INCOME, CONSUMPTION, AND SAVINGS BEHAVIOR IN THE CÔTE D'IVOIRE

by

VALERIE JEAN KOZEL

B.A., Liberal Arts, St. John's College, Annapolis
M.S., Transportation, Northwestern University

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Signature of Author _____
Department of Urban Studies and Planning
March 17, 1987

Certified by _____
William C. Wheaton
Associate Professor, Department of Economics
Department of Urban Studies and Planning
Thesis Supervisor

Accepted by _____
Langley Keyes
Chairman, Ph.D Committee

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ABSTRACT

This is an empirical study of household income, consumption expenditures, and savings behavior in the Côte d'Ivoire. It uses data collected in a household survey administered in the Côte d'Ivoire in 1985 under the aegis of the Living Standards Measurement Study (LSMS), a World Bank sponsered project designed to develop new ways of assessing changes in levels of living which result from government policy actions.

Private savings rates are historically low in the Côte d'Ivoire, and have been adversely impacted by the stagnant economic conditions occuring in the country since early 1980. According to survey results, some two-thirds of Ivorian households are dissaving in 1985 (current consumption expenditures exceeds current income), and positive savings are primarily limited to the upper 40 percent of the income distribution. Because consumption is a better indicator of permanent income than current income, savings rates were found to be relatively independent of overall consumption levels.

Marginal propensities to save are highest for households participating in farm or non-farm self-employment activities, and lowest for households in the wage sector. Estimated permanent income is a better predictor of consumption and savings than current income; the marginal propensity to save out of permanent income is estimated at .2 to .3 for the country as a whole, in contrast to a MPS out of transitory income of .5 to .6.

Convincing evidence of liquidity constraints is found for both urban and rural areas in the Côte d'Ivoire. According to study estimates, households in Abidjan consume on average 4.6 percent less than desired due to liquidity constraints, households in other urban areas consume on average 6.5 percent less, and rural households consume on average 5.6 percent less. Households who report low levels of income in the current year are the most severely affected by liquidity constraints; by our estimates, they consume an average of 12 to 13 percent less than they would have chosen to if credit was more readily available.

Thesis Supervisor: Dr. William Wheaton
Title: Associate Professor, Department of Economics and
Department of Urban Studies and Planning

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1. INTRODUCTION

The relationship between income and consumption is fundamental to economic analysis. Savings is generally defined as the residual between the two -- income not spent in the current period is saved to finance consumption needs in later periods. Aggregate savings are derived from the private (or household) sector, the corporate sector, and the government. In developing areas, savings accruing to the formal corporate sector tend to be small in comparison to private sector savings, primarily because the corporate sector is itself typically small. A significant majority of output is derived from the so-called informal sector and smallholder households. For example, Alamgir (1974) found that private savings constituted an average 60 to 70 percent of total savings in ECAFE countries. In India, the private sector contributed 78 percent of total savings in 1970-71 according to Bhalla (1976).

It is generally agreed that private savings can play a critical role in economic development. The extent and effectiveness of savings in the household sector clearly depend on private investment opportunities, the role of government investments and public policy, the existence of financial intermediaries, and competing uses for resources. Development specialists claim a pressing need to "mobilize" private resources, that is, to increase private savings rates and channel resources towards desirable investment ends. Many developing areas are characterized by poorly developed capital markets and uneven access to investment opportunities, which may serve to depress overall levels of private

savings, limit new capital formation, and thereby decrease levels of growth. There is conflicting evidence as to whether savings respond to investment opportunities or investment is itself constrained by a lack of resources; in general, the assumptions one makes in this regard reflect both ideological orientation and region/country-specific problems and institutions.

Although much has been said about the role of savings in overall economic development, rather less attention has been given to questions of the inter-sectoral composition of savings and the distribution of welfare. Growth models generally treat savings as a single aggregate value and ignore the impact of structural change on savings decisions. Such an approach "offers only limited insight into the development process and contributes little to the policy-maker who seeks to understand the savings decision and how he might act upon it" (Kelley and Williamson, 1968, p. 385). The major constraint to a structural analysis of savings lies in data availability -- with a few notable exceptions, most LDC's do not have sufficient resources to collect micro (or household-level) data nor to process it once it has been collected. This is particularly true for some of the poorest countries.

