in the theory of welfare economics. Typically, this function has as arguments the utility or welfare levels of individual members of society. This implies that the ranking of alternative social states depends on the welfare levels of individual members of society. The use of the social welfare function permits the measurement and comparison of changes in levels of individual welfare as the allocation of resources or social states is altered (Broadway and Bruce 1984; Deaton and Muellbauer 1980a; Glewwe 1987).

The Bergson-Samuelson form of the social welfare function is commonly used in welfare analysis. Like other such functions, it expresses social welfare as a function of individual or household utility levels. While social welfare functions often have individuals as the unit of analysis, the household can also be used. To analyze at the household level, it is typically assumed that each household member has the same level of welfare as that of the household. The Bergson-Samuelson social welfare function for policy analysis requires two important assumptions. First, it is assumed that utility can be compared across individuals or households. Second, it is assumed that each individual or household has the same utility function, which has as arguments household characteristics.

The commonly used approach to measuring household welfare is to transform household utility levels into their "money-metric utility" equivalent. The monetary representation of household utility implied by the money-metric approach posits that under the standard set of economic assumptions (household utility maximization and a given set of prices) the amount of money necessary for a household to achieve a given level of utility can be estimated and compared.

Thus, utility levels can be measured by the amount of household income or expenditures, adjusted to reference prices and household characteristics, required to obtain a specific level of utility.

The money-metric approach allows indifference curves to be labeled by the minimum amount of money needed to attain them at the reference prices for households with the reference characteristics (Deaton and Muellbauer 1980a). As Glewwe (1987) points out, money-metric utility allows labeling of indifference curves so that differences between individual levels of utility can be distinguished and compared; but this utility does not imply a particular cardinalization of the common utility function.

The household money-metric equivalent is measured by estimating an expenditure function. Thus, the expenditure function becomes a proxy for the unobservable welfare levels of the household (Broadway and Bruce 1984). This permits a cardinalization of the household utility function, which is necessary for aggregation by the social welfare function. However, the utility derived by the household from leisure and pure public goods is not included in the estimate of household welfare in this approach (Glewwe 1987).

Social welfare theory provides the theoretical foundation for much of the empirical work on welfare comparisons. The data available for measuring changes in welfare are typically household income expenditure survey data. The concept of money-metric utility, based on the expenditure function, suggests the use of estimates of household expenditures instead of income to infer welfare. As Glewwe (1987) points out, the use of household expenditure instead of income data is justified on several grounds. First, consumption better reflects household welfare, given the permanent income hypothesis, which implies that while income can fluctuate yearly, consumption tends to be smoothed out over time. Second, expenditure data are more easily obtained from survey data. Income data are more prone to information bias given their more sensitive nature. Finally, remittances and wages from informal sector employment and temporary labor are difficult to capture, except through expenditure figures.

Equivalence Units

There is debate in the literature over whether to use per capita versus adult equivalent units when analyzing income distribution issues (Deaton and Muellbauer 1980a; Glewwe 1987). There is broad consensus that total household expenditures should be adjusted to account for household size. Without size adjustment household welfare tends to be overestimated. Because goods and services consumed by the household are divided among family members, household size influences the welfare derived from a given consumption level.

In using the per capita measure every family member, regardless of age or sex, is assigned the same weight (unity). Alternatively, adult equivalent units (AEU) may be used. These assign to household members of different ages and sex a weight less than unity, which is assigned to adult males. The theoretical justification for using AEU is that children require a smaller expenditure to

maintain a given level of welfare. In addition, certain kinds of expenditures allow economies of scale in consumption. For example, durable goods, housing stock, and clothing can be shared among family members at little or no additional cost. A small child does not eat as much as an adult does. Thus, the "cost" of the additional child to the family is some fraction of the cost of an adult. Therefore, using per capita consumption may underestimate welfare levels in larger households because economies of scale and joint consumption effects are not considered (Glewwe and van der Gaag 1987).

There are several problems in using AEU in demand analysis. A major problem is establishing the adult equivalent units themselves. To determine rigorously the specific weights to be used in a particular country setting is a difficult and controversial task. Further, the appropriate weights may not be constant across regions, ethnic groups, and/or income classes, complicating the application of standard AEU. As Deaton and Muellbauer (1980a) pointed out, using AEU assumes that child-to-adult equivalence in consumption and the economies of scale are the same for all commodities, which is seldom the case.

Several recent studies have examined empirically the differences between per capita and equivalent scales in comparing household welfare levels (Glewwe 1987; Glewwe and van der Gaag 1987). They indicate that while adult equivalent units may be preferred theoretically to the more standard per capita method, the results generated by the two methods are not significantly different in relative terms. The absolute levels of mean consumption change with AEU, but the relative order and magnitude of levels of consumption do not appear to change significantly. Thus, depending on the type of analysis being performed and the importance of relative versus absolute poverty, the application of AEU may not significantly change conclusions.

Table 10 presents a comparison of rankings using the EBC data adjusted by per capita and AEU. The AEU's are derived by Deaton and Muellbauer and reported in Glewwe (1987). Children less than 7 years of age are given a weight of 0.2, children aged 7 to 12 are given a weight of 0.3, children 13 to 17 are given a weight of 0.5, and anyone 18 or older is given a weight of 1.0. Results of this comparison confirm the findings discussed above. Rankings of households remained roughly the same. However, mean adjusted expenditures are higher with the AEU measure than the means obtained with the per capita measure. Given the focus in this study on relative ranking of households to determine the characteristics of poverty, the per capita measure will be used.

The Unit of Analysis

In this study total household expenditures are used to measure welfare levels. The terms household expenditures, consumption, and income will be used interchangeably. The analysis in this study is based on estimates of per capita household expenditures, primarily because the focus is on relative versus absolute rankings of household welfare. In addition, the per capita measure is used instead of an adult equivalent scale because of its simplicity, the known direction of the bias associated with the per capita measure, the difficulties

Table 10 – Comparison of Rankings of Households by Per Capita and Adult Equivalent Units

	Income Quintiles										Share of Households	Mean Annual Expenditures		
	1	2	3	4	5	1	2	3	4	5		Percent	Per cap	Per AEU
	Per Capita, Percent					Per Adult Equivalent Unit, %								
Agroecological zone														
Forest	13	20	18	20	17	13	18	20	22	15	17	141.3	196.6	
High Plateau	45	33	32	28	21	43	32	31	31	21	32	113.8	164.3	
North	38	40	37	32	20	39	44	38	28	19	34	112.0	157.1	
Coast	4	6	9	8	4	6	6	7	8	5	6	134.3	192.0	
Yaoundé	0	0	2	6	19	0	0	1	5	20	5	454.5	588.0	
Douala	0	0	2	7	19	0	1	2	6	20	6	380.0	500.2	
Cameroon	100	100	100	100	100	100	100	100	100	100	100	152.0	210.2	
Education of head of household														
None	80	70	64	57	40	83	72	67	56	34	62	114.2	156.4	
Primary	17	25	29	30	33	15	24	28	33	35	27	168.1	238.2	
Secondary	1	3	4	7	15	1	3	3	6	17	6	299.6	412.0	
Vocational	1	1	3	5	7	1	1	2	4	9	3	288.2	402.1	
University	0	0	0	1	4	0	0	0	1	5	1	701.3	914.2	
Other	0	0	0	0	0	0	0	0	0	0	0	135.8	201.2	
Cameroon	100	100	100	100	100	100	100	100	100	100	100	152.0	210.2	
											Per cap	Per AEU		
Budget shares														
Food	62	60	57	54	37	62	61	58	54	42	55	47	70.1	98.8
Food and beverages	6	8	8	9	13	6	7	9	9	11	8	10	16.2	21.3
Clothing and shoes	6	6	7	7	8	6	7	7	7	8	7	8	11.6	16.2
Rent and utilities	8	8	9	10	13	9	8	9	10	12	10	5	16.9	22.7
Household durables	4	4	5	5	6	4	4	4	5	6	5	5	8.3	11.3
Services & health	6	5	5	5	6	6	5	5	5	6	6	6	8.9	12.4
Transportation & communication	3	4	4	6	12	3	4	4	5	9	5	9	13.1	18.1
Education	3	3	3	3	3	3	3	2	3	3	3	3	4.0	5.9
Leisure and other	1	1	1	2	2	1	1	1	2	2	2	2	2.8	3.6
Total	100	100	100	100	100	100	100	100	100	100	100	100	152.0	

Source: Lynch (1991).

Notes: Percentages may not sum to 100 due to rounding error. The adult equivalents are: children < 7 years = .2; children 7-12 years = .3; children 13-17 = .5.

associated with establishing adult equivalent units for Cameroon given the available information, and the evidence that relative results are not significantly different between the two methods.

The household estimate of total expenditures includes household monetary expenditures on food and nonfood items, an estimate of the value of home production consumed by households in the rural areas, and imputed rent. This estimate is adjusted for both household size and regional prices. Given the lack of information on the purchase date, price, and quality of durable goods owned by the household, no service value for the use of durable goods is included in the estimation of household expenditures.

Price Index

A regional price index was constructed to compare household welfare levels across regions, as estimated by per capita household expenditures. The index deflates household expenditures to account for price differences across agroecological zones. Deflating expenditures by a price index is necessary in order to analyze differences in real consumption between regions (Wood and Knight 1987).

An index for food and nonfood items was constructed for each of the six agroecological zones (Forest, High Plateau, North, Coast, Yaoundé, and Douala) based on a basket of commonly purchased goods (Table 11). A set of national weights was used in the calculation of the indices.

The basket of food items consisted of 16 commodities, while that for nonfood items consisted of four products. The common basket is evaluated for each agroecological zone using regional specific commodity prices. All household food and nonfood expenditures are then adjusted using Yaoundé as the reference basket. The regional commodity price index is presented below (see Appendix B for further details on the calculation of the price index).

The Definition of Poverty

The issue of how to identify poor versus nonpoor households has been extensively debated (Foster 1984; Foster, Greer, and Thorbecke 1984; Kakwani 1980). Several different methods are commonly used to identify poor households. In this study poor households are defined as those found in the first and second quintiles of the income distribution, the poorest 40 percent of the population. Thus, from a relative ranking of poverty, an absolute poverty measure is established based on the cutoff point between households in the two lowest quintiles and all other households. Households defined as poor earn less than CFAF 78,000 per capita (US\$ 260 per person), the cutoff point between the poorest 40 percent and the nonpoorest 60 percent of the population.

The major drawbacks of this so-called head count method are (1) it is a discrete measure, (2) it is difficult to estimate a cutoff point between rich and

Table 11 – Regional Price Index

Agroecological Zone	Food	Nonfood
Forest	0.99	1.08
High Plateau	0.80	1.09
North	0.86	1.13
Coast	0.94	1.02
Yaoundé	1.00	1.00
Douala	0.93	1.00

Source: Lynch (1991).

poor, and, most importantly, (3) it provides no information about the distribution of welfare among the poor. The latter point, under some situations, is a limitation. The absolute measure used here does not distinguish the ultrapoor from the poor. It provides no information on the distribution of poverty among the poor. As an example, using the head count measure of poverty, the move of a household from just under the poverty line to a point above the poverty line is weighed the same as the move of a household *significantly* below the poverty line. Clearly, the move of the very poor household represents a greater change in household welfare than the move of the "barely" poor. For the fine-tuning of poverty programs, this distinction is important.

Despite these limitations, the head count method of determining poverty continues to be used. The reasons include its conceptual simplicity, ease of computation, the focus of most policy applications on ordinal versus cardinal rankings, and policymakers' need for a crude rather than a sophisticated measure of poverty.

DESCRIPTION OF EXPENDITURE DECILES AND QUINTILES

The following tables and figures present information based on the ranking of household by per capita expenditure deciles or quintiles. To derive this ranking, total household expenditures as defined above are deflated by the appropriate regional food and nonfood price index and divided by household size in order to generate per capita "price adjusted" household expenditures. This "price adjusted" per capita measure of household expenditures is used to rank households from lowest to highest and assign them to the appropriate decile or quintile. Thus, each decile and quintile contains 10 and 20 percent, respectively, of the 1.5 million households comprising Cameroon's population in the EBC. The first income decile and quintile contain the poorest 10 and 20 percent, respectively, of the households and the tenth and fifth income decile and quintile represent the wealthiest 10 and 20 percent of the households, respectively.

Mean Per Capita Expenditures by Income Class

Mean per capita expenditures in Cameroon increase significantly in moving from the poorest to richest decile, from CFAF 29,000 to CFAF 619,000 (Table 12). The decile share of total expenditures is similarly skewed. The poorest 10 percent of the population command only 3 percent of the total value of household expenditures, while the richest decile controls 25 percent of total expenditures. Expenditures on food conform to Engel's law: as income increases, the share of total income allocated to food declines. The share of food expenditures declines from 61 percent of total household expenditures for the poorest households to 37 percent for the wealthiest households. Households in the poorest decile comprise 14 percent of the total population. This population share declines fairly linearly, with richer deciles having a smaller share of total population. Thus, the poorest 10 percent of the households command 3 percent of total expenditures while representing 14 percent of total population. In contrast, the households

Table 12 – Mean per Capita Annual Expenditures in Cameroon by Income Deciles and Quintiles

	Mean per Capita Expenditures	Share of Total Expenditures	Mean per Capita Food Expenditures	Budget Share of Food Expenditures	Decile Population	Percent of Total Population
	CFAF 1,000	Percent	CFAF 1,000	Percent	1,000	Percent
Per capita income decile						
1	28.7	3	17.5	61	1214.7	14
2	44.7	5	28.1	63	1052.5	12
3	57.7	6	35.2	61	1033.7	12
4	70.9	7	42.5	60	963.6	11
5	86.3	8	49.5	57	934.9	11
6	105.9	9	59.7	56	862.0	10
7	131.7	10	74.0	56	805.4	9
8	165.9	12	86.9	53	755.4	9
9	235.4	16	114.0	49	692.4	8
10	619.3	25	202.7	37	473.7	5
Cameroon	152.0	100	105.1	55	8,788.3	100
Per capita income quintile						
1	36.7	8	22.8	62	2,267.2	26
2	64.3	12	38.9	61	1,997.3	23
3	96.0	17	54.6	57	1,796.9	20
4	148.7	22	80.4	54	1,560.9	18
5	425.9	40	158.0	43	1,166.1	13
Cameroon	152.0	100	105.1	55	8,788.3	100

Source: Lynch (1991).

Notes: Household income is estimated by total expenditures plus imputed rent and the value of the consumption of home production. Percentages may not sum to 100 due to rounding error.

in the tenth decile command 25 percent of total expenditures but represent only 5 percent of the total population.

The frequency distribution of household per capita income in Figure 3 illustrates the skewed income distribution. The wide horizontal bars express the percentages of households within a given CFAF range of per capita income. The thin horizontal lines show the quintile means from Table 12. Figure 3 gives dramatic graphical evidence of the skewed distribution of welfare in Cameroon. The means of the three lowest quintiles are concentrated at the left of the income distribution. The mean of the fifth quintile is at the far right of the distribution with the mean of the fourth beginning the break from the lower end of the income distribution.

Very few comparative data exist for other African countries. One of the few recent studies available is from the World Bank's Living Standards Measurement Study (LSMS) on the distribution of welfare in the Ivory Coast. The income and expenditure data for this study were collected in 1985. Table 13 presents calculations of mean per capita annual expenditures by income quintiles for Cameroon and the Ivory Coast, and the dollar value of the quintile means. While not strictly comparable because of differences in the calculation methods, the LSMS means nonetheless provide a reference point for comparing Cameroon's figures.⁴

Overall, the estimate of mean per capita annual expenditures in the Ivory Coast is roughly 40 percent higher than the comparable Cameroonian mean. The means in Cameroon start from a low of CFAF 37,000 (US\$ 122) per household per person in the lowest quintile to a high of CFAF 426,000 (US\$ 1,420) in the highest quintile. For the country as a whole, household mean per capita annual income is estimated at CFAF 152,000 (US\$ 507). In the Ivory Coast the estimate is CFAF 217,000 (US\$ 722).

Regional Distribution of Income by Quintile

The distribution of welfare by agroclimatic zone indicates that the largest concentration of poorest households, 45 and 38 percent, respectively, are found in the High Plateau and North (Table 14). These percentages are higher than the share of the national population for these two zones. The remainder of the households in the poorest quintile are in the Forest (13 percent) and Coastal (4 percent) zones. Less than 1 percent of the poorest households are found in the major urban areas of Yaoundé and Douala.

The small percentage of poor households identified in the survey as located in the major cities was unexpected. Direct observation of shanty towns in Yaoundé and Douala suggests that the number of poor households in urban areas is

⁴ Quintile means from the Ivory Coast are calculated as the average of decile means presented in Table 2 of Glewwe (1987). Quintiles are based on per capita income estimates for the population not the household.