This study attempts to rectify in a small way the relative dearth of information on the structural determinates of household savings behavior in one of the poorer areas of the developing world -- Africa south and west of the Sahara. It uses recent (1985) budget and expenditure data collected in the Republic of the Côte d'Ivoire under the

auspices of the Living Standards Measurement Study (LSMS) to examine selected aspects of household savings behavior for urban and rural households. Like earlier efforts, this research is bound by data constraints; the survey was not designed explicitly for the analysis of private savings behavior and is limited to a single year (for reasons discussed later, repeated observations of the same households over time would have been far better). However, we live in an imperfect world, and the data are among the best obtained to date for an analysis of household savings behavior in sub-Saharan Africa.

1.1 Policy Context [1/]

Following independence in 1960, the Côte d'Ivoire experienced some twenty years of impressive economic growth. Spearheaded by an export crop-led growth strategy, output grew at nearly 8 percent per annum between 1960 and 1973, and the real value of exports expanded at 9 percent per annum over that same period. While early growth was primarily led by the agriculture sector, the late 1970's and early 1980's witnessed an increasing emphasis on economic diversification and industrialization. The economy began to slow in the mid-1970's, following the first oil shock in 1974. However, the boom in the coffee and cocoa prices (both major export crops in the Côte d'Ivoire) in the latter part of the 1970's shored up the faltering economy through the early 1980's. During this period, coffee and cocoa growers were taxed heavily; for example, in the mid-

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1/ This section is primarily drawn from Zartman and Delgado (1984).

1970's, smallholders were paid only 52 percent of the world price for cocoa for their crops, which dropped to a 38 percent share in 1978/79. Not surprisingly, nearly a third of all government revenues were derived from coffee and cocoa during this period.

Interestingly, although agriculture served as the so-called "engine of economic development", the share of agriculture in GDP declined from 43 percent in 1960 to only 26 percent by 1979, while other sub-Saharan countries showed an increase in the share of agriculture from 30 to 36 percent over that same period. In the Côte d'Ivoire, industry accounted for some 25 percent of GDP in 1979, and the service sector for the remainder.

This impressive economic performance was both insured by and helped to insure a high degree of social and political stability in the country. The country has had a single party system headed by a charismatic and extremely adroit political leader, Felix Houphouet-Boigny, since independence. Rivals have been co-opted into the system or carefully eased out if deemed politically expedient. While the political elite who run the country initially had a strong rural orientation (Houphouet himself was a chief and son of a chief, coffee planter and son of a coffee planter), they have grown increasingly urban in their social and economic orientation in the years since independence.

The Ivorian economy stagnated in the early 1980's due to a series of external shocks and internal problems. This stagnation has been

accompanyied by a serious deterioration in the balance of payments. According to outside estimates, total private expenditures have fallen by an estimated 26 percent since the boom-years of 1978/79. In response to falling levels of output, the government has attempted to implement a series of austerity measures, "liberalize" the economy, and mobilize domestic resouces so as to increase levels of private investment. In the latter case, it appears to have meet with little success.

Private savings levels have always been low in the Côte d'Ivoire. In 1979, for example, a year typified by extremely favorable economic conditions, private savings constituted only 6.7 percent of private income (World Bank, 1986) according to national accounts and Central Bank (BCEAO) estimates. By 1981/82, the savings rate had fallen to a low of 1.2 to 1.3 percent. Recent estimates put the private savings rate at only around 3 percent of total income, low by any standards in the developing world.

Why are private savings rates so low in the Côte d'Ivoire? There a number of possible reasons: First, the Ivorian population are considered a highly consumption-oriented society, accustomed to a booming capitalist economy with impressively high rates of growth, which in itself provides little incentive to save. In addition, there is little to save for in the Côte d'Ivoire; until recently, there were virtually no rural land markets, labor was plentiful and cheap (a substantial share of the Ivorian population are job seekers from other African nations) and coffee and cocoa requires little in the way of mechanical cultivation, public

services such as education and health care are either free or highly subsidized and are increasingly available in rural as well as urban areas, and financial institutions are generally poorly developed. Also, some two-thirds of the population live in extended households, which mitigates the need for lifecycle savings behavior.

However many of these economic and social conditions either have changed or are changing in the Côte d'Ivoire. The government is following an aggressive policy of economic liberalization, user charges and lowered subsidies are under consideration in the health and education sectors, and population pressures are such that land markets are developing rapidly in many of the more accessible rural areas. In addition, the flow of foreign capital into the country has slowed to a trickle in recent years. Clearly there is much to be gained by explicit policies to mobilize private resources and encourage savings and investment in the private sector. Equally clearly, such policies can only effectively be planned if one has a clear understanding of the structural determinates and intersectoral composition of savings in the Côte d'Ivoire.

1.2 General Objectives of the Research

This study seeks to establish the empirical relationship between income, consumption, and savings in the Côte d'Ivoire; it draws on a large body of theoretical development on savings and consumption functions in doing so. It examines three major hypotheses:

1. Entrepeneurs (e.g., households deriving income from farm and non-farm self-employment activities) save more intensively than households dependant on wage income, regardless of income levels.

2. Households respond to long-run, or permanent income in establishing consumption levels (i.e., some form of the permanent income hypothesis holds in the Côte d'Ivoire) rather than simply current income.

3. However, the timing of consumption is not completely independent of the timing of income flows. Among other factors, liquidity constraints may cause some households to consume at levels less than those commensurate with permanent income levels. Accordingly, the permanent income hypothesis will hold more strongly for households not currently liquidity constrained than for constrained households.

Regarding the relationship between savings (and implicitly consumption) and income: There is a massive body of theoretical and empirical work on the relationship between income and consumption. The work is structured around two basic questions; (i) whether savings rates are independent of income levels and income distribution, and (ii) whether current income or some longer-run measure of income is the prime determinate of savings behavior (the so-called Keynesian or absolute income hypothesis in contrast to Friedman's (1957) permanent income hypothesis and the lifecycle models developed by Modigliani, Brumberg, and Ando (1954, 1963, 1966, and 1970)). If savings are not independent of income, then current income is the appropriate income concept in modelling savings behavior.

Regarding liquidity constraints: Consumption forms the basis of economic well-being; consumers derive utility largely from what they consume rather than from what they earn. The timing of consumption expenditures may not be independent of the timing of income flows for the following reasons: (i) differences in short-term borrowing and lending rates; (ii) differences in the liquidity of assets, often caused by transaction costs in asset markets; (iii) uncertainty as to future price and income levels; and (iv) rationing in the credit market. This represents a departure from the standard model of consumer behavior, which assumes perfect markets for all commodities, and that all markets clear.

The ability to save or dissave at certain points in time may play a critical role in ensuring that basic standards of living are meet. Further, the form that savings take and the composition of asset holdings may also affect welfare levels. Poor households in particular may face credit and liquidity constraints that prevent them from borrowing against future income for either consumption or investment purposes. While informal sources of credit may substitute for formal credit sources for some households, others may be faced with the necessity of liquidating existing resources or simply consuming less until income levels rise.

Most studies of savings behavior based on cross-sectional data have simply ignored the effect of liquidity constraints in estimating savings or consumption functions. While it is possible that questions of liquidity may be ignored in more industrialized countries without seriously compromising the results of empirical analyses, this is unlikely

to be the case in most of the developing world, particularly regions such as West Africa. However, it is difficult to identify which households are liquidity constrained, and which are not -- the constraint cannot be observed directly. For purposes of comparison, we first estimate current and permanent income-based consumption functions ignoring possible effects of liquidity constraints, and then test for the existence of such constraints and re-estimate the consumption models accordingly.