Figure 3 – Income Distribution of Cameroonian Households

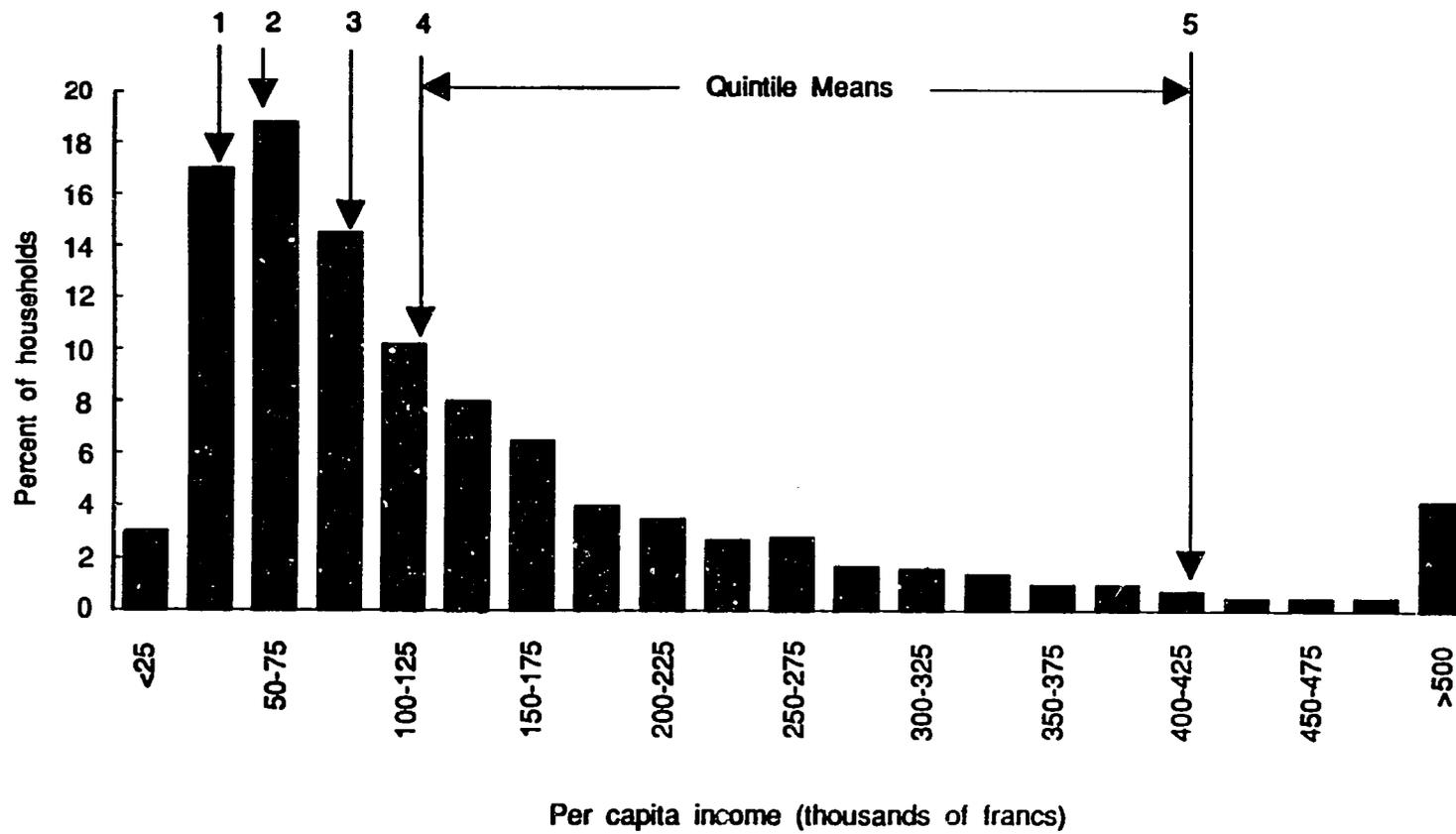


Table 13 – Mean per Capita Annual Expenditures by per Capita Income Quintiles

	Per Capita Income Quintiles					National Average
	Poor		Nonpoor			
	1	2	3	4	5	
	CFAF 1,000					
Cameroon	36.7	64.3	96.0	148.7	425.9	152.0
(US\$) ^a	(\$122)	(\$214)	(\$320)	(\$496)	(\$1,420)	(\$507)
Ivory Coast ^b	55.7	103.2	149.3	228.0	547.0	216.5
(US\$) ^a	(\$186)	(\$344)	(\$498)	(\$760)	(\$1,823)	(\$722)

Source: Lynch (1991).

^a US\$ 1 = CFAF 300.

^b Estimated from income deciles presented in Glewwe (1987).

Table 14 – Regional Distribution of Households by Income Level

	<u>Per Capita Income Quintiles</u>					<u>Cameroon</u>	<u>Mean per Capita Expenditures</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>		
	<u>Percent of Households</u>						<u>CFAF 1,000</u>
Agroclimatic zone							
Forest	13	20	18	20	17	17	141.3
High Plateau	45	33	32	28	21	32	113.8
North	38	40	37	32	20	34	112.0
Coast	4	6	9	8	4	6	134.3
Yaoundé	0	0	2	6	19	5	454.5
Douala	0	0	2	7	19	6	380.0
Cameroon	100	100	100	100	100	100	152.0
Regions							
Yaoundé	0	0	2	6	19	5	454.5
Douala	0	0	2	7	19	6	380.0
North semiurban	1	2	4	5	8	4	217.7
South semiurban	11	11	14	14	15	13	160.6
North rural	37	39	33	28	13	30	98.8
South rural	50	48	44	41	27	42	113.8
Cameroon	100	100	100	100	100	100	152.0

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

not insignificant. The low percentage of urban poor is, in part, a construct of the definition of poverty used in this study. The problem is the establishment of an arbitrary and strictly monetary poverty line. Given the data available in the survey it is not possible to assess a household's standard of living that encompasses the satisfaction of basic needs like health, nutrition, and adequate housing. When using a monetary cutoff point as in this study, the only factor is income. Households with total expenditures below CFAF 78,000 per capita are defined as poor. While adjustments were made to account for regional price differences for food and manufactured goods, there are still differences in the cost structure of urban versus rural living. An example is housing. Housing in the urban areas is considerably more expensive than in the rural areas. An urban household could have a lower overall standard of living than a rural poor household, even with a higher income that puts them above the poverty line. Thus, while it may be concluded from the data that most of the poor are rural, it should not be concluded that there are no poor households in the urban areas. Rather, poor urban households have higher incomes than rural poor households and thus, are not classified as poor if a monetary cutoff point is applied. Throughout the subsequent analysis this point should be borne in mind.

Returning to Table 14, in moving from the poorest to the richest quintile, the percentage of households from the High Plateau and North declines. In the fifth quintile only 20 percent of the richest households are in each of these regions. Consistent with the higher salaries in urban areas, the share of households found in Yaoundé and Douala increases moving from the lowest to highest income quintile. Roughly 40 percent of the richest households are located in these two cities. This share is significantly higher than Yaoundé and Douala's 11 percent share of total population. The Forest and Coastal zones' shares of each quintile are roughly similar to their shares of the national population.

The impression given above of increasing concentrations of wealthier households in the urban areas is reinforced by examining income quintiles by regions (Table 15). The percentages of households in each quintile remain the same for Yaoundé and Douala as described above. The share within each quintile of households living in the semiurban areas increases slightly as the level of income increases.

Most of Cameroon's poor households, roughly 80 percent of the lowest quintiles, are found in the rural areas. In fact, as the level of income increases the percentage share of rural households within each quintile declines. It is apparent that income and location are highly correlated. This is due not only to income earning opportunities but also accessibility to factors that influence income-earning possibilities, such as education and health facilities.

The importance of region in influencing household income levels is reflected in the mean per capita expenditure levels presented in Table 15. The mean expenditure level for all of Cameroon is CFAF 152,000. In Yaoundé the mean is CFAF 456,000 - almost a 200 percent increase over the national mean. In the semiurban areas the means are more than 100 percent larger than the national

Table 15 – Distribution of Households Within a Region by Income Level

	Per Capita Income Quintiles					Cameroon	Mean per Capita Expenditures
	1	2	3	4	5		
	Percent of Households						CFAF 1,000
Agroclimatic zone							
Forest	15	23	21	23	19	100	141.3
High Plateau	29	21	20	17	13	100	113.8
North	23	24	22	19	12	100	112.0
Coast	14	19	29	24	14	100	134.3
Yaoundé	0	1	8	22	69	100	454.5
Douala	0	2	8	24	66	100	380.0
Cameroon	20	20	20	20	19	100	152.0
Regions							
Yaoundé	0	1	8	22	69	100	454.5
Douala	0	2	8	24	66	100	380.0
North semiurban	5	10	21	24	39	100	217.7
South semiurban	18	16	22	22	22	100	160.6
North rural	25	26	22	18	8	100	98.8
South rural	24	23	21	19	13	100	113.8
Cameroon	20	20	20	20	19	100	152.0

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

average for Cameroon, while in the rural North and South, mean expenditure levels are less than 75 percent of the national average.

Within Region Distribution of Income

The distribution of income within agroclimatic zones is often highly skewed (Table 15). Yaoundé and Douala have few poor households, in relative terms. The majority of their populations are found in the fifth quintile. In the High Plateau and North the situation is reversed. A larger share of their populations are found in the poorest quintile. The Forest and Coast zones have a considerably less skewed distribution, with approximately the same percentage of their population in the poorest and richest quintile. This skewed distribution of income is also evident when dividing the households into urban, semiurban, and rural regions. In the urban and semiurban areas, there are a greater percentage of rich households than poor. In rural areas, North and South, poor households comprise one-fourth of each of those region's populations.

These results are broadly consistent with the other limited sources of information on welfare in Cameroon. The 1978 National Nutrition Survey (Cameroon National Nutrition Survey 1978) found that for all of Cameroon 22 percent of children aged 3 to 59 months suffered from chronic malnutrition (less than 90 percent of the standard height-for-age). Chronic malnutrition was found to be more prevalent in rural areas than in semiurban and urban areas. The breakdown by agroclimatic zone indicated that the High Plateau had the greatest proportion of children suffering from chronic malnutrition, and the North and Forest agroecological zones had the second greatest proportion. The EBC data also identified these areas as having high percentages of poor households.

Household Characteristics by Quintile

The level of household per capita expenditures are negatively correlated with household size (Table 16). Quintile shares of households with more than five members decreases as income increases. Moving from the poorest to the wealthiest quintile, the share of households with six members or more declines from 64 percent to 23 percent. For households with fewer than five members, the trend is reversed. Moving from the lowest to highest income quintile, the share of smaller households increases from 36 percent to 77 percent.

Of particular note is the predominance of single-member households in the wealthier quintiles. These households represent only 2 percent of the poorest households, but they comprise 26 percent of the wealthiest. This result can be partially explained by the fact that most single member households are found in urban areas where salaries are higher.

Deaton and Case (1987) point out that using total expenditures instead of per capita expenditures to rank households can lead to an opposite conclusion. They report a positive correlation between income and household size using this alternative measure of household wealth to rank households. When analyzing the

Table 16 – Household Characteristics by Income Level

	Per Capita Income Quintiles					Cameroon	Mean per Capita Expenditures CFAF 1,000
	1	2	3	4	5		
	Percent of Households						
Household size							
1	2	3	6	9	26	9	377.5
2-5	34	43	50	54	51	46	156.6
6-9	43	39	31	27	17	32	104.2
10+	21	15	13	10	6	13	95.5
Cameroon	100	100	100	100	100	100	152.0
	Percent of Population						
Household age distribution							
0 - 5	3	22	20	19	16	21	
6 - 15	33	30	28	26	23	29	
16 - 25	12	14	17	17	22	16	
26 - 45	18	20	20	22	25	20	
46 - 65	10	12	12	13	11	11	
66 +	3	3	3	3	3	3	
Unknown	0	0	0	0	0	0	
Cameroon	100	100	100	100	100	100	
Education of household							
None	64	60	54	49	39	55	
Primary	33	36	39	40	39	37	
Secondary	2	3	6	9	16	6	
Vocational	1	1	1	-	4	1	
University	0	0	0	0	2	0	
Unknown	0	0	0	0	0	0	
Cameroon	100	100	100	100	100	100	
Relationship to head							
Head	14	16	17	20	26	18	
Spouse	16	18	18	18	17	17	
Children	51	48	46	43	39	46	
Parents	1	2	2	2	1	2	
Other	18	17	17	17	18	17	
Total	100	100	100	100	100	100	

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

ranking of households in the Cameroon data by total household income, not adjusted for household size, a positive correlation between income and household size is also observed.

Since explanations can be developed to explain both the positive and negative correlation between household income and size, Deaton and Case argue for the use of equivalent scales. However, in applying the equivalent scales discussed above and crossing per AEU income quintiles with household size, the result is a negative correlation between AEU income and household size. This suggests that while the strength of the negative correlation between household size and income may be overestimated in using per capita expenditure estimates, correcting it by equivalent scales may not change the negative correlation, at least in Cameroon. This coincides with the relationship found in the Ivory Coast study, where the use of adult equivalent units also resulted in a negative correlation between household size and income.

An analysis of household age distribution indicates that the wealthiest households in Cameroon have a smaller percentage of children 15 and under than the poorest households (Table 16). Conversely, as one moves from the lowest to highest quintile, the share of 16-to-45-year-old individuals increases. Households across all quintiles have roughly the same proportion of household members 46 and older.

Education of household members is positively correlated with income levels. While 64 percent of the household members in the lowest quintile have no education, only 39 percent of those in the highest quintile are in this category. In the higher income quintiles larger shares of household members have primary and higher levels of education.

The relationship to the head of household confirms the impression given in the above discussion of the household age distribution (Table 16). Children represent a larger share of the members of poorer than wealthier households. The importance of single person households is evidenced in the increasing importance of heads of households in household composition. Other household members (spouse, parents and other) are roughly similar across quintiles.

Head of Household Characteristics by Quintile

The sex of the head of household does not appear to be an important determinant of household welfare (Table 17). Except in the fifth quintile, the percentage of male- and female-headed households in each quintile varies slightly around the national averages of 82 and 18 percent, respectively. In the fifth quintile the number of female-headed households increases to 22 percent.

This is an interesting result given the debate about the feminization of poverty. A partial explanation may be that most female-headed households are in the urban areas, where incomes tend to be higher. This may be reflected in the higher mean per capita expenditure for female-headed households, CFAF 175,000 versus CFAF 147,000 for male-headed households. Also, as in many west African

Table 17 – Head of Household Characteristics by Income Level

	Per Capita Income Quintiles					Cameroon	Mean per Capita Expenditures CFAF 1,000
	1	2	3	4	5		
	Percent of Households						
Sex head of household							
Male	84	85	82	82	78	82	147.0
Female	16	15	18	18	22	18	174.6
Cameroon	100	100	100	100	100	100	152.0
Marital status head							
Single	2	4	5	6	23	8	362.7
Monogamous	53	54	55	57	47	53	136.0
Polygamous	28	25	23	18	13	21	111.3
Widowed	15	14	14	13	12	14	133.4
Divorced	2	3	3	5	6	4	226.3
Total	100	100	100	100	100	100	152.0
Age head of household							
16-25	3	5	5	5	10	5	241.3
26-45	40	43	46	47	54	46	171.9
46-65	43	43	40	38	29	39	124.4
66+	14	9	10	9	7	10	116.1
Unknown	0	0	0	0	0	0	361.0
Total	100	100	100	100	100	100	152.0
Education head of household							
None	80	70	64	57	40	62	114.2
Primary	17	25	29	30	33	27	168.1
Secondary	1	3	4	7	15	6	299.6
Vocational	1	1	3	5	7	3	288.2
University	0	0	0	1	4	1	701.3
Unknown	0	0	0	0	0	0	135.8
Cameroon	100	100	100	100	100	100	152.0

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

countries, females participate in both food and nonfood trading. This can be very remunerative. Finally, 1983/84 was the peak of the oil boom, when disposable income was high and expenditures on entertainment, especially in urban areas (Cameroon's "chicken houses" are famous) were high. Female-headed households were important recipients of this kind of expenditure.

One-half of the household heads in Cameroon are in monogamous marriages, one-quarter are polygamous, and the remaining quarter are single, divorced, or widowed (Table 17). The share of single and divorced heads of households increases with income, while the share of monogamous and polygamous heads of households declines. This trend is influenced by the fact that married heads of households tend to have more household members thereby lowering household per capita expenditures. Similarly, younger heads of households, 16 to 45 years of age, represent a larger share of the quintile population as income rises. This is a factor not only of smaller family size but also of the fact that a larger percentage of this age group resides in urban areas where salary levels are higher.

As might be expected, the education of the head of household is closely associated with household welfare (Table 17). While 62 percent of all heads of households in Cameroon have had no education, 80 percent of those in the poorest quintile have had no education. The quintile share of heads of households who have had no education decreases linearly from 80 to 40 percent for the wealthiest quintile. Primary, and to a greater extent secondary, vocational, and university education, are positively related to household welfare.

Positive returns to education of the head of household are reflected in the increases in mean per capita expenditures by level of education (Table 17). A household whose head has no education has a mean expenditure level of CFAF 114,000, roughly 75 percent of the national mean of CFAF 152,000. The mean expenditure level of households whose heads have a university degree is CFAF 701,000, a 350 percent increase over the national average. Heads of households with even a primary, secondary, or vocational education have a mean per capita expenditure level higher than the national average.

Head of Household Employment Characteristics

An analysis of income quintiles by employment category and sector of employment of the head of household reveals that the percentage of households with heads employed in white collar jobs (i.e., government, professional services, private sector) and as workers (nonprofessional salaried jobs) increases in moving from the lowest to highest quintile (Table 18). Nationally, 14 percent of all household heads are employed in these two categories, but they make up roughly 32 percent of the households in the fifth income quintile. Again, as seen in section 3, these households are primarily located in the urban centers. This contrasts dramatically with households whose heads are farmers.

Owner/operators of farms represent more than three-fourths of the poorest quintile and only 31 percent of the wealthiest quintile, even though this group

Table 18 – Employment Characteristics of the Head of Household

	Per Capita Income Quintiles					Cameroon	Mean per Capita Expenditures CFAF 1,000
	1	2	3	4	5		
	Percent of Households						
Employment							
White collar	0	1	3	5	10	4	350.0
Worker	3	4	8	12	22	10	250.1
Self-employed	7	11	11	14	19	12	213.3
Farmer	79	76	68	57	31	62	102.0
Agricultural worker	2	3	2	2	2	2	177.8
Retired	5	3	2	3	3	3	242.6
Other	4	2	5	6	13	6	129.4
Cameroon	100	100	100	100	100	100	152.0
Sector of employment							
Agriculture	90	85	75	65	38	71	106.5
Industry/energy	2	2	3	4	6	3	222.3
Construction	2	2	3	3	7	3	226.5
	2	5	9	13	22	10	271.4
Commerce/transportation	4	6	11	15	28	13	275.2
Services/banks	100	100	100	100	100	100	152.0
Cameroon							

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

represents 62 percent of the total number of households. Household welfare by sector of employment of head of household reconfirms the impression established above that a disproportionate share of the poorest households are found in the agricultural sector. More than 90 percent of the poorest households are employed in the agricultural sector, while in the wealthiest quintile only 38 percent of the households are employed in this sector. Sectors of employment largely associated with the urban sector and/or salaried jobs such as commerce, transportation, services, and banking, which includes government employment, have an increasing proportion of households in the higher income quintiles.