Any study of this type necessarily has a large methodological component -- our results are affected by the assumptions we make regarding the measurement of income, consumption, and estimates of savings rates. However, for purposes of this study, we do not concentrate on methodological issues, but instead push to develop a better understanding of household consumption and savings behavior despite possible data problems. This does not mean that we ignore data and measurement error, but rather that we do the best we can with existing information. Efforts are made in several places to verify research findings and assess possible impacts of measurement error and data limitations. Based on these and similar analyses, we find rather reassuring evidence that the Côte d'Ivoire Living Standards Survey (CILSS) data are robust and internally consistent.

The thesis has seven chapters. This, the first, describes the policy context and objectives of the research, and briefly discusses the data used in empirical work. The second chapter overviews salient features of the household economy in the Côte d'Ivoire, discusses

measurement issues pertinent to income and consumption, and describes the composition and distribution of both measures based on CILSS survey results. The third chapter begins with a discussion of the composition and distribution of household assets in the Côte d'Ivoire. Various asset and variable factor input measures are used to obtain an estimate of permanent household income. These models are desribed in the latter half of Chapter 3. The fourth chapter discusses the measurement of savings, and derives empirical measures using an annual residual income approach to measure changes in net worth. In addition, a general model to predict the proportion of savers and dissavers in the sample population is presented in the chapter. Chapter 5 describes current income-based or Keynsian consumption models as well as permanent income-based consumption models. Estimates of marginal propensities to save for various segments of the Ivorian population are derived from both Keynesian and permanent income models. The sixth chapter chapter explores the extent to which liquidity (or credit) constraints affect consumption and savings behavior in the Côte d'Ivoire. Consumption functions are re-estimated for households that are not liquidity constrained, and compared to previous estimates. The seventh and final chapter briefly summarizes the main findings of the research, and identifies directions for future work.

1.3 Description of the Data

The empirical work makes use of the first year of data from the Côte d'Ivoire Living Standards Survey (CILSS). The survey is part of a larger research effort sponsered by the World Bank "to improve the

quantitative basis for the design and monitoring of development policy" (Grootaert, 1985). The study, called the Living Standards Measurement Study (LSMS), focuses on ways of measuring changes in the quality of life in the developing world. It has three phases; the first, completed several years ago, was primarily conceptual, and involved the development of an general framework for measuring living standards in developing areas. Based on these findings, and with the assistance of numerous field experts, the LSMS team developed prototype household and community questionaires and began data collection efforts in the Republic of Côte d'Ivoire in February, 1985, and Peru in July, 1985. This particular piece of research is a part of the final phase of the study, which involves analysis of LSMS data sets and research dissemination.

The CILSS is a permanent survey and will be re-adminstered every year to a national sample of households. Some 1600 households living in 100 distinct areas (designated primary sampling units, or PSU's) were interviewed during the first year, in such a way as to insure a self-weighted sample. A two staged sampling procedure was used: First, 100 PSU's were selected with probability proportional to size from a list of cities, towns and rural villages. A group or cluster of households was then chosen from the PSU by means of a field presurvey. Each cluster has 16 households, randomly selected during the presurvey from a randomly chosen group of 64 households within the PSU. Of the 100 PSU's, 21 were located in Abidjan, the capital city, 5 in Bouake (the next largest city), 17 in other urban areas, and 57 in rural areas. The sample constitutes roughly a 1.3 percent share of the total Ivorian population.

The same areas will be resampled during the second year; 800 of the households will be visited again, and 800 will be replaced. The third year entails replacement of half of the PSU's, while the remaining half will be reinterviewed.

The CILSS household questionaire includes a broad spectrum of questions relating to all aspects of household welfare (see Grootaert, 1986, for an annotated description). In particular, there are seperate sections on household composition, housing, education, health, employment activities and time use, migration, agriculture, family enterprises, household expenditures, durables, fertility, other income sources, private transfers, and credit and savings. Efforts were made to include a detailed accounting of both income and household expenditures; initial tabulations suggest that this was done with some degree of success. The derivation of household level income and consumption measures is described in detail in the next chapter.