Housing Characteristics by Quintile

Housing characteristics are another important indicator of welfare and determinants of quality of life and basic health (Table 19). Virtually all the households in the poorest quintile own their own home. This result, at first counterintuitive, is because most of the poorest households are in the rural sector. As discussed in section 3, land in the rural areas is acquired through traditional land tenure arrangements, and homes are built by the residents on this land.

As the level of welfare increases, the percentage of homeowners decreases and the percentage of renters and those lodged by an employer increases. This reflects the importance of urban households in the higher income quintiles. Housing is often provided to certain levels of government civil servants and private sector employees. This is particularly noticeable in the urban areas and is reflected in the increasing percentage of households lodged by their employer. In urban areas, with high land and construction costs, more households rely on the rental market.

The source of water is another variable closely associated with income and location. Roughly half of the households in Cameroon rely on spring or river water; this includes a quarter of the households in the fifth income quintile. As income increases, access to piped water increases as well. Three-fourths of the wealthiest households, typically located in the urban areas, have access to well or piped water, either indoor or outdoor.

Kerosene lamps are the most important source of lighting for most Cameroonians regardless of welfare level. Seventy-four percent of the households in the poorest quintile and 59 percent of households in the richest quintile depend on this source of lighting. For households in the highest quintile, electricity is the most important alternative light source.

Most households in Cameroon do not have simple sanitation facilities on their premises. Nationally, 46 percent of the households have latrines, while only 2 percent of the households have a flush toilet. Even in the fifth quintile, indoor facilities are possessed by only 7 percent of the households. Possession of a latrine or flush toilet is income related. As the level of income increases so does the percentage of households with improved sanitation facilities. However, these statistics must be interpreted carefully. Latrines

Table 19 – Housing Characteristics by Income Level

	Per Capita Income Quintiles					Cameroon	Mean per Capita Expenditures
	1	2	3	4	5		
	Percent of Households						
Housing							
Owners	97	96	94	87	66	88	123.7
Renters	1	2	4	10	28	9	393.8
Lodged ^a	1	2	2	3	7	3	287.1
Cameroon	100	100	100	100	100	100	152.0
Source of water							
Indoor faucet	4	4	3	5	18	7	346.0
Outdoor faucet	9	8	13	18	28	15	221.3
Well	23	31	34	34	25	29	142.2
Spring	29	26	23	23	14	23	109.8
River	35	30	27	20	12	25	99.7
Other	0	0	1	1	2	1	423.2
Cameroon	100	100	100	100	100	100	152.0
Source of lighting							
Electricity	1	2	5	13	36	11	397.7
Kerosene lamp	74	76	81	77	59	73	128.3
Wood	24	21	13	9	4	14	85.0
Other	1	1	1	1	1	1	112.1
Cameroon	100	100	100	100	100	100	152.0
Type of toilet							
Flush	0	0	0	1	7	2	621.9
Latrine	40	38	47	53	54	46	171.0
Other	60	62	53	45	38	52	
Cameroon	100	100	100	100	100	100	152.0

Source: Lynch (1991).

^a Lodging provided by employer, with or without household contribution.

Note: Percentages may not sum to 100 due to rounding error.

and flush toilets are often shared by several households. These figures, therefore, do not necessarily imply exclusive household access to improved facilities.

Household Possession of Durable Goods by Quintile

Possession of durable goods by households is positively related to household income (Table 20). Radios are the more common durable found in almost half of all households in Cameroon. Thirty-one percent of the poorest households and 66 percent of the wealthiest households, as measured by per capita income, possess radios. If possession of stereo equipment is added to that of radios, three-fourths of the wealthiest households own audio equipment. Roughly one-fourth of the households own a bike or motor bike. The share of households in the fourth and fifth income quintile owning a bike or motor bike declines, because ownership of cars increases.

The distribution of durables based on total household income versus per capita income reveals even greater concentration of possessions in the highest income quintiles (Table 20). Using total income to rank households, 17 percent of the poorest households and 93 percent of the wealthiest possess a radio or stereo. The difference between the two measures of household welfare is due to household size. The per capita measure assigns high-income households with large families to a lower quintile than occurs with a total income measure. The effect of this is particularly evident in dealing with durable goods for which there are strong economies of scale. Additional family members can share a radio or refrigerator, for example, at no additional cost.

Household Allocation of Total Expenditures by Quintile

Table 21 presents data on household allocation of total expenditures on eleven different categories of expenditures. On average, Cameroonian households allocate 55 percent of total expenditures to food eaten at home. If food eaten away from home and beverages are added to this figure, expenditures on all food and beverages is 64 percent of the total. Food expenditures decline in moving from the first to fifth quintile, from 62 to 43 percent of total household expenditures.

One caveat mentioned in section 3 is that these figures probably underestimate the share of food expenditures in total expenditures for households in Cameroon. The effect of the drought in 1983/84 and problems with the home-consumption data discussed earlier contribute to this underestimation.

Returning to Table 21, it is interesting to note that, except for food and beverages, the expenditure shares of the first three quintiles are very similar. Only in the fifth, and to a lesser extent the fourth income quintiles are differences between expenditure shares apparent. This is particularly evident in the categories of food consumed away from home and beverages, rent and utilities, and transportation and communication.

Table 20 – Household Possession of Durables by Income Level

	Per Capita Income Quintiles					Cameroon
	1	2	3	4	5	
	Percent of Households					
Household durables						
Radio	31	37	48	54	66	47
Stereo	0	1	2	3	9	3
Bike or motor bike	17	22	27	26	22	23
Car	0	0	2	3	9	3
Refrigerator	0	0	2	5	15	4
Sewing machine	7	11	17	19	24	16
Electric/gas stove	0	1	3	5	17	5
	Total Income Quintiles					Cameroon
	1	2	3	4	5	
	Percent of Households					
Household durables						
Radio	17	32	46	63	81	47
Stereo	0	0	2	2	12	3
Bike or motor bike	7	19	27	31	31	23
Car	0	0	0	1	9	3
Refrigerator	0	0	0	2	20	4
Sewing machine	0	6	11	21	37	16
Electric/gas stove	0	0	1	3	20	5

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

Table 21 – Allocation of Shares of Total Expenditures by Income Level

Expenditure categories	Per Capita Income Quintiles					Cameroon
	1	2	3	4	5	
	Share of Expenditures					
Food ^a	62	61	57	54	43	55
Food and beverages ^b	6	8	8	9	11	8
Clothing and shoes	6	7	7	7	8	7
Rent and utilities	8	8	9	10	13	10
Household durables	4	4	5	5	6	4
Household durables	4	4	5	5	6	4
Services and health	6	5	5	5	6	6
Transport and communication	3	4	4	5	9	5
Education	3	3	3	2	3	3
Leisure and other	1	1	1	2	2	1
Cameroon	100	100	100	100	100	100
Value of total expenditures (CFAF 1,000)	36.7	64.3	96.0	148.7	425.9	152.0

Source: Lynch (1991).

^a Includes value of consumption of home production.

^b Food consumed away from home.

Note: Percentages may not sum to 100 due to rounding error.

One possible explanation for the similar expenditure patterns is the skewed distribution of household per capita income described above and presented graphically in Figure 3. The similarity of expenditure patterns is influenced by the fact that the first three quintiles are bunched tightly together at the lower end of the income distribution and are located predominately in rural areas. It is only in the fifth quintile and to a lesser extent in the fourth quintile that a major increase in quintile mean expenditures occurs.

The allocation of total food expenditures on nine food categories is summarized in Table 22. The data suggest that the budget share spent on cereal and cereal products, and legumes and nuts declines as the level of welfare increases. The share of expenditures allocated by households for dairy products and eggs, and meat and fish, increases with income levels.

One factor that obscures changes in food composition as income increases is the tremendous regional diversity of diets in Cameroon. For example, 45 percent of the households in the first quintile are located in the High Plateau region, where maize and plantain are the major food crops, 13 percent are located in the Forest zone, where roots and tubers are the staple and 38 percent come from the North, where millet and sorghum dominate. Thus, the staple food of the poorest households varies by region. In trying to analyze expenditure share changes, especially in the first three quintiles, the regional composition of that quintile must be kept in mind.

On average, 50 percent of all food expenditures of rural households is generated by the household's own production (Table 23). Data on household consumption of own production was collected in the rural areas only. The importance of home production in total food expenditures declines as income increases, from 54 percent in the lowest quintile to 36 percent in the highest quintile. While the share of the value of home production out of total food expenditures declines as income increases, the monetary value of home production increases as income increases. The value of home consumption increases from CFAF 14,000 for the poorest quintile to CFAF 53,000 for the wealthiest quintile. This reflects in part the substitution of higher value products in home production in wealthier households. There is an increase in the importance of home production in providing dairy and eggs, oils, meat and fish, and condiments as income increases, and a decline in the shares of cereal, roots and tubers, vegetables, and legumes and nuts.

There is a great deal of variation in the importance of home consumption among food categories. Household demand for products such as oils, meat and fish, sugar and sugar products, and condiments is primarily satisfied by market purchases. The share provided by home production averages between 3 and 18 percent for rural households, though this varies significantly within quintiles. However, for other products such as cereals, roots and tubers, vegetables and fruits, and legumes and nuts, home production provides between 45 and 59 percent of total consumption of rural households.

Table 22 – Allocation of Shares of Food Expenditures by Income Level

	Per Capita Income Quintiles					Cameroon
	1	2	3	4	5	
	Share of Expenditures					
Food categories						
Cereal and cereal products	30	28	25	22	19	25
Roots and tubers	14	16	16	16	16	16
Vegetables and fruits	10	11	11	11	11	11
Legumes and nuts	11	11	9	9	6	9
Dairy and eggs	1	1	1	2	4	2
Cooking oils	11	9	11	11	10	10
Meat and fish	18	20	23	26	31	24
Sugar and sugar products	1	1	1	2	2	1
Condiments	3	3	3	3	3	3
Total	100	100	100	100	100	100
Value of total food expenditures (CFAF 1,000)	22.8	38.9	54.6	80.4	158.0	105.1

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

Table 23 – Budget Share of Total Household Food Expenditures Provided by Home Production in Rural Households

	Per Capita Income Quintiles					Rural Cameroon
	1	2	3	4	5	
	Share of Expenditures					
Food categories						
Cereal and cereal products	53	49	44	39	28	45
Roots and tubers	56	55	54	53	50	54
Vegetables and fruits	59	65	60	58	45	59
Legumes and nuts	56	57	56	56	44	55
Dairy and eggs	4	3	5	5	7	5
Cooking oils	10	18	21	23	23	18
Meat and fish	1	2	3	3	5	3
Sugar and sugar products	2	3	5	4	4	4
Condiments	5	8	12	13	16	10
All food categories	54	55	51	47	36	50
Value of home production (CFAF1,000)	13.9	23.4	30.6	41.7	53.3	

Source: Lynch (1991).

Note: Percentages may not sum to 100 due to rounding error.

CHARACTERISTICS OF POOR HOUSEHOLDS IN CAMEROON

Table 24 summarizes the information presented in Tables 12 to 23, focusing only on the poorest 20 and 40 percent of the households, those defined in this study as poor, and compares this to the national average. This comparative information is given on the first and second quintiles and the national average to more precisely distinguish between the very poor (the first quintile), the poor (average of the first and second quintile), and the national average.

Using this arbitrary poverty line of households in the lowest 40 percent of the population arrayed by income, the following picture of poverty in Cameroon emerges. Poverty is primarily a rural phenomena. Roughly 87 percent of the poorest households live in rural areas, with most of the remaining poor households living in the semiurban areas. Fewer than 1 percent of the poorest households, as defined in this study, are located in Yaoundé or Douala. The largest percentages of poor households, 39 percent, are found in the High Plateau and North. High population densities and vulnerability to drought, especially in the North, reduce the income-generating possibilities of these regions.

The sex of the head of household does not appear to be a determinant of poverty in Cameroon. The share of female-headed poor households is not very different from the national average of 18 percent. The poorest 40 percent of the households tend to be larger, consisting of six or more members. Three-quarters of the heads of the poorest households have had no education.

The majority of the poorest households are employed in smallholder agriculture. Since only primary occupation information was collected during the survey, it is not possible to assess the importance of other employment opportunities. A small percentage of heads of households are self-employed, usually from commerce, transportation, or other services. There appears to be very little permanent hired agricultural labor among the poor.

Most of the poorest households own their own home. More than 60 percent rely on a spring or river for water, while 31 percent have access to wells. Kerosene is the most important source of lighting for 75 percent of households. Radios, bikes and motor bikes, and sewing machines are the only durables possessed by any significant number of households. Of these, the radio is the most common, owned by some 39 percent of the poorest households.

In contrast to the national average of 55 percent, the poorest households in Cameroon allocate roughly 61 percent of total expenditures to food eaten at home. The household allocation of food expenditures by the poorest 40 percent is not significantly different from the national average, except for two food categories. The poorest households allocate a larger share of food expenditures to cereal and cereal products and less on meat and fish, and dairy products. The poorest households depend more on their own production for food than other households do. On average, the poorest households produce more than 50 percent of their own food, while the national average is 45 percent. Cereals, roots and tubers, vegetables and fruits, and legumes and nuts are the most important home-produced items in terms of home consumption.

Table 24 – Summary Characteristics of Cameroon's Poorest Households

	Poorest		Cameroon
	20%	40%	
Strata			
Yaoundé/Douala	0	0	11
North semiurban	1	1	4
South semiurban	11	11	13
Rural north	37	38	30
Rural south	50	49	42
Agroecological zone			
Forest	13	16	17
High Plateaux	45	39	32
North	38	39	34
Other	5	6	17
Sex			
Male	84	84	82
Female	16	16	18
Household size			
1	2	3	9
2-5	34	39	46
6-9	43	41	32
10 +	21	18	13
Education			
None	80	75	62
Primary	17	21	27
Secondary +	2	3	11
Type of employment			
Self-employed	7	9	12
Farmer	79	77	62
Other	15	14	26
Sector of employment			
Agriculture	90	84	71
Services	4	5	
Other	6	13	29
Home ownership			
Home owners	98	97	88
Other	2	3	12

(continued)

Table 24 (continued)

	Poorest		Cameroon
	20%	40%	
Source of water			
Faucet	13	12	22
Well	23	31	29
Spring or river	64	61	49
Source of lighting			
Kerosene	74	75	73
Wood	24	22	14
Ownership of durables			
Radio	31	34	47
Bike or motor bike	17	20	26
Sewing machine	7	9	16
Total expenditure shares			
Food	62	61	55
Food/beverages	6	7	8
Other	32	32	36
Food expenditure shares			
Cereal and cereal products	30	29	25
Roots and tubers	14	15	16
Vegetables and fruits	10	11	11
Legumes and nuts	11	11	9
Dairy and eggs	1	1	2
Oils	11	10	10
Meat and fish	18	19	24
Sugar	1	1	1
Condiments	3	3	3
Share home production			
Cereal and cereal products	53	51	45
Roots and tubers	56	56	54
Vegetables and fruits	59	62	59
Legumes and nuts	56	57	55
Dairy and eggs	4	4	5
Cooking oils	10	14	18
Meat and fish	1	2	3
Sugar	2	2	4
Condiments	5	7	10

Source: Lynch (1991).

Logistic Regression

The information presented in Table 25 identifies key variables associated with households living in poverty. Using a logit model, a maximum likelihood estimation technique, the likelihood that a household will be poor is estimated. A logit model permits the use of a dichotomous dependent variable, in this case whether a household is poor or nonpoor. Table 25 presents the results of the logistic regression. All the variables are significant and the signs conform to a priori expectations. Coefficients in the logit model present the change in the log of the odds associated with a unit change in the explanatory variable (Hanushek and Jackson 1977). The log of the odds of a household being poor increases if the household is located in the High Plateau, North, or Forest regions, with the log of the odds being highest for High Plateau households. The odds decrease dramatically if the household resides in Yaoundé or Douala, and to a lesser extent in the semiurban regions. A household head having no education and being employed in the agricultural sector is also shown to significantly increase the probability that the household will be poor.

INEQUALITY MEASURES

Several different summary statistics for evaluating inequality in the distribution of income have been used in the literature. Each measure generates a number that describes the entire distribution of income over the population. While these measures are defined in terms of inequality of income they can be equally applied to an expenditure distribution (Glewwe 1987). One problem associated with using any of the common summary statistics is that different measures give different rankings of the underlying income distribution. This suggests that no one measure is the best; instead the choice rests on the purpose of the study and data availability (Kakwani 1980).

In the use of these inequality measures, it is assumed that expenditures are the appropriate measure of individual utility. It is also assumed that expenditure levels representing individual utility levels are comparable among individuals. These assumptions are justified by transforming expenditures into their money-metric equivalent and by assuming that all households have identical utility functions.

Inequality measures have several desirable characteristics: (1) mean independence, where the degree of inequality is not affected by equiproportionate changes in all individuals' income; (2) population size independence, where the distribution of income over larger or smaller populations does not affect measured inequality; (3) symmetry, where exchanging income levels among different observations does not affect inequality; (4) transfer sensitivity, where a transfer of income from a wealthy person to a poor person reduces measured inequality (Glewwe 1987).

An additional desirable characteristic of an inequality measure is that it be group decomposable. Decomposability implies that the measure of total

Table 25 – Parameter Estimates of Logistic Regression

Variable	Beta Coefficient	Standard Error
Intercept	-2.38	.01
Yaoundé/Douala	-3.34	.02
Semiurban	-0.07	.006
North	0.20	.008
Forest	0.05	.009
High Plateau	0.60	.008
Female head of household	0.02	.005
No education of head of household	0.76	.0006
Household size	0.19	.005
Agricultural sector employment of head of household	0.55	
No. of observations	D_Poor = 0 D_Poor = 1	915,778 624,369

Source: Lynch (1991).

inequality can be divided into two components: within and between group inequality. The within group inequality is the weighted inequality found within each group, and the between group inequality is the degree of inequality that would exist if each observation has the mean income of its own group. If between group inequality represents a significant proportion of total inequality, reducing inequality between the groups would contribute to lessening total inequality.

I estimate three different measures of income inequality in this study: (1) the Theil entropy measure of expenditure inequality; (2) the log variance of expenditures; and (3) the Gini coefficient. The Theil entropy measure satisfies all of the desired axioms, while the log variance satisfies all of the axioms except transfer sensitivity (axiom 4) for high incomes (Glewwe 1987).

The Gini coefficient, the most common measure, describes the cumulative distribution of income over population shares and is represented by the Lorenz curve. The value of the Gini coefficient ranges from 0.0, representing total equality, to 1.0, representing total inequality. The Gini satisfies the mean, population-size independence and Pigou-Dalton transfer axiom (Yotopoulos and Nugent 1976).

The first two measures are group-decomposable. While the Gini coefficient is decomposable by income sources, it cannot be decomposed by expenditure, so only the total Gini for the whole population is presented. In calculating these income inequality statistics, the unit of observation, unless otherwise indicated, is the household. Household per capita expenditures are used as the proxy for income. Alternative units of observation, total population and adult equivalent population, are used in calculating the Gini coefficient for comparative purposes.

The Gini coefficient for Cameroon is 0.49 when household per capita expenditures are used (Table 26). A relatively more equitable distribution, 0.44, is obtained when the unit of measure is the individual. Gini coefficients based on expenditures per AEU are 0.45 when the household is the unit of analysis and 0.43 when individuals are the unit of analysis.

Gini coefficients for Cameroon, derived in a comparable fashion, are not available from other recent studies. However, the Living Standards Measurement Study in the Ivory Coast does calculate Gini coefficients based on expenditures per AEU. The Gini coefficient in the Ivory Coast is 0.44, which is very similar to that found in Cameroon when using the AEU adjustment.

The decomposition of inequality into within- and between-group inequality provides important insights into the factors contributing to poverty. The Theil and the log variance inequality measures are decomposed by agroecological zone, region and education, sex, and age of head of household (Table 27). If a high percentage of inequality can be attributed to inequality between groups, then efforts to reduce this type of inequality will contribute substantially to overall equality. This kind of information provides important guidance in the development of policy aimed at reducing inequality and poverty. While the

Table 26 – Gini Coefficients

Unit of Observation	N (Millions)	Measure of Expenditure	Gini Coefficient
Household	1.54	Per capita	0.49
Individual	8.78	Per capita	0.44
Household	1.54	Per AEU	0.45
Individual	5.49	Per AEU	0.43
Household	1.54	Total expenditure	0.47

Source: Lynch (1991).

Table 27 - Decomposition of Measures of Inequality

	Gini	Theil	Log Variance	Ranking		
				Gini	Theil	Log Variance
All Cameroon	0.49	0.521	0.676			
Agroecological zone						
Forest	0.429	0.377	0.527	4	3	4
High Plateau	0.442	0.381	0.589	2	2	2
North	0.404	0.309	0.479	5	6	5
Coast	0.404	0.315	0.475	5	5	6
Yaoundé	0.490	0.553	0.634	1	1	1
Douala	0.442	0.372	0.539	2	4	3
Between group (% of total)		26.0	21.0			
Region						
Yaoundé	0.490	0.553	0.634	1	1	2
Douala	0.442	0.372	0.539	3	3	4
Semiurban North	0.427	0.319	0.582	4	5	3
Semiurban South	0.472	0.445	0.674	2	2	1
Rural North	0.366	0.249	0.412	6	6	6
Rural South	0.414	0.330	0.524	5	4	5
Between group (% of total)		29.0	23.0			
Level of education						
None		0.372	0.542		4	4
Primary		0.498	0.613		1	3
Secondary/ professional		0.477	0.757		2	1
University		0.379	0.755		3	2
Between group (% of total)		18.0	14.0			
Sex of head of household						
Male		0.510	0.651		2	2
Female		0.550	0.780		1	1
Between group (% of total)		< 1.0	< 1.0			
Age head of household						
10-15		0.008	0.016		5	5
16-25		0.518	0.937		2	1
26-45		0.578	0.717		1	2
46-65		0.406	0.559		3	4
66 +		0.334	0.616		4	3
Between group (% of total)		3.0	2.0			

Source: Lynch (1991).

rankings of these two measures often vary, there are some broad areas of agreement between the two measures. First, both measures identify a high percentage of between group inequality when decomposing by agroecological zone and region and to a lesser extent education. In the case of agroecological zone and region, the between group inequality accounted for more than 20 percent of the total inequality. Decomposition by education level of head of household indicates that between group inequality accounts for 14 to 18 percent of total inequality. Between group inequality in sex and age of head of household is found not to contribute substantially to total inequality.

Calculation of the three inequality measures by agroecological zones reveal that the highest degree of inequality is found in Yaoundé, the capital. This is consistent with the concentration of high income earners in Yaoundé. It is also consistent with the findings of the Ivory Coast study, where the highest degree of inequality was found in Abidjan, the capital. All three measures rank the High Plateau region as having the second highest degree of inequality. While the High Plateau region has a very high proportion of the poorest households (Table 14), it is also the home of the Bamilike people, known for their commercial acumen and wealth. These factors contribute to the high degree of inequality found in that region. Both measures find the greater degree of equality in the North and Coast agroecological zones though the two measures switch their ranking.

The Gini, Theil, and log variance rank the rural North as having the most equal income distribution in the decomposition by region. However, the three measures do not agree on the ranking of the other regions. Yaoundé and the semiurban South (which includes the High Plateau region described in the preceding paragraph) vie for the distinction of having the greatest inequality.

Decomposition by education of head of household indicates that the most equitable distribution of income is among households where the head of household has no education. Otherwise there is no consistent ranking of households between the two measures as to which group has the greatest inequality.

Finally, sex and age of head of household do not contribute substantively to total inequality in Cameroon. While the two measures rank the distribution between women as more inequitable there is no consistent ranking of the other decompositions. Neither of these household characteristics appear to have greater influence in the degree of inequality.

5. THEORETICAL AND EMPIRICAL CONSIDERATIONS IN ESTIMATING CONSUMER DEMAND IN CAMEROON

The descriptive analysis of household demand for goods and services presented in previous sections provides the foundation for the analysis of welfare issues in Cameroon. In the next two sections, I discuss the relationships among demand patterns, income, and household sociodemographic composition in further detail. I estimate demand parameters by income class for a disaggregated list of commodities in order to study how consumption patterns change as income changes. This provides information for understanding the distributional effects of a price or income change on demand.

In this section I provide the theoretical background for the Almost Ideal Demand System (AIDS) used to estimate the demographically augmented Engel curves used in this analysis. In addition, I describe the empirical problems encountered in the specification of the model. These include the modeling of differences between northern and southern Cameroon, zero household consumption of certain commodities, and the problem of endogeneity when estimating a demand system with total expenditures as a dependent variable. The econometric results are presented in section 6.

THE THEORETICAL MODEL

To estimate the demand parameters in this study, the Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer (1980b) was selected instead of either a single equation or other system approach for both theoretical and practical reasons. Estimating a system rather than a single equation improves the asymptotic efficiency of the estimation procedure by taking into consideration the correlation between the disturbances of the different structural equations (Kamanta 1986). From a theoretical point of view the AIDS uses a flexible functional form, which permits a first order approximation to any demand system. The restrictions of economic theory, homogeneity, symmetry, and adding up can easily be imposed and tested. This system aggregates perfectly over consumers without imposing linear Engel curves. An additional advantage is that the system can be linearized and therefore easily estimated (Deaton and Muellbauer 1980b).

The development of the AID system starts with a specific set of preferences, permitting exact aggregation over all consumers. This allows for the expression of market demands as the decision of a single consumer whose preferences are formed by the aggregate of all the underlying consumers (Bryant 1987). This set of preferences, referred to as the PIGLOG class, are represented by a cost function. The cost function, which has utility and prices, $c(u, p)$, as arguments,

defines the minimum expenditure necessary to attain a specific utility level at given prices (Deaton and Muellbauer 1980b). The AIDS cost function is written as follows:

$$\log c(u,p) = \alpha_0 + \sum \alpha_k \log p_k + 1/2 \sum_k \sum_j \delta_{kj}^* \log p_k \log p_j + u \beta_0 \prod_k p_k^{\beta_k}, \quad (1)$$

where u and p represent utility and prices, respectively, the parameters to be estimated are α , β , and δ , and p_j and p_i are prices of the j^{th} and k^{th} commodity, respectively.

The logarithmic form of Shepard's lemma coupled with the assumption of utility maximization yields the AIDS demand functions in budget share form. Budget shares are a function of prices and total expenditures

$$w_i = \alpha_i + \sum_j \delta_{ij} \log p_j + \beta_j \log \left(\frac{X}{P^*} \right), \quad (2)$$

where w_i is the budget share of the i^{th} good and is defined as $w_i = \text{Exp}_i / X$ where Exp_i is the household expenditure on the i^{th} commodity, X is total expenditures, and p_j is the price of the j^{th} good. P^* is the exact price index and is defined as

$$\log P^* = \alpha_0 + \sum_k \alpha_k \log p_k + 1/2 \sum_j \sum_k \delta_{kj} \log p_k \log p_j. \quad (3)$$

Theoretical restrictions are imposed on the parameter estimates as follows:

1) adding up

$$\sum_{j=1}^n \alpha_j = 1, \quad (4)$$

$$\sum_{j=1}^n \beta_j = 0, \quad (5)$$

2) homogeneity

$$\sum_{j=1}^n \delta_{ij} = 0, \quad (6)$$

3) and symmetry

$$\delta_{ij} = \delta_{ji}, \quad i \neq j. \quad (7)$$

The coefficients in the AIDS system are easily interpreted. The intercept term α_i represents the average value of the budget share assuming zero price and income effects. The β coefficients on the log of total expenditures represents the effect on the expenditure share of the i^{th} commodity of a 1 percent change in income (total expenditures). If $\beta_i > 0$, the commodity is a luxury good; if $\beta_i < 0$, it is a necessity. Similarly, the δ_j represents the effect on the expenditure share of commodity i of a 1 percent change in the price of good j . A positive or negative δ_j indicates whether the goods are substitutes or complements (Savadogo and Brandt 1988).

Sociodemographic characteristics, such as family size and composition, region, and educational and occupational characteristics of household members, influence household expenditure patterns. These factors are important variables in policy design and analysis because they affect household demand patterns. During the last decade research has been done on how to incorporate socio-demographic effects in demand analysis (Pollak and Wales 1978; Deaton and Muellbauer 1980a; Howe 1977; Heien, Jarvis, and Perali 1988).

One way to handle the incorporation of demographic information in the AIDS is to make the intercept term, α_i , a linear function of demographic variables. Demographic information is incorporated into equation 2 by respecifying the intercept as

$$\alpha_i = \rho_{i0} + \sum_{k=1}^s \rho_{ik} d_k, \quad (8)$$

where d_k is equal to the k^{th} demographic variable, ($k=1, \dots, s$) (Heien, Jarvis, and Perali 1988; Heien and Willett 1988).

The Data

The data used in the estimation of the demand system contains annual observations on 5,101 households. An additional 148 households included in the descriptive section of this paper are eliminated in this phase of the analysis. These households are omitted because of missing data for three key variables used in the demand system analysis; head of household education, employment, and age.

Because of the lack of data, commodity prices are not included. The model estimated without prices but with demographic effects is

$$w_i^k = \rho_i + \sum \rho_{ik} d_k + \beta_j \ln x, \quad (9)$$

which is essentially a demographically augmented Engel curve (Heien, Jarvis, and Perali 1988).

MODEL SPECIFICATION AND ESTIMATION PROCEDURES

As mentioned earlier, several problems are encountered in the specification and estimation of the model. These include the representation of differences between southern and northern Cameroon, zero consumption by the household of a commodity group, and endogeneity in the specification of the AIDS. In this section, these issues are discussed and the methodology used to resolve each problem is presented.

Differences Between the North and South

The analysis in the preceding sections has revealed significant differences between northern and southern Cameroon. A number of factors contribute to this diversity. Differences in ethnic and religious backgrounds, colonial history, agroclimatic conditions, human capital development, and physical infrastructure result in disparate underlying socioeconomic conditions in the North and South.

The strength of this dissimilarity raises the question of how to capture the regional differences when estimating the demand system. The underlying question is whether or not the parameters of the demand system are the same for households in the North and South. There are several different approaches to this problem, depending on the assumptions made. Using a single model to estimate the parameters for the whole sample assumes that the parameter estimates for all the independent variables are the same regardless of residence in the North or South. Using interaction terms in the estimating equation allows for parameter estimates of specific independent variables to vary depending on region. Estimating the model separately by region assumes that the effect of each regressor may differ between the North and South.

In order to test whether or not households in the North and South are subject to the same preference structure, a Chow test is performed. This procedure tests whether the structural parameters of the demand system are the same between the North and South. To perform this test the data are aggregated into 12 commodity groups – 8 food and 4 nonfood. These categories group together food commodities with similar nutritional characteristics. Nonfood categories aggregate together commodities with similar demand characteristics. The food categories consist of (1) cereal and cereal products; (2) roots and tubers; (3) fruits and vegetables; (4) legumes and nuts; (5) meat, fish, dairy products, and eggs; (6) cooking oils; (7) other foods; (8) food eaten away from home and beverages. The four nonfood categories are: (9) clothing and shoes; (10) durables; (11) transportation and communication; (12) other nonfoods.

The Chow test is performed on each of the 12 commodity groups included in the demand system. The dependent variable is the household budget share for the expenditure category. Two equations are estimated. The "Full" model allows each independent variable to vary by region (North or South) by including an interaction term for the North. The "Reduced" model assumes that all the coefficients on the independent variables with interaction terms are not statistically significant. The null hypothesis is that in each equation tested

all the parameters on the interaction variables are zero. The alternative hypothesis is that at least one of the restriction is not zero. Thus, the hypothesis tested is

$$H_0: b_1=b_2=b_3=b_4=b_5=b_6=0 \text{ and}$$

$$H_a: \text{at least one of the estimated } b = 0.$$

The hypothesis is rejected if the calculated F statistic, F^* , is greater than 2.10. The "Full" model is

$$W_i = f(a_1 \text{Intercept}, b_1 \text{North}, a_2 \text{Rural}, b_2 \text{North} * \text{Rural}, a_3 \text{Adults}, \quad (10) \\ b_3 \text{North} * \text{Adults}, a_4 \text{Kids}, b_4 \text{North} * \text{Kids}, a_5 \text{Sexhhf}, \\ b_5 \text{North} * \text{Sexhhf}, a_6 \text{Pltexp}, b_6 \text{North} * \text{Pltexp}, a_7 \text{Major Urban}),$$

and the reduced model is

$$W_i = f(\text{intercept}, \text{Rural}, \text{Adults}, \text{Kids}, \text{Sexhhf}, \text{Pltexp}, \text{Major Urban}), \quad (11)$$

where W_i = the household budget share of i^{th} commodity; North = the dummy for northern Cameroon; Major Urban = the regional dummy for Yaoundé and Douala; Adults = number of adults in household; Kids = number of kids in household; Sexhhf = female head of household; and Ltexp = log of total expenditures.

The calculated statistic, F^* , for each commodity group is presented in Table 28. In all 12 of the equations the null hypothesis is rejected at the .05 level of significance. This provides statistical evidence that there are significant differences between the North and South in the economic forces affecting consumption.

Often the rejection or acceptance of a null hypothesis is influenced by the size of the sample. In general, the null hypothesis is more likely to be rejected the larger the sample (Kamanta 1986). A procedure developed by Leamer changes the level of significance with sample size. The test statistic is

$$f > \frac{n-k}{r} (n^{\frac{r}{n}} - 1), \quad (12)$$

where r = number of restrictions; $n-k$ = degrees of freedom corresponding to the unrestricted error sum of squares, and n = total number of observations.

If the calculated value of F^* is greater than that implied by the correction procedure, I can conclude that the sample evidence favors the alternative hypothesis (Kamanta 1986). Using Leamer's procedure, the critical value of F is 8.6. The F^* value exceeds the Leamer correction in 11 out of 12 cases (Table 28). The only aggregate commodity group where the null hypothesis cannot be rejected is the equation for clothing and shoes. This reinforces the

Table 28 – Calculated F-statistic

Aggregate Commodity Group	F*
Cereal and cereal products	1,199
Roots and tubers	386
Fruits and vegetables	11
Legumes and nuts	101
Meat, fish, eggs, and dairy	78
Cooking oils	211
Other food	32
Food eaten away from home and beverages	23
Clothing and shoes	4
Household durables	6
Transportation and communication	17
Other nonfood	178
Number of observations	5,101
Number of restrictions	6
Number of regressors	13

Source: Lynch (1991).

statistical evidence that the structural parameters of the North and South are different.

Based on this statistical evidence, I decided to estimate separate demand systems for northern and southern Cameroon. The separate specification permits a more disaggregated breakdown of food expenditure groups than with a single system. As discussed in sections 4 and 5, food consumption patterns, particularly for cereals and roots and tubers, are region specific. For example, millet and sorghum are consumed almost exclusively in the North, while roots and tubers are consumed primarily in the South. In estimating the demand systems separately, food commodity groups can be disaggregated by region.

To accommodate this regional diversity, separate food commodity groups are developed for households living in the North and South. For both sets of households, commodity groups 3-12, as defined above, remain identical. Two different regional definitions for the aggregate food categories of cereals and roots and tubers are developed and total expenditures of each household are adjusted accordingly.

As indicated in Table 29, millet and sorghum are not included in the cereal group in the South, and maize is not included in the cereal definition of the North. In the South, roots and tubers consists of plantain, manioc, and other roots and tubers (yams, sweet potato, irish potatoes, macabo, and other). In the North, the only root and tuber included is manioc.