One of the more difficult aspects of the survey was determining an appropriate definition of household membership. In general, a decision was made to base membership on co-residence rather than kinship (in much of West Africa it is not unusual for individuals to reside together -- share food and lodgings -- who are not closely related by blood or marriage. The household was first asked to identify a "head", and then list all persons who (i) slept in the dwelling unit last night, (ii) typically sleep and eat in the dwelling unit, or (iii) occasionally sleep/eat in the dwelling unit. Persons were classified according to

their relationship to the household head. Household members were identified as all individuals who were (i) the head, or (ii) slept and ate in the unit for at least 3 months over the last 12 and were not tenants or servants. Some 14 percent of individuals initially listed in the household roster are not household members according to these criterion. In addition, some 25 percent of all children less than 14 years old live in a household without either of their natural or adopted parents. Clearly, household membership is a somewhat fluid arrangement in the Côte d'Ivoire.

The results presented here are based a sample of 1569 households (1569 in the case of consumption expenditures, and 1564 in the case of income) interviewed in the first 12 months of the survey. Much of the analysis is done seperately for households living in (i) Abidjan, (ii) other urban areas (defined rather broadly as villages or small cities with more than 1000 inhabitants), and (iii) rural areas, primarily due to expected price differentials and differences in the structure of production and availability of public services. Table 1-1 shows the distribution of households by region, average household size, and percentage of households with at least one member in the labor force, participating in farm activities, and participating in non-farm self-employment activities. Roughly one-quarter of the sample is drawn from Abidjan, one-quarter from other urban areas (Bouake and large villages), and the remaining half from rural areas. Note also that rural households are on average larger than urban households (and large in some absolute sense compared to households in other regions of the world).

Table 1-1

Basic Characteristics of 1985 CILSS Sample Households

	Abidjan	Other Urban Areas	Rural	Total Population
Number of Households	334	333	902	1569
Average Household Size	7.3	8.9	8.5	8.4
Income Generating Activities:				
(i) Percent of households with employees	71.6	52.2	10.6	32.4
(ii) Percent of households reporting farm income	4.5	41.4	93.6	63.5
(iii) Percent of households with non-farm family enterprises	45.8	53.5	27.1	36.6

Source: CILSS tabulations

According to Table 1-1, households with at least one member in the labor force tend to live in urban areas (71.6 percent of households residing in Abidjan received wage income, 52.2 percent in other urban areas, and only 10.6 percent in rural areas). In all likelihood, there are more effective wage earners in rural areas than the survey was able to identify; there is evidence of undersampling of non-indigenous households, who tend to live outside rural communities. For example, nearly a third of all farm households reported having sharecroppers work their land, and nearly as many appeared to make use of casual laborers. However, the survey identified only one-fifth as many sharecroppers as landlords, and very few rural laborers.

Not surprisingly, nearly all rural households receive income from agriculture activities (93.6 percent), as do a substantial proportion of households residing in towns and villages outside Abidjan (41.4 percent). Non-farm self-employment is predominately an urban phenomena (45.8 and 53.5 percent of households in Abidjan and other urban areas, respectively, receive non-farm self-employment income), although a reasonable share of rural households (27.1 percent) receive non-farm self-employment income as well. Two-thirds of non-farm family businesses are in the commercial food sector, and over 80 percent are one person enterprises. Two thirds of the total are operated by women.

Two classification schemes are used extensively throughout the research -- by region (as in Table 1-1) and by structure of productive activity (defined in terms of income sources). Households are grouped

into five major categories based on how they obtain income: (i) those receiving only wages; (ii) those receiving income only from own-farm activities; (iii) those receiving only income from non-farm self-employment, or income from non-farm self-employment in conjunction with own-farm activities; (iv) those receiving both wages and income from self-employment; and (v) households who receive no earned income. In total, 16.7 percent of households are in the first (wage only) category, 39.6 percent receive only farm income, 26.0 percent receive non-farm or farm and non-farm self-employment income, 16.1 percent obtain income both from wage activities and self-employment, and only 1.7 percent report receiving no earned income at all. It is important to note that the two classification schemes are not independent of one another; for example, most farmers live in rural areas while most wage earners reside in the cities. To provide a context for the analysis described in ensuing chapters, Table 1-2 shows the cross-categorization of survey household by region and income source category.

According to this table, nearly all households (92.4 percent) wholly dependent on wage income live in Abidjan or some other city. In contrast, nearly 94 percent of households wholly dependent on farm income live in rural areas. Households reveiving at least some income from non-farm self-employment in addition to wage income are spread rather evenly through the country (31.1 percent reside in Abidjan, 36.7 percent in other urban areas, and 29.6 percent in rural areas), while households that receive only self-employment income (but not solely farm income) tend to

Table 1-2

Counts of Households by Income Source Category and Region

	Abidjan		Other Urban		Rural		Total Country	
	N	Percent	N	Percent	N	Percent	N	Percent
Wage income only (N)	161	48.4	84	25.3	15	1.7	260	16.7
(percent)	61.9		32.3		5.8		100.0	
Farm income only (N)	3	0.9	35	10.5	580	64.7	618	39.6
(percent)	0.5		5.7		93.9		100.0	
Non-farm self-employment income, (N)	79	23.7	113	34.0	214	23.7	406	26.0
farm & non-farm self-employment income (percent)	19.6		27.8		52.7			
Wage and self-employment income (N)	78	23.4	92	27.7	81	9.0	251	16.1
(percent)	31.1		36.7		29.6		100.0	
No earned income (N)	12	3.6	8	2.4	7	0.8	27	1.7
(percent)	44.4		29.6		25.9		100.0	
Total Country	333	100.0	332	100.0	897	100.0	1562	100.0
	21.3		21.3		57.4		100.0	

Source: CILSS tabulations.

be in rural areas (57.2 percent), but reside in urbanized areas as well (19.6 percent in Abidjan, 27.8 percent in other urban areas).

Table 1-2 also presents percentage shares along regional dimensions. For example, of the 333 household surveyed in Abidjan, nearly 75 percent receive income from wages, and 48 percent on wholly dependent on wage income. In contrast, some 65 percent of rural households depend on farm income to satisfy all consumption needs, while less than 11 percent obtain income from wages.

2. COMPOSITION AND DISTRIBUTION OF HOUSEHOLD WELFARE

The change in net worth, or private savings rate over a particular period can be defined as the difference between income flows and consumption expenditures over that period. The maximum increase in the net worth of a household is bounded by the flow of income into the household; the maximum decrease is bounded by the flow of consumption expenditures out of the household. Thus, an estimate of savings as an income/consumption residual requires prior estimates of both income and consumption expenditures. Note that savings can also be estimated directly if infomation is available on the value of capital stocks at the beginning and end of a specified period, and adjustments for within period price changes can be made.

Primarily due to data availability, this research measures savings as the difference between current income and consumption expenditures; we are limited to a single year cross-section of households. Ideally, one would like to have a series of observations on the same households over time, so that changes in asset holdings (i.e., changes in net worth) could be evaluated directly. With a few notable exceptions (see, for example, Bhalla, 1978, for India, and Kusnic and DaVanzo, 1980, for Malaysia), panel data are generally not available in developing areas. The CILSS will constitute such a panel as field efforts proceed over the upcoming months. When the full data set is available, comparisons should be made between residual savings rates based on a

single year cross section of data, and the changes in the asset holdings of a single household over time.

How good are residual savings estimates? Clearly this will depend on the accuracy with which income and consumption can be measured, as well as the validity of the income and consumption concepts used. Past work indicates the tendency to overstate consumption and understate income in typical budget and income surveys, which suggests that residual savings will be understated as well (see Bhattacharya, 1963, Deaton, 1985a, 1985b, Visaria, 1980). Efforts were made to obtain very detailed measures of both income and consumption in the CILSS, which should help to minimize measurement errors. Comparisons with national accounts data show that CILSS consumption estimates are on average very similar to national accounts consumption estimates (from the IFS data base maintained by the International Monetary Fund). Unfortunately, there are no good external sources of data with which to compare income estimates. Comments on potential error introduced by measurement problems will be made as appropriate throughout the paper; for the present, we can only hope that the careful efforts to obtain accurate information in the field will be reflected in the quality of the data.