I introduce six new regional dummy variables, three in the North and three in the South, to capture intraregional variation. The new subdivisions disaggregate along finer differences in agroclimatic characteristics. In the North the three variables added are Mokolo, consisting of the Mandara Mountain region; Maroua, which includes Maroua and the irrigated rice producing regions along the Lagone and Chari rivers, and Ngoundere, which comprises the area around Ngoundere and the southern portion of the northern provinces. The three variables added to the analysis of the South are Central, which consists of the provinces of Central, South, Coast, and Southwest; East, which consists of the Eastern Province; and West, which is comprised of the Northwest and West provinces.

Zero Consumption

The problem of censored responses arises when estimating this demand system. Censored response occurs when household budget shares for a commodity under consideration are zero. This implies that some of the observations on the dependent variable, household budget share in the AIDS model, are zero (Kamanta 1986; Alderman 1986; Heien and Wessells 1990).

Neoclassical economic theory handles with difficulty zero consumption as it results in a corner solution. A basic assumption of utility maximization is that the consumer purchases a positive amount of each commodity (Heien, Jarvis, and Perali 1988). The problem of nonzero expenditures becomes more complex when

Table 29 – Expenditure Categories for Southern and Northern Cameroon

	Percent Zero Consumption	
	South	North
Maize	37	
Millet and sorghum		7
Rice	8	50
Bread	47	45
Other cereal products	13	9
Plantain	19	
Manioc	10	55
Other roots and tubers	8	
Fruits and vegetables	1	0
Legumes and nuts	7	2
Meat, fish, dairy, and eggs	1	1
Cooking oils	3	27
Other food	3	1
Food away and beverages	3	3
Clothing and shoes	2	2
Household durables	1	1
Transportation and communication	3	20
Other nonfood	0	0

Source: Lynch (1991).

estimating a demand system. In a system, the demand equations are related through the error term as well as the cross equation constraints imposed on the system (Heien and Wessells 1990).

Heien and Wessells (1990) identify several reasons why zero consumption may be observed: (1) the recall period is too short to capture the purchase; (2) reporting error; (3) differences in household tastes and preferences, which result in dissimilar consumer baskets. The problem of households with zero observations cannot be rectified by subsetting the sample to include only those households with nonzero expenditures. Important socioeconomic information on consumer behavior is lost by eliminating these households. In any case either including or eliminating the households with zero consumption leads to a limited range in values for the dependent variable. With a censored sample the mean of the disturbance term is nonzero, which results in biased and inconsistent estimators using OLS (Kamanta 1986; Heien and Wessells 1990).

Table 29 gives the percentage of households with zero expenditures for the commodity groups used in this analysis. For the more aggregated commodity groups zero expenditures are not a problem. However, for some of the single commodities, such as maize and plantain in the South and manioc, rice, bread, and cooking oil in the North, zero expenditure is more problematic.

To deal with the problem of a censored sample in this analysis, a two-step procedure is used, which was developed by Amemiya and applied by Heien and Wessells (1990). As Heien and Wessells point out, the model assumes that the dependent variables, the budget shares for the commodity groups described above, are zero or above. Households with zero expenditure shares are assumed to be censored by an unobservable or latent variable that influence the decision not to purchase that commodity during the survey period. The essence of the procedure is the assumption that the decision to purchase the commodity in question can be captured in a binary indicator variable, which is a function of the latent variable. This variable is then incorporated into the demand equation to capture the influence of the latent variable, thus correcting the bias introduced.

The procedure consists of two steps. First, for each commodity a probit regression is used to estimate the probability of expenditure. Using the estimated parameters the inverse Mills ratio for each household is computed. In the second step, the calculated inverse Mills ratios are included in the estimation of the demand system as instruments for the censored latent variable (Kamanta 1986; Heien and Wessells 1990).

The first step is to model the decision to purchase as a dichotomous choice problem

$$Y_i = bX + u, \quad (13)$$

where Y_i is the censored dependent variable representing the decision to purchase or not purchase. It is represented by the dummy variable defined as follows:

$Y_i = 1$ if household consumption of the good is > 0 , and $Y_i = 0$ if household consumption is zero. X is a vector of independent variables and b is a vector of unknown coefficients.

Theoretical guidance is scant on which independent variables to include in the X matrix. Following Heien and Wessells (1990) I assume that the decision to purchase or not to purchase is a function of the same variables used as explanatory variables in traditional demand analysis. Choice is a function of total expenditures and demographic variables. The specifications of the probit model for the South and North are:

$$Y_{is} = f(\text{Central, West, Major urban, semiurban, sex of head of household, household size, and log of total expenditures}), \text{ and} \quad (14)$$

$$Y_{in} = f(\text{Maroua, Mokolo, semiurban, sex of head of household, household size and log of total expenditures}), \quad (15)$$

where Y_i is defined above and Central = regional dummy South; West = regional dummy South; East = regional dummy South; Major urban = dummy variable for Yaoundé and Douala; semiurban = dummy for semiurban areas; Maroua = regional dummy North; Mokolo = regional dummy North; and Ngoundere = regional dummy North.

The model was estimated using probit analysis for each of the disaggregated commodity groups in the South and North. An equation was not estimated for expenditure categories *other nonfood* in the South and *fruits and vegetables* and *other nonfoods* in the North because there were no households with zero expenditures for those commodity groups.

Instrumental Variables

In the theoretical specification of the AID system household income is included as an explanatory variable. As discussed earlier, in this analysis total household expenditure is used as a proxy for unobserved permanent household income. A problem of simultaneous equation bias is encountered by including total household expenditures as a right hand side variable in the AIDS specification. The bias occurs because households make production and consumption decisions simultaneously. In other words, the amount of income earned (household production) and how the income is allocated between commodity groups (household consumption) are codetermined.

The existence of simultaneous equation bias is a problem in estimation because all parameter estimates derived using OLS are biased and inconsistent. This is because a key assumption of regression analysis is violated. It is assumed that the mean of the disturbance term is zero and that the disturbance term is independent of the regressors so that the covariance between the disturbance term and the independent variables is zero. Where there is

covariance between a regressor and the disturbance term, the problem of simultaneous equation bias occurs (Kelejian and Oates 1981).

One way to deal with this problem is to use an instrumental variable, or proxy, for the regressor that is correlated with the disturbance term. Basically, this technique replaces a right hand side endogenous variable with a constructed regressor that serves as a proxy for the original variable but is uncorrelated with the disturbance term (Mirer 1983).

In order to mitigate the problem of endogeneity in the estimation, a predicted variable is constructed to replace the total expenditure variable in the AIDS specification. An equation is estimated with the log of total expenditures as the dependent variable. The log of total expenditures is specified as a function of the human capital characteristics of the head of household, location of the household, and household demographics,

$$\text{LTEXP} = f(\text{Degree of urbanization, Education of head of household, Presently employed head of household, Number of Adults, Sex of head of household, Age of head of household, and Age of head of household squared}). \quad (16)$$

Parameter estimates derived from this equation are used to predict the value of total expenditures (PLTEXP) for each household. This variable is used in the AIDS model as the instrumental variable for household income.

Table 30 presents the two regional equations estimating the log of total household expenditures. In both regional equations, all coefficients of all the independent variables are significant and have the expected signs. The adjusted R^2 in the predictive equation for the South is 0.54 while in the North it is 0.41.

Relative to rural areas, residence in major or semiurban areas increases the log of total expenditures in both the North and South, all other factors constant. An additional adult member of the household also has a positive relationship with total household expenditures as does present employment of the head of household. Education has a significant and positive influence on earnings in both the North and South. The higher the level of education the larger the estimated coefficient and as a result, the greater the contribution to the dependent variable. In both the North and South, the log of total expenditures is less for a female head of household relative to her male counterpart. Both age of head of household and age squared are also significant.

Absent from these equations are variables reflecting employment of the head of household or other household members. In the original specification of the model, employment of the head of household was included. However, this variable was found to be highly collinear with education of head of household. Of the two, the education variable is less subject to measurement error so it was maintained in the model while employment was dropped.

Table 30 – Regional Income Equations

Variables	Parameter Estimate	
	South	North
Intercept	4.86 (4.2)	4.78 (25.5)
Major urban	0.67 (23.4)	
Semiurban		0.60 (13.6)
Rural	-0.250 (-9.4)	
Adults	0.15 (26.6)	0.20 (16.9)
Female head of household	-0.06 (-2.2)	-0.29 (-4.0)
Presently employed	0.14 (4.4)	0.17 (2.2)
Primary education	0.27 (10.3)	0.35 (5.3)
Secondary education	0.53 (15.5)	0.56 (3.9)
University education	1.04 (15.8)	1.54 (5.6)
Age of head of household	0.03 (7.1)	0.02 (3.1)
Age of head of household squared	-0.0004 (-7.7)	-0.0003 (-4.2)
Number of observations	3,913	1,187
Adjusted R ²	0.54	0.41

Source: Lynch (1991).

Note: t-statistic given in parentheses.

Throughout the analysis, I have identified important differences between northern and southern Cameroon. One major difference between the two regions is disparate earning opportunities. The estimation of an equation for the log of total expenditures permits the examination of these differences. Another Chow test is developed to examine the influence of key variables determining the earning capacity of heads of households in the North and South.

This specification of the Chow test consists of estimating an equation with a set of independent variables and the same set of variables with a North interaction term. The test determines whether the coefficients on the variables with regional interaction terms are equal to zero at a given level of confidence. The null hypothesis is that all the parameters on the variables with interaction equal zero. The alternative hypothesis is that at least one of the restrictions is not equal to zero. The equation estimated is

$$\begin{aligned} \text{LTEXP} = f(\text{a}_1\text{Intercept, a}_2\text{major urban, a}_3\text{rural, a}_4\text{adults,} & \quad (17) \\ & \text{a}_5\text{sex of head of household, a}_6\text{activity level of} \\ & \text{head of household, a}_7\text{education of head of} \\ & \text{household, a}_8\text{age of head of household, a}_9\text{age of} \\ & \text{head of household squared, b}_1\text{North, b}_2\text{North*rural,} \\ & \text{b}_3\text{North*adults, b}_4\text{North*sex of head of HH,} \\ & \text{b}_5\text{North*activity level, b}_6\text{North*education of head} \\ & \text{of HH, b}_7\text{North*age of head of HH, b}_8\text{North*age of} \\ & \text{head of HH squared),} \end{aligned}$$

and the hypothesis tested is

Ho: $b_1=b_2=b_3=b_4=b_5=b_6=b_7=b_8=0$, and

Ha: at least one $b = 0$.

The equation is estimated using the whole sample. Results of the estimation are presented in Table 31.

All the coefficients on the noninteraction terms are significant and have the expected sign. Significant coefficients for the interaction terms are observed for four variables: North dummy, rural dummy, number of adults, and female head of household. This suggests that the earning potential of rural households in the North is significantly lower than rural households in the South. This is not surprising given the limited agricultural earning potential in the North. The lower potential is due not only to the harsher climate but also the more limited marketing infrastructure and greater isolation of rural areas.

The negative influence of a female-headed household on total expenditures is larger in the North than in the South. This is partially explained by the

Table 31 – Regional Differences in Income Equation

Variable	Parameter Estimate	Variable	Parameter Estimate
Intercept	4.9 (42.0)	North * intercept	0.52 (2.3)
Major urban	0.67 (23.4)		
Rural	-0.25 (-9.5)	North * rural	-0.35 (-6.8)
Number of adults	0.15 (26.7)	North * number of adults	0.05 (3.7)
Female head of household	-0.06 (-2.2)	North * female head of household	-0.24 (-3.0)
Head presentl/ employed	0.14 (4.4)	North * head presently employed	0.03 (0.3)
Primary education	0.27 (10.3)	North * primary education	0.08 (1.2)
Secondary education	0.53 (15.5)	North * secondary education	0.02 (0.2)
University education	1.04 (15.8)	North * university education	0.50 (1.8)
Age of head	0.03 (7.1)	North * age of head of household	-0.01 (-1.2)
Age head of household ²	-0.00 (-7.7)	North * age of head of household ²	0.00 (0.8)
No. of observations	5,101	Adjusted R ²	0.54

Source: Lynch (1991).

Note: t-statistic given in parentheses.

generally low level of education and the Islamic influence in the North, which limits opportunities for women to work outside the home. An additional adult member of a household has a larger positive influence on household total expenditures in the North than in the South. The differences between the parameter estimates for the North and South are not statistically significant for activity level, level of education, and age of head of household.

6. CONSUMER PREFERENCES AND POLICY IMPLICATIONS

Knowledge of the nature and strength of consumer preferences can contribute useful information to the debate over public policy. Information on demand parameters provides a key to understanding the links between macroeconomic policies and household consumption. Further disaggregation of this information by region or income class helps to identify the differential nature of the consequences for rich, poor, and spatially separated households.

While information on the structure of preferences for both food and nonfood commodities is useful, the former is especially valuable. This is because of the strong relationship between food consumption patterns and nutrition. If the focus of concern is the well being of members of society then household nutrition is a key concern. This is because in many developing countries food represents a large part of household expenditures and adequate nutrition is a more critical issue. Changes in a household's ability to procure food, either because of a change in income or prices, could have a profound effect on household welfare. Thus, an understanding of consumer preferences, by income class and region, allows one to assess the distributional aspects of macroeconomic policies affecting relative prices and income faced by the household (Pinstrup-Andersen 1985; Timmer et al. 1983).

In this section separate demand systems for southern and northern Cameroon are estimated. The parameter estimates from the two demand systems are used to calculate expenditure elasticities for a disaggregated list of food and nonfood commodities. Then the expenditure elasticities are used to examine the income effect of an exogenous change in income and prices. First, the income effect of a 10 percent decrease in household income is examined, then the income effect of a 10 percent increase in food prices. The purpose of these exercises is to examine differences or similarities between income classes in the way they respond in terms of their demand for goods and services. These similarities or differences provide information useful for the analysis of policy implications.

ECONOMETRIC RESULTS

Two regional AID systems, one for the North and one for the South, are estimated using seemingly unrelated regression (SUR). The demand system includes 15 and 17 commodity equations for the South and North, respectively (see Table 29 for the list of commodities). The economic theory restrictions of homogeneity and symmetry are not imposed because price data are not available. However, the adding up restriction given in equations 4 and 5 is satisfied. The specification of the systems for the South and North are

$$W_{iS} = f(\text{Central, West, Major urban, Semiurb, Household size, Sex of head of household, Predicted log of total expenditures, and Inverse Mills ratio}), \text{ and} \quad (18)$$

$$W_{iN} = f(\text{Maroua, Mokolo, Semiurb, Household size, Female head of household, Predicted log of total expenditures, and Inverse Mills ratio}), \quad (19)$$

where w_i is the household budget share for commodity group $i=1, \dots, n$ and for region $S = \text{South}$ and $N = \text{North}$. The remaining variables are as defined earlier.

The equation was originally specified to include household composition variables such as number of women, men, and male and female children in the household. However, these variables were not statistically significant in most equations. These variables were replaced with a variable for total household size in the subsequent specification.

Parameter Estimates

The econometric results for the South and North are presented in Tables 32 and 33. In the South, the dummy variables indicating the degree of urbanization and region are significant and have the correct sign with some exceptions. The coefficients on these variables indicate the incremental effect of region on the household budget allocation to a particular commodity, other factors held constant. Differences in regional production possibilities, markets, and consumption habits are captured in the regional coefficients (Heien et al. 1988).

As might be expected, the household location in urban or semiurban areas, other factors held constant, increases the expenditure shares for convenience foods such as rice, bread, other cereal products, and food eaten away from home and beverages. Conversely, expenditure shares of certain "traditional foods" (maize, manioc, and other roots and tubers), which are often not in a convenient preparation form, decrease for urban households relative to rural households. The coefficients of the urban dummies are negative in the fruits and vegetable and legumes and nuts equations and not significant at the 95 percent level of confidence in the other food equation. Budget allocations to meat, fish, dairy and eggs increase if a household is located in the semiurban areas but location in Yaoundé/Douala has no impact. With respect to nonfood expenditures, the negative coefficients for the dummy variable for the major urban areas of Yaoundé/Douala in the clothing and shoes and durables equations are contrary to expectations.

The regional dummy variables are generally significant and the signs are plausible. However, prior expectations would suggest that the coefficients for the dummy variables of Central and West would be positive in the equations for clothing and shoes and durables. The negative coefficients in these equations indicate that households in these two regions would allocate a smaller amount of an additional unit of budget to these categories of expenditures than would a household in the East. Households in the East are generally more economically

Table 32 -- Coefficient Estimates for AIDS in Southern Cameroon

	Intercept	Major Urban	Semi-urban	Central	West	Household Size	SexHHF	PLTExp	Mills	Adj. R ²
Maize	0.087 (6.0)	-0.022 (-4.8)	-0.027 (-13.1)	-0.027 (-8.2)	0.016 (5.0)	0.0007 (3.2)	0.002 (1.3)	-0.009 (-3.7)	0.010 (8.2)	0.25
Rice	0.041 (7.7)	0.009 (5.5)	0.008 (10.3)	0.003 (2.2)	0.007 (5.6)	0.0007 (8.0)	0.0005 (0.8)	-0.006 (-6.4)	0.003 (4.1)	0.07
Bread	0.045 (7.7)	0.009 (5.0)	0.007 (8.6)	-0.002 (-1.3)	-0.001 (-1.1)	0.0002 (2.8)	-0.003 (-4.5)	-0.005 (-4.8)	-0.007 (-11.0)	0.09
Other cereal	0.034 (8.8)	0.012 (9.9)	0.005 (9.1)	0.004 (4.1)	0.0006 (0.6)	0.0003 (5.8)	-0.001 (-2.1)	-0.005 (-7.0)	0.006 (-14.2)	0.15
Plantain	0.029 (4.2)	-0.003 (-1.5)	-0.005 (-5.5)	0.007 (4.6)	0.0006 (.4)	-0.000 (-1.0)	0.000 (0.5)	-0.000 (-.0)	-0.014 (-21.0)	0.18
Manioc	0.144 (14.1)	-0.067 (-21.0)	-0.022 (-15.4)	-0.033 (-14.1)	-0.069 (-31.0)	0.0005 (3.2)	0.003 (2.0)	-0.009 (-4.9)	-0.007 (-7.5)	0.38
Other roots and tubers	0.121 (6.0)	-0.007 (-1.1)	-0.050 (-17.7)	0.026 (5.7)	0.038 (8.7)	0.0006 (1.9)	0.014 (5.7)	-0.013 (-3.7)	-0.005 (-3.9)	0.25
Fruits and vegetables	0.131 (9.2)	-0.009 (-2.1)	-0.017 (-8.5)	-0.005 (-1.6)	-0.0004 (-0.1)	0.0008 (4.1)	0.004 (2.5)	-0.012 (-5.0)	-0.002 (-0.7)	0.08
Legumes and nuts	0.071 (4.5)	-0.028 (-5.6)	-0.026 (-11.6)	-0.009 (-2.5)	0.002 (0.6)	0.0005 (2.0)	0.010 (5.1)	-0.004 (-1.5)	-0.008 (-6.2)	0.13
Meat, fish, dairy, eggs	0.162 (7.8)	-0.007 (-1.1)	0.033 (11.6)	-0.020 (-4.3)	-0.051 (-11.4)	0.002 (5.4)	0.009 (3.6)	-0.005 (-1.4)	-0.008 (-2.3)	0.13
Cooking oils	0.117 (6.9)	-0.002 (-0.4)	-0.016 (-6.9)	0.026 (6.6)	0.048 (13.0)	0.0006 (2.3)	0.005 (2.3)	-0.013 (-4.4)	-0.010 (-5.8)	0.25
Other food	0.034 (11.9)	0.0001 (0.1)	-0.0005 (-0.7)	-0.006 (-4.9)	0.0005 (0.4)	0.0003 (3.6)	0.0001 (-0.2)	-0.007 (-7.6)	-0.006 (-8.3)	0.11
Food away and beverages	0.069 (2.4)	0.021 (2.4)	0.020 (5.1)	0.030 (4.7)	0.006 (1.0)	-0.004 (-8.9)	-0.056 (-16.0)	0.006 (1.3)	-0.004 (-1.8)	0.12
Clothing and shoes	0.014 (0.8)	-0.015 (-2.9)	0.006 (2.5)	-0.011 (-2.9)	-0.021 (-5.7)	-0.0003 (-1.1)	0.002 (1.1)	0.013 (4.3)	-0.011 (-5.8)	0.08
Durables	-0.022 (-1.4)	-0.023 (-4.7)	0.005 (2.3)	-0.010 (-2.6)	-0.021 (-6.0)	-0.001 (-4.8)	0.0007 (0.4)	0.015 (5.6)	-0.003 (-0.7)	0.04
Transportation and communications	-0.222 (-9.0)	0.014 (1.8)	0.009 (2.7)	0.014 (2.5)	0.029 (5.4)	-0.002 (-4.3)	-0.007 (-2.3)	0.044 (10.4)	-0.003 (-1.3)	0.13
Other nonfood	0.181 (5.7)	0.103 (10.5)	0.071 (16.1)	0.002 (0.2)	0.014 (2.0)	-0.0008 (-1.7)	0.013 (3.5)	0.003 (0.5)	-	0.20

Source: Lynch (1991).

Notes: Number of observations = 3,913; t-statistics are in parentheses.

Table 33 – Coefficient estimates for AIDS in Northern Cameroon

	Intercept	Semi-urban	Maroua	Mokolo	Household Size	SexHHF	PLTExp	Mills	Adj. R ²
Millet and sorghum	0.447 (5.7)	-0.156 (-11.8)	0.131 (11.3)	0.150 (10.6)	0.006 (4.0)	-0.021 (-1.4)	-0.054 (-3.9)	-.003 (-.9)	0.42
Rice	-0.008 (-0.2)	0.025 (4.3)	0.022 (4.3)	-0.004 (-.6)	0.001 (1.5)	-0.002 (-0.3)	0.002 (0.3)	.0005 (.2)	0.08
Bread	0.022 (2.9)	0.014 (10.3)	-0.019 (-16.2)	-0.018 (12.5)	0.0002 (1.4)	-0.004 (-2.5)	0.0002 (0.2)	-.005 (-4.2)	0.44
Other cereals	0.054 (3.6)	-0.029 (11.1)	-0.009 (-4.0)	-0.014 (-5.1)	-0.000 (-0.3)	-0.000 (-0.0)	-0.005 (-1.7)	-.007 (-4.8)	0.26
Manioc	0.077 (4.1)	-0.008 (-5.6)	-0.034 (-23.7)	-0.037 (-21.5)	-0.0005 (-3.1)	0.002 (1.4)	-0.001 (0.9)	-.006 (-4.1)	0.41
Fruits and vegetables	0.148 (5.6)	-0.018 (-4.1)	-0.010 (-2.7)	-0.027 (-5.8)	-0.000 (-0.0)	0.007 (1.4)	-0.010 (-2.2)	-	0.07
Legumes and nuts	0.197 (3.4)	-0.040 (-4.0)	0.035 (4.1)	0.150 (14.2)	0.001 (1.2)	-0.005 (-0.5)	-0.026 (-2.5)	-0.005 (-1.5)	0.30
Meat, fish, eggs, dairy	0.126 (2.1)	0.077 (7.8)	-0.012 (-1.3)	-0.034 (-3.2)	-0.0006 (-0.6)	0.013 (1.2)	0.006 (0.6)	-0.010 (-1.8)	0.15
Cooking oils	0.034 (2.8)	0.017 (8.0)	-0.004 (-2.1)	-0.014 (-6.3)	-0.0002 (-0.7)	0.006 (2.7)	-0.0007 (-0.3)	-0.013 (-9.3)	0.35
Other food	0.043 (4.1)	0.009 (7.1)	-0.012 (-8.0)	-0.019 (-10.0)	-0.0003 (-1.7)	0.002 (1.0)	-0.0008 (-0.5)	-0.005 (-2.2)	0.17
Food away and beverages	-0.025 (-0.6)	-0.024 (-3.3)	0.005 (0.8)	0.011 (1.5)	-0.002 (-2.1)	-0.018 (-2.2)	0.018 (2.3)	-0.004 (-1.4)	0.05
Clothing and shoes	0.007 (0.2)	-0.005 (1.0)	-0.030 (-7.0)	-0.045 (-8.7)	-0.001 (-2.3)	-0.006 (-1.0)	0.016 (3.1)	-0.014 (-3.7)	0.12
Durables	-0.004 (-0.2)	0.003 (0.8)	-0.010 (-3.7)	-0.019 (-5.7)	-0.001 (3.3)	0.0009 (0.3)	0.010 (3.0)	-0.005 (-1.8)	0.08
Transportation and communication	-0.144 (-4.6)	-0.005 (-0.9)	-0.020 (-4.4)	-0.020 (-3.6)	-0.0008 (-1.4)	0.009 (1.5)	0.033 (6.0)	-0.008 (-3.7)	0.14
Other nonfood	0.144 (4.7)	0.080 (15.6)	-0.030 (-6.7)	-0.050 (-9.1)	-0.002 (-3.1)	0.013 (2.2)	0.000 (0.0)	-	0.42

Source: Lynch (1991).

Note: t-statistic in parentheses.

and socially isolated relative to other areas of southern Cameroon, hence the expectation that households in more centrally located regions of the South would allocate a larger share of additional budget to these categories.

A one unit increase in household size increases the budget share allocated for all food groups with the exception of food eaten away from home and beverages. The coefficients for plantain and roots and tubers are not significant. Household size coefficients for all nonfood expenditure categories are negative, with the exception of clothing and shoes, which is not significant. This implies that a one unit increase in household size decreases the expenditure on nonfood categories.

In six of the equations the dummy variable for female head of household is not significant. Equations where the dummy variable for female head of household is significant are bread; other cereal products; manioc; other roots and tubers; fruits and vegetables; legumes and nuts; meat, fish, dairy and eggs; cooking oils; food eaten away from home and beverages; and other nonfood. Having a female head of household generally increases the share of the budget allocated to food with the exception of processed foods such as bread and other cereal products. In contrast to male-headed households, female heads allocate less of the budget to food eaten away from home, and transport and communication.

The variable for the predicted log of total expenditures is usually significant and has the theoretically expected sign. The coefficients for all food expenditure categories are negative, indicating that the groups are necessities. This is in contrast to nonfood expenditure categories, which have a positive coefficient indicating that they are luxury goods.

The predicted log of total expenditures is not significant in only five equations: plantain; legumes and nuts; meat, fish, dairy products, and eggs; food eaten away from home and beverages; and other nonfood. In the case of plantain; legumes and nuts; and meat, fish, dairy, and eggs, a partial explanation may be that these are desired commodities by households in all income classes and regions and households. Many households produce these commodities themselves and as a result households face very different prices and degrees of availability.

The coefficient on the Mills ratio, included to correct for the bias introduced due to zero observations, is significant in 13 out of 16 equations. It is significant in all the equations where the percent of zero observations is greater than 5 percent. In the three equations in which the Mills ratio is not significant, the percent of zero observations is between 0 and 3 percent. In these equations the effect of the truncated sample is negligible.

In the North, the semiurban and regional variables Maroua and Mokolo are statistically significant for most of the equations in the AID system (Table 33). Location in the urban North increases the budget allocation, relative to rural households, to rice, bread, meat, fish, dairy products and eggs, cooking oils, and other food. Relative to their rural counterparts, urban households allocate less of their budget to millet and sorghum, other cereal products, manioc, fruits

and vegetables, legumes and nuts, and surprisingly, food eaten away from home and beverages.

It is interesting to note that female heads of household, household size, and the predicted log of total expenditures are not statistically significant in the majority of equations. The lack of significance of the predicted log of total expenditures in explaining the allocation of budget shares is unexpected. A partial explanation of this lack of significance may be the economic isolation and lack of agronomic diversity of households in the North. Households, regardless of their wealth, face a limited set of choices in the market place. The severity of the climate limits the variety of agricultural production, thereby limiting substitution possibilities. This tendency is further reinforced by the general isolation of northern markets in general and rural markets in particular. Imported goods must be shipped at considerable cost from the southern port of Douala or smuggled across the border with Nigeria.

Support of this hypothesis is given by the fact that the regional variables in the demand equations are often significant. This suggests that region specific factors such as agricultural potential, market access and integration, and the impact of these factors on consumer tastes and preferences, are important in shaping household budget allocations.

The Mills ratio is significant in 7 out of 13 equations. In most of the cases where the Mills ratio is not significant the percentage of zero consumption is small. The only exception to this is in the rice equation, where the Mills ratio is not significant and the percentage of zero consumption is 50 percent. This suggests that there is no selectivity bias influencing the decision to purchase or not purchase rice.

In general the explanatory power of both systems of equations is low as evidenced by the adjusted R^2 . This may be expected given the heterogeneity of the categories and the tremendous amount of individual variation contained in large microeconomic samples (Deaton and Case 1987; Heien and Willet 1988). In addition, important variables explaining household budget allocations are not included. Prices are key explanatory variables that could not be included because of the lack of data. Two other variables influencing expenditures, particularly food, are ethnic group and religion. These variables are partially captured in the regional dummy variables Central, West, and East. Ethnic groups and religious affiliation are often loosely associated with a specific area. Examples of this are the Bamilike in the West; Bulu, Bassa, and Ewando in the Central zone; Moslems in the North; and Christians in the South. However, given Cameroon's tremendous ethnic and religious diversity, the regional association is suggestive at best. Regional association is not possible in the large urban areas of Yaoundé and Douala, where people from all regions, ethnic groups, and religious orientations are found. Household ethnic and religious information was not collected by the EBC survey.

Expenditure Elasticities

Tables 34 and 35 present budget shares and expenditure elasticities for the disaggregated list of commodities for poor, and middle and rich households in the South and North, respectively. Household classifications are based on the per capita expenditure quintiles discussed in section 4. Poor households are those found in the bottom two quintiles, which represent the poorest 40 percent of the population. The middle income group consists of households in the third and fourth quintile. Households classified as rich are found in the fifth quintile and represent 20 percent of the total population. The expenditure elasticity is calculated using the following formula:

$$\eta_{ir}^k = 1 + \frac{B_{ir}}{W_{ir}^k}, \quad (20)$$

where η_{ir}^k = the expenditure elasticity for the i^{th} commodity the r^{th} region (r = South and North) and the k^{th} income class (k = poor, middle, rich); B_{ir} = coefficient of the predicted log of total expenditures for the i^{th} commodity group and the r^{th} region; and W_{ir}^k = the average budget share of the weighted sample representing the i^{th} commodity group, the k^{th} income class, and the r^{th} region.

In the South the 17 commodity group elasticities across all income classes are positive (Table 34). This implies that all the expenditure categories included in the demand system in the South are normal goods, either necessities or luxury goods. All the food categories, except plantain and food eaten away from home and beverages, are necessities as the elasticities are greater than zero but less than one. This means that as income increases, the quantity consumed and therefore the budget share increase but by an amount less than the income increase. For plantain and meat, fish, and dairy products and eggs, the expenditure elasticity is unitary across all income classes. For all nonfood categories of expenditures and income classes the expenditure elasticity is greater than one, indicating luxury goods.

The relationship between demand as income changes has received much scrutiny since the work of Engel in the late 1800s. From this body of research has emerged Engel's law and several corollaries. Engel's law posits that the proportion of the family budget allocated to food declines as the household's income increases. It is also argued that the income elasticities for food of the poor are relatively larger than those of higher income groups. This implies that income elasticities for food decline as incomes increase (Timmer, Falcon, and Pearson 1983; Deaton and Muellbauer 1980a). However, this decline may not be observed for all categories in disaggregated food commodity analysis. Perhaps as incomes increase, consumers can switch to higher quality and more expensive forms of a product. In this situation, the budget share allocated to a certain commodity could increase as consumers pay more for better quality.

Expenditure elasticities vary considerably by income class. In most cases, expenditure elasticities decline as income increases. This implies that richer

Table 34 – Budget Shares and Expenditure Elasticities for Southern Cameroon

Expenditure Groups	Income Coefficient	Budget Shares			Expenditure Elasticities		
		Low	Middle	High	Low	Middle	High
Maize	-0.009	0.042	0.024	0.012	0.78	0.62	0.20
Rice	-0.006	0.020	0.018	0.014	0.70	0.67	0.58
Bread	-0.005	0.014	0.015	0.018	0.66	0.69	0.73
Other cereal products	-0.005	0.007	0.009	0.010	0.34	0.46	0.51
Plantain	-0.000	0.020	0.025	0.021	1.00	1.00	1.00
Manioc	-0.009	0.042	0.034	0.020	0.80	0.75	0.57
Other roots and tubers	-0.013	0.077	0.064	0.034	0.34	0.80	0.63
Fruits and vegetables	-0.012	0.059	0.055	0.043	0.79	0.78	0.71
Legumes and nuts	-0.004	0.038	0.041	0.026	0.89	0.90	0.84
Meat, fish, dairy, and eggs	-0.005	0.110	0.117	0.129	0.96	0.96	0.96
Cooking oils	-0.013	0.081	0.073	0.044	0.84	0.83	0.71
Other foods	-0.006	0.023	0.019	0.015	0.70	0.64	0.55
Food away and beverages	-0.006	0.070	0.096	0.121	1.09	1.06	1.05
Clothing and shoes	0.013	0.071	0.073	0.083	1.18	1.17	1.15
Durables	0.015	0.046	0.048	0.059	1.33	1.31	1.26
Transportation and communication	0.044	0.051	0.061	0.095	1.86	1.73	1.47
Other nonfood	0.003	0.229	0.227	0.257	1.01	1.01	1.01

Source: Lynch (1991).

Table 35 – Budget Shares and Expenditure Elasticities for Northern Cameroon

Expenditure Groups	Income Coefficient	Budget Shares			Expenditure Elasticities		
		Low	Middle	High	Low	Middle	High
Millet and sorghum	-0.054	0.343	0.209	0.132	0.84	0.74	0.60
Rice	0.002	0.006	0.030	0.066	1.28	1.05	1.02
Bread	0.000	0.003	0.006	0.012	1.09	1.04	1.02
Other cereal products	-0.005	0.013	0.023	0.028	0.65	0.80	0.84
Manioc	-0.001	0.004	0.009	0.009	1.40	1.16	1.15
Fruits and vegetables	-0.010	0.079	0.071	0.054	0.87	0.86	0.81
Legumes and nuts	-0.026	0.135	0.084	0.032	0.81	0.69	0.19
Meat, fish, dairy, and eggs	0.006	0.121	0.181	0.196	1.05	1.04	1.03
Cooking oils	-0.001	0.010	0.024	0.033	0.93	0.97	0.98
Other foods	-0.001	0.020	0.028	0.028	0.96	0.97	0.97
Food away and beverages	0.018	0.073	0.069	0.073	1.24	1.25	1.24
Clothing and shoes	0.016	0.054	0.074	0.083	1.30	1.22	1.20
Durables	0.010	0.028	0.041	0.052	1.34	1.23	1.18
Transportation and communication	0.033	0.014	0.030	0.062	3.29	2.12	1.53
Other nonfood	0.000	0.098	0.123	0.140	1.00	1.00	1.00

Source: Lynch (1991).

households are less responsive to a one unit change in total household expenditures than are poorer households. There are, however, two expenditure categories where the reverse is true. The expenditure elasticities for bread and other cereal products increase as income increases. The expenditure elasticities for plantain, and meat, fish, dairy products, and eggs are constant across all income classes.

In the North, as in the South, all elasticities are positive indicating either necessity or luxury goods (Table 35). However, unlike in the South, several food commodities are considered luxury goods. Commodities with expenditure elasticities greater than one in the North include rice, bread, manioc and meat, fish, and dairy products. The expenditure elasticity and thereby the responsiveness to a change in the household budget declines as income increases for most commodities in the North. The exceptions are bread, other cereal products, and cooking oils. Three commodities have expenditure elasticities that are invariant with respect to income class: other food; food eaten away from home and beverages; and other nonfood.