Estimates of average consumption expenditures and income are presented in this chapter, stratified by income and consumption rankings. The first section describes the measurement and composition of income. The second section does likewise for consumption expenditures.

The third and final section of the chapter examines distributional issues relating to both welfare measures.

Current, or annual income has typically been used as a measure of welfare in past studies. More recent evidence suggests that consumption expenditures provide a better measure of long-term welfare than income, due to a high correlation between permanent income and consumption (Deaton, 1980, Anand and Harris, 1985). Current income is expected to be more variable over time than consumption, particularly for farm households, those dependent on the informal wage sector, and households who derive income from family enterprises -- in short, all households outside the formal wage sector. Households suffering transitory shortfalls in income can finance current consumption needs out of savings or through borrowing, while households with surpluses can save or invest to insure against future income shortfalls. According to the CILSS, less than 10 percent of the Côte d'Ivoire's working age population are in the formal wage sector, which suggests that the transitory component of income may be high for many households. Questions relating the the relative advantage of using consumption expenditures instead of income as a measure of household well-being are discussed in the final section of the chapter.

2.1 Income

For purposes of this research, income is defined as the returns to household labor inputs and capital stocks, plus the annualized flow of services from durable goods and the housing stock. It has nine major

components: (i) wages; (ii) farm income; (iii) non-farm self-employment income; (iv) capital and interest income; (v) income from forced savings; (vi) other unearned income; (vii) private transfer income; (viii) imputed rents; and (ix) income from durable stocks. For purposes of the present work, no effort was made to impute a flow of income to time spent in home production activities (housework, childcare, and the like), nor to leisure time -- in short, no effort was made to measure full income (see Becker, 1965, Gronau, 1976, Evenson and Quinzon, 1977). This is not because we feel that time spent working at home is unimportant, but rather due to limitations in the scope of the present work.

Wage income is derived from Section 5 of the CILSS questionaire, which describes time use and earnings for all individuals aged 7 years or older. Respondants described earnings and time inputs for up to four unique wage-paying jobs over the 12 month period preceeding the interview. Information was solicited on in-kind as well as monetary payments; of the 785 individuals who described themselves as employees (out of a universe of 10,067 potential employees), some 43 percent reported receiving some form of in-kind payments. These payments constitute an average 12 percent of total wage renumeration. Note that 142 persons, or some 18 percent of employees, claimed not to receive any cash payments for their work. Upon inspection, the bulk of these appear to be young (15 to 25 years old) persons serving unpaid apprenticeships.

Table 2-1

Components of Household Income

Income Component	Description
1. Wage	Cash and in-kind income from employment
2. Farm	Net revenues from crop and livestock activities Net revenues from agriculture product sales
3. Non-farm Family Enterprise	Net revenues from non-farm self-employment
4. Capital and Interest	Land and buildings rental income, dividends and interest payments
5. Social Security, Pensions, etc.	Income from social security and pensions
6. Other Unearned Income	Income from grants, scholarships, gifts, dowery and inheritance, etc.
7. Private Transfer Income	Gross income from private transfer payments
8. Imputed Rents	Net imputed value of housing services from residing in one's own dwelling unit (rural households excluded)
9. Service Flows from Durables	Annual imputed value of services from durables

Farm income is derived from Sections 9 and 12 of the CILSS questionnaire. Section 9 is the source of all agriculture related measures except the value of home-produced agriculture goods consumed at home, which is drawn from Section 12. Farm income includes the returns to family labor and productive assets (Singh and Asokan, 1981). It is defined as the difference between gross farm income and expenditures on variable inputs. It includes (i) income from crop sales, (ii) income from livestock sales and changes in livestock holdings due to non-market transactions (gifts, births, deaths), (iii) income from the sales of products made from agriculture outputs, (iv) the estimated value of agriculture outputs consumed at home (see Section 2.2 for a description of how this measure was derived), and (v) land and equipment rents.