The relative geographic and economic isolation of the North versus the South is reflected in the elasticities presented in Tables 34 and 35. In the North, more food products are found to be luxury goods and/or the elasticities are higher than comparable commodities in the South. In the North there are few substitutes to the basic staples of millet, sorghum, and groundnuts (included in the legumes and nuts category). The isolation is reflected in the unexpectedly high elasticities for transport and communication.

In general the income elasticities seem high. However, three factors may contribute to this. First, income effects are expected to be higher when estimating a complete demand system with total expenditures as the explanatory variable versus a partial food demand system with total food expenditures as the explanatory variable. Second, expenditure elasticities are generally larger than those based on physical quantities. This is because the expenditure elasticity captures the quantity response to an income change as well as a price effect due to quality differences (Tomek and Robinson 1972). Third, expenditure elasticities based on cross-section data represent long run adjustment parameters and are expected to be larger than short-run responses (Timmer, Falcon, and Pearson 1983).

POLICY SIMULATIONS

Change in Household Income

The first exogenous shock examined is a 10 percent reduction in total household income. This is an estimate of the decline in Cameroon's GNP between 1984 and 1987, following the decline in the world price of oil (Blandford and Lynch 1990). Using the demand parameters developed in the previous section, the effect of that drop on the consumption patterns of households in Cameroon is estimated.

In this simulation, it is assumed that the decline in GNP is absorbed by all households equally as a 10 percent reduction in their income. Several assumptions are made in this simulation. First, it is assumed that all households suffer an equal percentage loss in income due to the decline in oil prices. Insufficient information exists on how the decline was distributed throughout the economy to warrant differentiating by employment category. Second, given the lack of cross price elasticities, it is assumed that there is no substitution between categories of expenditures.

New budget shares are calculated for low-, middle-, and high-income classes in both the North and South, incorporating a 10 percent decline in income. The new shares are derived by modifying the original budget share by the marginal change in budget share resulting from the decline in income.⁵ Since expenditure elasticities for all income classes in both the North and South are positive, the decline in income results in a decline in expenditures for all categories of expenditures and for all income classes in both the North and South.

Budget allocations of all income classes in both the North and South show no significant change after a 10 percent decline in income (Table 36 and 37). There are only minor differences between the original budget shares and the new budget shares for each income class.

This reflects two features of consumer preferences in Cameroon. First, the agricultural diversity of Cameroon, particularly in the South, allows households to consume a wide variety of food products in each agroecological zone. As a result, in each of the income classes the budget shares of each individual commodity as well as the aggregate categories do not represent a major portion of the budget. No single commodity dominates food expenditures. Only low income households in the North allocate more than a quarter of their yearly expenditures on one food category (34 percent to millet and sorghum). In the South, the *other nonfood* category absorbs 23 to 26 percent of yearly expenditures. For all other income classes and categories of expenditures, the budget share is less than 13 percent in the South and 18 percent in the North.

The second factor that contributes to the small change in budget shares is the narrow range of most of the elasticities. Most expenditure elasticities fall between 0.6 and 1.1. There are no inferior goods, and the few luxury goods are luxuries for all the income classes within a region. The narrow range of the elasticities, coupled with small budget shares for most commodities, disperses the impact of the income reduction over a number of commodities. The relative magnitude of the expenditure decline is greater for luxury goods than for necessities. Thus, while in absolute terms the expenditures on all commodities

⁵ Elasticities represent the effect of a marginal change in income, expenditures, or prices. Technically, therefore, they are not defined over the scale of changes simulated here. However, the results obtained using the elasticities in this fashion do provide an approximation useful for policy analysis.

Table 36 – Budget Shares for Low-, Middle-, and High-Income Groups after a 10 Percent Reduction in Income in Southern Cameroon

Expenditure Group	Original Budget Shares			New Budget Shares			Change in Budget Shares (Percent)		
	Poor	Middle	High	Poor	Middle	High	Poor	Middle	High
Maize	0.042	0.024	0.012	0.043	0.025	0.013	0.02	0.04	0.08
Rice	0.020	0.019	0.014	0.021	0.020	0.015	0.05	0.05	0.07
Bread	0.014	0.015	0.018	0.015	0.016	0.019	0.07	0.07	0.06
Other cereals	0.007	0.009	0.010	0.008	0.010	0.011	0.14	0.11	0.10
Plantain	0.020	0.025	0.021	0.020	0.025	0.021	0.00	0.00	0.00
Manioc	0.042	0.034	0.020	0.043	0.035	0.021	0.02	0.03	0.05
Other roots and tubers	0.077	0.064	0.034	0.078	0.065	0.035	0.01	0.02	0.03
Fruits and vegetables	0.059	0.055	0.043	0.060	0.056	0.044	0.02	0.02	0.02
Legumes and nuts	0.038	0.041	0.026	0.038	0.041	0.026	0.00	0.00	0.00
Meat, fish, etc.	0.110	0.117	0.129	0.110	0.117	0.129	0.00	0.00	0.00
Cooking oils	0.081	0.073	0.044	0.082	0.074	0.045	0.01	0.01	0.02
Other food	0.023	0.019	0.015	0.024	0.020	0.016	0.04	0.05	0.07
Food away	0.070	0.096	0.121	0.069	0.095	0.120	-0.01	-0.01	-0.01
Clothing and shoes	0.071	0.073	0.083	0.070	0.072	0.081	-0.01	-0.01	-0.02
Durables	0.046	0.048	0.059	0.044	0.046	0.057	-0.04	-0.04	-0.03
Transportation and communication	0.051	0.061	0.095	0.046	0.056	0.090	-0.10	-0.08	-0.05
Other nonfood	0.229	0.227	0.257	0.229	0.227	0.256	0.00	0.00	0.00

Source: Lynch (1991).

Table 37 – Budget Shares for Low-, Middle-, and High-Income Groups after a 10 Percent Reduction in Income in Northern Cameroon

Expenditure Group	Original Budget Shares			New Budget Shares			Change in Budget Shares (Percent)		
	Poor	Middle	High	Poor	Middle	High	Poor	Middle	High
Millet and sorghum	0.343	0.209	0.132	0.348	0.214	0.138	0.01	0.02	0.05
Rice	0.006	0.030	0.066	0.006	0.030	0.066	0.00	0.00	0.00
Bread	0.003	0.006	0.012	0.003	0.00	0.012	0.00	0.00	0.00
Other cereals	0.013	0.023	0.028	0.013	0.023	0.028	0.00	0.00	0.00
Manioc	0.004	0.009	0.009	0.004	0.009	0.009	0.00	0.00	0.00
Fruits and vegetables	0.079	0.071	0.054	0.080	0.072	0.055	0.01	0.01	0.02
Meat, fish, etc.	0.135	0.084	0.032	0.138	0.087	0.035	0.02	0.04	0.09
Legumes and nuts	0.121	0.181	0.196	0.120	0.180	0.195	-0.01	-0.01	-0.01
Cooking oils	0.010	0.024	0.033	0.010	0.024	0.033	0.00	0.00	0.00
Other food	0.020	0.028	0.028	0.020	0.028	0.028	0.00	0.00	0.00
Food away	0.073	0.069	0.073	0.071	0.067	0.071	-0.03	-0.03	-0.03
Clothing and shoes	0.054	0.074	0.083	0.052	0.072	0.081	-0.04	-0.03	-0.02
Durables	0.028	0.041	0.052	0.027	0.040	0.051	-0.04	-0.02	-0.02
Transportation and communication	0.014	0.030	0.062	0.010	0.026	0.058	-0.29	-0.13	-0.10
Other nonfood	0.098	0.123	0.140	0.098	0.123	0.140	0.00	0.00	0.00

Source: Lynch (1991).

decline, in relative terms the budget shares after the decline in income stay roughly the same for each income category.

CHANGE IN FOOD PRICES

While the structure of household expenditures on food items does not change significantly after the decline in income for any single income group, the real income effect on food expenditures does differ by income class. Table 38 shows estimates of the real income effect of a 10 percent increase in all food prices for poor households in the North and South and, for comparative purposes, the wealthiest households in those regions. Such a change in price could result from an across-the-board food sales tax. I assume that there is no substitution between the food expenditure categories, or between food and nonfood commodities.

Because low-income groups spend a greater proportion of their total budget on food commodities than richer households, the impact of the increase in prices is greater for the former group. The real income effect, calculated as the product of the income class specific elasticity, the budget share and the change in prices indicates that the effect is greater on poor households. Furthermore, the impact of the increase in food prices on food acquisition is more severe for both the rich and poor in the North than in the South. This is because rich and poor households in the North allocate a larger share of their income to food on average than do households in the South.

Table 38 reveals that the impact of an increase in food prices is regressive by income class and by region. What is unknown are the implications in terms of a household's ability to maintain a nutritionally adequate diet. Since there is a lack of information on current household nutritional status, it is difficult to estimate whether this change in purchasing power renders a proportion of households at risk nutritionally. In addition, if food producers received any portion of the price increase, then, other variables remaining constant, household income would increase depending on the size of the marketable surplus. To the extent poor households are net purchasers of food, however, then the increase in food prices reduces household welfare.

Speculation on the Substitution Effect

The income effect is only one component of the total or uncompensated price elasticity. The Slutsky equation breaks down the total price elasticity into the real income effect and the substitution effect. The former is derived by multiplying the budget share by the income elasticity.

The EBC data do not permit the direct estimation of price elasticities for Cameroon. Economic theory provides little guidance on how price elasticities change as incomes increase. However, recent empirical work analyzing consumption patterns in other developing countries provides some information with which to speculate on the relative magnitudes of the unobserved price elasticities (Pinstrup-Andersen 1985; Timmer 1981; Timmer and Alderman 1979; Sahn 1985).

Table 38 – Decline in Real Income after a 10 Percent Increase in Food Prices

Region	Poor	Rich
	Percent	
South	5.2	4.3
North	7.4	5.9

Source: Lynch (1991).

7. SUMMARY AND CONCLUSIONS

REVIEW OF STUDY

This study presents a comprehensive analysis of the consumer preferences and socioeconomic characteristics of the West African nation of Cameroon. The goal of this study is to identify the characteristics of the poorest segment of society in order to develop a clearer picture of the factors that differentiate them from the rest of society. Characteristics of particular importance are education, region, employment, household composition, and expenditure patterns. Knowledge of the characteristics of the poor can greatly enhance the ability of policymakers to both develop interventions to improve the standard of living of the poor or to mitigate the negative consequences of a general policy. This kind of information is vital to the ongoing debate in Cameroon over policies related to structural adjustment.

This study represents the first analysis of the newly available data from Cameroon's National Income Expenditure Survey (EBC). The survey was implemented by Cameroon's Ministry of Plan and Territorial Management from September 1983 through August 1984. The EBC provides data on monetary expenditures on food and nonfood items, quantities consumed of home-produced food, regional prices for some agricultural products, and household socioeconomic and demographic information.

First the data are used to provide a detailed description of household composition, size, education, ownership of assets, employment, and expenditure patterns. Differences in these characteristics by region and per capita income quintiles are explored. In order to focus on the characteristics of the poor, the poor in Cameroon are defined as those households in the two lowest per capita income quintiles. Using this arbitrary poverty line, the characteristics of poor households in Cameroon are summarized. To further explore the factors contributing to poverty, logit analysis is used to determine how the probability of a household being poor changes given a change in an explanatory variable. The degree of inequality is investigated by agroecological zone, region, and education, sex, and age of head of household using Gini, Theil, and log variance measures of inequality.

In order to generate expenditure elasticities, an Almost Ideal Demand System is used to estimate demographically augmented Engel curves for a disaggregated set of food and nonfood categories. Because of their significant differences, separate models are developed for northern and southern Cameroon. The estimated expenditure elasticities are used to assess the impact on poor households in Cameroon of a 10 percent decrease in income and a 10 percent increase in all food prices.

Speculation on the elasticities focuses on the size of the substitution elasticities relative to the total income effect and changes in the magnitude of the price elasticities as income changes.

A substantial body of literature examines the relationship between income levels and the magnitude of price elasticities (Timmer 1981; Timmer and Alderman 1979; Pinstруп-Anderson 1985; Sahn 1985). The general conclusion reached in these studies is that the poor respond more to price changes than the wealthier members of society do. Empirical evidence suggests that the poor tend to have larger substitution elasticities than their wealthier counterparts. What this intuitively suggests is that the poor cannot afford to maintain their expenditure habits and are sensitive to changes in relative prices of commodities. Conversely, the rich are less sensitive to these changes and can afford to maintain their expenditure preferences, even in the face of changes in prices.

Alderman (1986) hypothesizes about the nature and magnitude of the substitution elasticity when only the income effect is known. He suggests that for food products the substitution effect usually exceeds the income effect, particularly in disaggregated analysis, and when a large number of substitute goods is available. In his review of existing empirical work, Alderman reports that the real income effect is almost always less than 0.25, while the absolute value of a total price elasticity for a specific food item can exceed one (p. 25).

Speculating, given the many substitutes available in most important food categories in southern Cameroon, the unobserved substitution elasticities may be larger than the real income effect. Even in the North, which generally has fewer alternatives, the substitution effect is still probably larger than the income effect.

Speculating that the substitution effect declines as income increases, I can hypothesize about the characteristics of price elasticities for some of the food commodities. As income increases, the decline in responsiveness due to a change in income or price already observed with food commodities through the declining real income effect (maize, rice, manioc, other roots and tubers, fruits and vegetables, legumes and nuts, cooking oils, and other food in the South; and millet and sorghum, fruits and vegetables, and legumes and nuts in the North) would be reinforced if substitution elasticities decline with income. For the other commodities, where the real income effect increases with income, lower substitution elasticities for the rich would act to level off the differences in responsiveness between rich and poor.

MAJOR FINDINGS

One important contribution of this study is to highlight the differences in socioeconomic characteristics between northern and southern Cameroon. These differences are significant and in some cases will necessitate separate consideration of policy interventions and their consequences. Differences in agroclimatic conditions, colonial history, ethnic and religious affiliations, and transportation and communication infrastructure generate distinct economic environments.

The following generalities summarize the major differences between northern and southern Cameroon. A significantly larger percentage of the population in the North has no education compared with the South. This is not only true for heads of households (reflecting historical investment in human capital) but for all household members (which captures current investment in human capital).

With respect to household expenditures, northern households allocate a larger budget share to food consumed at home than their counterparts in the South. In addition, Northern households depend more on a single staple, millet/sorghum, while diets in the South are more diversified. In all of Cameroon there are no expenditure categories found to be inferior goods. In the South all food categories of expenditures are found to be necessities, while in the North rice, bread, manioc, and proteins (meat, fish, dairy products, and eggs) are found to be luxuries.

The second important contribution of this study is the identification of characteristics of poor households in Cameroon. Poverty in Cameroon is primarily a rural phenomenon. The vast majority of poor households are engaged in farming, tilling their own land. Of the poor households identified in this study, the largest percentages of are found in the agroecological zone of High Plateau and North, where high population densities and, in the latter, persistent droughts limit the income generating activities.

A caveat is necessary on the small percentage of poor households identified as residing in the urban and semiurban areas. As discussed in section 4, the use of a poverty measure based on a relative ranking of households by income may result in an under-representation of urban poor. This is because the cost structure of urban life is generally higher than in rural areas. As a result an urban household with a lower absolute standard of living than a rural household classified as poor, may have an income that exceeds the poverty line and is, therefore considered nonpoor. In conclusion, while most of the poor in Cameroon do reside in rural areas, it is not appropriate to conclude that the poor population in urban areas is negligible.

The heads of poor households are employed mainly in the agricultural sector and, as mentioned above, are farmers tilling their own land. Most have had no education. The sex of the head of households does not appear to be a significant factor in determining income class. Poor households tend to have few assets, though most own rather than rent their homes.

There is great similarity in the consumer preferences of the majority of the households in Cameroon, especially the bottom 60 percent of the population. More significant differences between expenditure patterns and income classes begin to appear in the fourth and fifth income quintile. Though expenditure patterns are similar it is not possible with this data set to assess quality differences in expenditures between the income classes. In both the North and South, goods classified as normal, either necessities or luxuries, are normal for all income classes. There are no inferior goods for any income class in either the North or South.

The poorest households, however, depend more on their own food production than the nonpoor and they allocate a larger share of their total budget to food expenditures. However, even poor households must rely on the market to purchase some of their staple food. The average poor household purchases in the market slightly more than 40 percent of the household's expenditures on the major staples: cereal and cereal products; roots and tubers; vegetables and fruits; and legumes and nuts.

The results of the logistic regression exploring the factors contributing to the likelihood that a household is poor reinforce the conclusions drawn above. The log of the odds of a household being poor increases if the household is located in the High Plateau, North, or Forest regions with the log of the odds being highest for households located in the High Plateau. The odds decrease if the household is located in Yaoundé or Douala, and to a lesser extent, the semiurban regions. Employment in the agricultural sector and a noneducated head of household also have a significant impact on the log of the odds of a household being poor.

The overall Gini coefficient of inequality in Cameroon is 0.49. Decomposing the Theil and log variance measures of inequality indicate that region and education contribute significantly to between group inequality. Between group inequality due to region and education accounted for more than 20 percent and 18 percent, respectively, of the total inequality found in Cameroon. Sex and age of head of household do not significantly influence inequality in Cameroon.

The final conclusion drawn from the EBC data is that education is correlated strongly with income. The positive return to education is reflected in the increase in income by level of education. A household whose head has had no education has a mean income level roughly 75 percent of the national mean. In comparison, households whose head has a university degree has a mean income of 350 percent higher than the national mean. Heads of households with even a primary, secondary, or vocational education have a mean per capita income higher than the national average.

IMPLICATIONS FOR POLICY ANALYSIS

The analysis in the preceding sections on income distribution, poverty, and consumer preferences in Cameroon provides information critical to the design and analysis of policies that affect prices and income and thereby household welfare.

Knowledge of the structure of preferences by region and income class facilitate an understanding of the distributional and regional impact of changes in prices and income on household welfare. This is particularly important in understanding the consequences of policies that affect the welfare of the poorest segment of society, especially their access to food. To minimize unintended consequences of policy interventions, careful attention needs to be paid to the structure of consumer preferences in the North and South and among the rich and poor.

A wide variety of policy options is available to governments that can influence households' access to food (Pinstrup-Andersen and Alderman 1988). Most food interventions are either an implicit or explicit subsidy, changing the prices facing consumer or transferring income (Timmer et al. 1983).

Food policy interventions generally can be divided into targeted and nontargeted interventions. The former attempt to provide benefits to only a certain group of recipients identified by any number of characteristics; income class, geographic location, sex, age, etc. The latter are expected to benefit the population as a whole. Examples of targeted interventions include food stamps with means tests, food ration shops with means test or geographic targeting, and price subsidies for inferior goods. Examples of nontargeted interventions are an overvalued exchange rate, a general food price subsidy, and food ration shops with unrestricted access.

Many factors should be considered in choosing the type of intervention to use. Obviously, the policy objective and specific set of demand characteristics are extremely important. Equally important to the successful implementation of an intervention is an accurate assessment of administrative and financial costs. The administrative costs of targeted interventions are often quite high because of the need to screen recipients. Without such screening, however, the financial costs of an intervention could become exorbitant because of the large number of beneficiaries. Clearly the tradeoff between financial versus administrative costs must be considered. Finally, as Timmer et al. (1983) point out, it is not only the policies' intent but the actual possibility for successful implementation that must be considered. Political realities, poor infrastructure, and corruption often limit the success of a policy from its inception. The effective implementation of a particular policy requires that all these factors be considered.

With respect to Cameroon, four factors influence consumer preferences and the profile of the poor, making food policy interventions difficult. The first important characteristic is that different intervention strategies designed to improve access to food must be devised for the North and South. Agroclimatic and infrastructural differences between the North and South generate different circumstances. Food expenditure patterns are markedly different between the North and South. No one commodity is important in the diets of the poor in both the North and South. Thus, a national policy may have different repercussions in the two regions. Failure to consider these differences could result in serious unintended consequences.

An example is the different impact that the current overvalued exchange rate has on overall welfare of households in the North and South. Cameroon is part of the CFA franc currency zone, which is linked to the French franc. Some estimate that the currency is overvalued by as much as 20 percent (Blandford and Lynch 1990). This makes the major food imports, rice, wheat flour, frozen meat, and beverages, less expensive and domestically produced foods and beverages more expensive. Households in the South generally benefit more from this policy than those in the North. This is because a greater share of total household expenditures is allocated to these goods in the South. In addition, the North is a major producer of rice. However, rice produced in the North cannot compete with the cheaper imported rice available in the major consuming regions of the South. Not only do consumers in the North benefit less from this general nontargeted food subsidy, but it also dampens the income earning potential of rice producers in the North.

In the same vein, a differentiating feature of regional consumer preferences is the greater vulnerability to price and income changes of northern households. Southern households are somewhat insulated from the impact of policies that alter relative food prices. This is largely due to the diversity of the diets in southern Cameroon. Assuming that poor households have large substitution elasticities, at least for the major food categories, and that supply elasticities for the commodities that the poor substitute are elastic (admittedly an arguable assumption), then poor households can substitute lower price foods in order to maintain nutritional adequacy.

The impact on northern households of a change in relative prices of food is more difficult to predict. Households in the North depend more on a single food staple, millet/sorghum. There is less diversity and therefore fewer substitution possibilities for poor households, especially poor households, in the North. In addition, poor households in the North allocate a larger share of their budget to food expenditures than do other income classes in both northern and southern Cameroon. Both attributes render northern households more vulnerable to policy interventions.

The second distinguishing characteristic of Cameroon's consumer preferences is the similarity between income classes of expenditure patterns. No food category is an inferior good in either the North or South. Luxury goods are luxury goods for all income classes and the same is true for necessities in both the North and South. The lack of inferior goods (i.e., goods for which consumption declines as income increases implying a negative income elasticity), makes it impossible to limit the benefits of a specific commodity price subsidy to the poor. Both rich and poor households benefit from a commodity subsidy on a normal good. If the subsidized commodity is a necessity (i.e., a commodity with an expenditure elasticity greater than 0 but less than one) then the benefit to the poor is larger in a relative sense as the subsidy makes up a larger proportion of the poor's total expenditures, while the rich benefit more in terms of the absolute value of the subsidy. Thus, a nontargeted commodity price subsidy or a food ration shop with unrestricted access results in significant leakage of the benefits and can be prohibitively expensive.

The third attribute of poverty in Cameroon is that the poor are primarily located in rural areas. Often widely dispersed, isolated, and less integrated into the general economy, the rural poor are more difficult to reach by any policy intervention. Even nontargeted food interventions, like an overvalued exchange rate, have little impact given the limited availability of imported goods found in rural markets. The isolation makes it difficult to implement targeted food interventions like food stamps for low-income households or food ration shops in poor areas. These methods of food intervention can target poor households through means tests and/or by geographic location, thereby limiting financial costs. However, because rural poor household members have had little or no education and are less privy to information and because they are so isolated, they are difficult to reach. In many developing countries, proving low income is difficult. Then a system must depend on a means test, which has high administrative costs and is vulnerable to corruption. Geographic targeting by establishing in poor areas food ration shops where subsidized food rations are sold can be effective if administrative costs can be kept manageable.

Finally, the fourth characteristic influencing the response of poor households to policy changes is the dual role of poor households as food consumers and producers. The vast majority of Cameroon's agricultural production, both export and food crop, is generated by the smallholder sector. A large part of poor households' income is from agriculture. An increase in the producer price of food products increases household income. However, the net benefit of this increase in price depends on the amount of marketable surplus available to the household. If the household is a net buyer, as many poor households are, then the increase in price results in a decline in their purchasing power. The overall effect of a food price increase depends on a number of factors, including the supply elasticity of the affected commodity.

In summary, the successful implementation of food interventions is complicated in Cameroon. If the objective is to ensure poor households' access to an adequate diet, then some form of targeted intervention is necessary. Without targeting, most of the benefits would accrue to urban, primarily southern, households. Targeted measures that require means tests are difficult to administer because of the difficulty in verifying household income. Targeting that relies on location to limit access could be effective if the subsidized commodity could be inexpensively transported to the rural areas. Perhaps a mobile ration shop that makes scheduled visits to the periodic markets in rural areas would effectively reach poor households.

In the larger context of the general income distribution, it is clearly demonstrated in this analysis that the between group inequality contributed by education and region are important. This implies that a reduction in income inequality can be achieved through a reduction in the disparity in household access to education and regional resources. The implication of this finding with respect to education is obvious. Education has been consistently shown to have a positive relationship to household income. Regional inequality is more difficult to influence. Differences in natural resource bases and historical backgrounds contribute to this inequality. However, some factors are amenable to policy intervention such as education, health services, and transportation and

communication infrastructure. While there are few short-run benefits to investments in these areas, in the long run they are essential for a more equitable distribution of welfare.

FUTURE RESEARCH

The data from the EBC provide important information on the socioeconomic characteristics of Cameroon's diverse population. This information, previously unavailable, adds significantly to our understanding of consumer preferences. However, serious limitations to the existing database need to be remedied for a more complete understanding of consumer responsiveness in general and the characteristics of poor households in particular.

The highest priority should be given to developing a national price collection system. The collection of price data should be disaggregated by region and degree of urbanization for a limited number of products. Given Cameroon's agricultural diversity, comprehensive price collection is impossible. The EBC data should be used to determine the list of products for which data should be collected. The availability of price data would facilitate the estimation of own and cross price elasticities. The calculation of price elasticities would provide an important element to our understanding of consumer responsiveness to changes in income and prices.

A second priority for further research are the specific characteristics of urban poverty. The analysis of the EBC data indicate that poverty in Cameroon is largely a rural phenomenon. Very few households in the two major cities of Yaoundé and Douala are identified as poor according to the definition used here. The small number of urban households classified as poor belies direct observation of the shanty towns in the major cities of Yaoundé and Douala. The small number of urban poor captured by the EBC data reflects the relative nature of the ranking procedure and may also be the result of survey procedures. The expansion of shanty towns is largely a product of the oil boom of the early 1980s. Survey sampling was largely dependent on the 1976 Population Census, which did not include these areas. Even if some of the poorest urban households had been included in the sample, they are often hard to maintain over the course of the survey period because they are less stable. This suggests that the urban poor may be under-represented in this survey. Data need to be collected on the characteristics of urban poverty even if in relative terms these households are not classified as poor.

In order to better understand the relationship between the arbitrary poverty line and its implication on household nutrition and health, a nutrition monitoring and surveillance program needs to be developed. The EBC data identify the primary characteristics of the poor both regionally and socioeconomically. This information can be used to design a very targeted program to monitor over time the nutritional and health status of the poorest households.

APPENDIX A

DISAGGREGATED LIST OF COMMODITIES

Table A.1 – Disaggregated List of Commodities

Second Aggregation	First Aggregation	Disaggregated
Cereal and cereal products	Millet and sorghum Corn Wheat Rice Other grain Pasta Baked goods and flour Cereal products	Millet and sorghum Corn Wheat grain Rice Other cereals Macaroin Spaghetti Other pasta Bread Pastry cakes Rusks Biscuits Other baked foods Millet and sorghum flour Corn flour Wheat flour Arab couscous Maize fritters Wheat fritters M/S fritters Rice fritters Other cereal products
Roots and tubers	Starchy roots Processed starchy roots	Plantain Potato Sweet potato Cassava Cocoyam Colosia (achu) Yam Other starchy roots Pure starch Dry starch Gari/tapioca Baton de manioc Cassava fritters Potato flour Dried sweet potato Dried cassava Cassava flour Other cassava products Other potato product Other sweet potato product
Fruits and vegetables	Vegetables	Carrots Onion Garlic Radish Leek Other roots and bulbs Cassava leaves Ndole Lettuce Spinach Bean sprouts Keleng Gumbo leaves Cabbage Other leafy vegetables

Second Aggregation	First Aggregation	Disaggregated
		Tomatoes Other tomatoes Cucumber Eggplant Squash String beans Sweet pepper Okra Nkui Other vegetables, edible Flowers and stems
	Processed vegetables	Canned tomatoes Canned pulses
	Fruits	Banana Grapefruit Lemon Orange Mandarin and clementine Other citrus Avocado Plum Other fat rich fruit Mango Guava Pawpaw Pineapple Apple Cherry Melons Other fruits Date (dried) Raisins Other dried fruits Coconut
Legumes and nuts	Legumes and seeds	Dry beans Dry peas Other pulses Fresh groundnuts (unshelled) Dry groundnuts (unshelled) Dry groundnut (shelled) Roasted groundnut Boiled groundnut Groundnut caramel Groundnut paste Other groundnut products Hazel nut Pumpkin seed Ndjansang ezezan Beniseed Other seeds
	Other fresh meat	Boneless beef Minced beef Choice sections Veal Dried beef Edible beef offal Other beef Pork (live) Pork meat with fat Pork meat without fat Dried pork Choice sections (pork chops) Pork offal Other pork meat

Second Aggregation	First Aggregation	Disaggregated
		Mutton, fresh Dried mutton Fresh goat meat Dried goat meat Sheep or goat offal Other sheep and goat meat Other live animals Rabbit meat Guinea pig meat (or rat meat) Meat, other domestic animals Game fresh Dried or smoked game Offal of other animals Snake meat Crocodile Other meat Cricket and grasshoppers Termite Larvae Caterpillar Other insects
	Insects	
	Fresh poultry	Chicken Duck Other fowls
	Processed meat	Sausage Bacon Ham Canned beef Canned pork Canned chicken Other meat products
	Processed fish	Sardine canned Mackerel canned Tuna canned Shellfish, canned Mollusks, canned Other canned
	Fish and crustaceans	Salt water fish Fresh water fish Fish, smoked or dried Fish salted Stock fish Crab Lobster, crawfish Fresh shrimp Shrimp, dried or smoked Other shellfish Snail Other mollusca Other aquatic animals
	Fresh milk	Fluid whole milk Unpasteurized, unsweetened whole milk
	Processed milk	Condensed unsweetened milk Whole milk powder Skimmed milk powder Other processed milk Cheese Cream Yoghurt Ice cream Curd milk
	Eggs	Other dairy products Eggs

Second Aggregation	First Aggregation	Disaggregated
Fats and oils	Vegetable oils Margarine and butter	Raw palm oil Refined palm oil Palm kernel oil Ordinary groundnut Refined groundnut oil Cotton oil Olive oil Other oils and vegetable fats Margarine Butter
Other foods	Sugar Chocolate Condiments	Sugarcane Natural honey Refined crystallized sugar Refined honey Syrup and molasses Jam and marmalade Sweet chewing gum Other Chocolate crunch or paste Salt Pepper Spices and aromatic herbs Maggi cube Sauce and soup Viner Ginger Other seasonings Baby food
Beverages and food eaten away from home	Beverages (nonalcoholic) Tea and coffee Coca Domestic alcohol Imported alcohol Food and beverages and other away from home	Lemonade and orange drink Fruit juice Tea Coffee Cocoa products (beverages) Palm wine Raphia wine Beer Corn beer and kwatcha Other local alcoholic beverages Wine and vermouth Whisky and spirits Other imported alcoholic beverages Food and beverages and other away from home
Clothes and shoes	Clothing and footwear	Clothing and accessories Footwear
Household durables	Household durables	Household furniture
Transportation and communication	Transportation Post and telecommunication	Purchase of auto Purchase of motorcycle Purchase of bike Purchase of other transport Vehicle operations and maintenance Transportation services Post and telecommunications
Other nonfood	Health Hygiene Telephone Education	Modern medicine Traditional medicine Toiletries and personal care Telephone bill (home) Education

APPENDIX B**ESTIMATION OF THE RENT EQUATION**

In order to estimate an annual value of housing services for households living in the urban and semiurban areas, a two step estimation procedure is used. In the first step a probit is used to estimate a dichotomous choice model. In the estimation of the probit regression, the dependent variable is a dichotomous dummy variable, where

$Y = 1$ if the household rents their home and
 $Y = 0$ if the household owns their home.

The variables included in the probit regression are age and sex of the head of household, a dummy variable indicating residence in Yaoundé or Douala, household size, a dummy for a married head of household, and a dummy variable for professional employment of head of household. From this equation an inverse Mills ratio is estimated, which captures the probability that a household has a positive value of Y .

In the second step, the inverse Mills ratio is included in a hedonic rent function, with rent as the dependent variable, which is estimated using the truncated sample. The rent function estimated has as independent variables square footage of the housing unit, dummy variables for electricity, indoor flush toilet, indoor piped water, residence in Yaoundé or Douala, and quality of wall construction.

The predicted value of rent for each urban and semiurban household is then estimated using the parameter estimates generated by the rent equation. The predicted value of housing is added to each urban and semiurban household's estimate of total expenditures.

APPENDIX C
REGIONAL PRICE INDEX

Sixteen food and beverage commodities and four nonfood expenditure categories are included in the representative market basket for Cameroon (Table C.1). For a commodity to be included in the basket two criteria had to be met. First, the commodity has to be a relatively major food expenditure consumed throughout the country. Second, a corresponding price for each agroecological zone must exist.

In order to create a national market basket for Cameroon, given the tremendous regional diversity, we combined millet/sorghum and maize into one category. The justification for this is twofold. First, it was necessary to aggregate millet and sorghum into another cereal category in order to include it in the price index. Millet and sorghum are predominately produced and consumed in northern Cameroon. There are no prices for millet and sorghum in the South, except in the Forest zone. According to Ministry of Agriculture (1980) millet/sorghum and maize are nutritional equivalents (354 versus 360 calories per 100 grams, respectively). EBC prices in the North for the two grains are the same, CFAF 99 versus CFAF 98 per kilogram for millet and sorghum, and maize, respectively. We used the set of maize prices in each agroecological zone to price this cereal combination.

The methodology for calculating the price index is given below:

$$\bar{w}_i = \sum \left(\frac{Exp_{ih}}{Totexp_h} \right) / n, \quad (21)$$

where Exp_{ih} are expenditures on the i^{th} commodity by the h^{th} household, $Totexp_h$ are total expenditures on the commodities in the basket by the h^{th} household, n is the number of households in the sample, and w_{ih} are the budget shares of the i^{th} commodity for the h^{th} household.

The agroecological zone specific price indices is calculated as follows:

$$Price\ Index_r = \frac{P_{ir} * \bar{w}_i}{P_{iy} * \bar{w}_i}$$

Table C.1 – Expenditure Commodities Included in the Price Index

Food Commodities		
Millet and sorghum, maize	Macabo	Banana
Rice	Potato	Eggs
Bread	Sweet potato	Poultry
Wheat fritters	Yam	Fish
Plantain	Groundnuts	Beer (homemade)
Manioc		

Nonfood Commodities
Electric batteries
Cleaning products
Urban transportation
Kerosene

Source: Lynch (1991).

where P_{ir} is the price of the i^{th} commodity in the r^{th} agroecological zone and P_{iy} is the price of the i^{th} commodity in Yaoundé, the reference region.

Prices for the index are derived from the sample data with the exception of nonfood items (Table C.2). In the case of nonfood items, a consistent price series from the EBC data are not available so nonfood prices collected by the Ministry of Plan's annual consumer price survey were used.

The food index is used to deflate all food products, beverages and tobacco and the nonfood index deflates all other categories of expenditures.

A number of problems are associated with constructing a general price index for Cameroon. First, regional production and consumption diversity, especially between the North and South, weaken the concept of a standard consumption basket for Cameroon. Second, problems with the methodology and implementation of the price survey resulted in inconsistent and incomplete price data (section 2). Third, a great deal of smuggling occurs along Cameroon's borders, particularly with Nigeria and Chad. Depending on the exchange rate, smuggled goods can be sold at a discount to goods imported into the port city of Douala or manufactured in the urban areas in southern Cameroon. This contributes to distortions in relative prices between urban and rural areas and between southern and northern Cameroon.

Table C.2 – Regional Price Indices

Agroecological Zone	Food	Nonfood
Forest	0.99	1.08
High Plateau	0.80	1.09
North	0.86	1.13
Coast	0.94	1.02
Yaoundé	1.00	1.00
Douala	0.93	1.00

Source: Lynch (1991).

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