Measurement problems were encountered in apportioning sharecropping income between the landlords and the sharecroppers; survey results indicate that sharecropping arrangements are more akin to a labor-buying than a land-leasing system. For the most part, the farmer retains control of the land and provides necessary inputs. The sharecropper essentially provides muscle, for which he or she receives one-half to one-third of total output. The vast majority of sharecropping arrangements in the sample involved cash crops, e.g., coffee and cocoa. Sharecroppers in the Côte d'Ivoire tend to be immigrants (or, autochtones) from other parts of the country or other West African countries, attempting to work their way into the rural economy in areas of relative land abundance and rich growing conditions. (Ruf, 1984) It is important to note that only 36 percent of farm households surveyed claimed to be able to sell their land

should they choose; for the remainder, hired labor or sharecropping arrangements are the only way to adjust factor proportions between land and labor inputs. Given this situation, it is not surprising that nearly 27 percent of all farm households report involvement in sharecropping arrangements.

Table 2-2 shows the composition of agriculture income in the country. According to our estimates, the average annual value of farm output (including outputs consumed at home) is CFA 932,344 per household, which is produced at a cost of 21 percent of gross output, or CFA 196,230, and thus yields a net farm income of CFA 736,114 per household. The vast majority of farm output is derived from crop cultivation. The value of home-consumed goods constitutes some 40 percent of the average value of net farm output (CFA 285,328 for crop consumption, and CFA 13,104 for consumption of livestock-related outputs). Table 2-3 shows the compositon of net farm income stratified by the three major agriculture regions in the Côte d'Ivoire -- The West Forest, East Forest, and the Savanne. According to this table, farmers in the West and East Forests earn significantly more on average than do farmers in the northern Savanne region.

Income from non-farm self-employment is derived from Sections 5 and 10 of the CILSS questionaire. Rather severe problems were encountered in attempting to compute the measure based on Section 10 alone, although this was the intended purpose of the section. Section 10 has three parts; (i) information on revenues and structure of the family enterprise, (ii)

Table 2-2

Composition of Farm Income in Côte d'Ivoire
(CFA)

	Gross Income	Expenditures	Net Income	Percentage Shares of Net Income
Crop Production	836,726	187,264	649,462	88.2
Livestock	41,317	4,315	37,002	5.0
Agriculture Product Sales	37,765	1,483	36,282	4.9
Agriculture Rents	16,536	3,168	13,368	1.9
Total Agriculture Activities	932,344	196,230	736,114	100.0

Source: 1985 CILSS Survey estimates.

Table 2-3

Composition of Net Farm Income in Côte d'Ivoire by Agriculture Region

	West Forest (N=239)		East Forest (N=478)		Savanne (N=329)	
	Avg. CFA	Percent	Avg. CFA	Percent	Avg. CFA	Percent
Crop Production	829,675	88.1	721,582	88.8	413,765	87.6
Livestock	37,330	4.0	39,775	4.9	32,737	6.9
Agriculture Product Sales	69,967	7.4	24,425	3.0	26,133	5.5
Agriculture Rents	4,790	0.5	27,168	3.3	-448	0.0
Total Net Income	941,852	100.0	812,950	100.0	472,187	100.0

Source: 1985 CILSS Survey estimates.

information on business expenditures, and (iii) an accounting section on business assets. Information is collected for a maximum of three enterprises per household. On average, a third of these were managed by the household head, a third by his/her spouse, and the remainder by some other household member. Over 50 percent of enterprises sold foodstuffs, and 25 percent were involved in other forms of commerce.

Based on data reported in Section 10, 65 percent of enterprises have negative profits. Clearly these figures are not realistic. Evidence suggests that spurious net revenue estimates are caused by underestimates of gross business revenues in the questionaire. It appears particularly difficult to obtain estimates of gross revenues for small enterprises (involving one or two family members), which consititute over 80 percent of all enterprises sampled in the CILSS, because the budget for the business and the budget for the household are seldom maintained separately.

Consider a woman who makes meat pies at home and sells them at noon time: she buys meat, vegetables, and flour in bulk. She uses some of the flour to make bread for the family (which we attempted to account for in the questionnaire), some of the vegetables for dinner, and her children take some of the meat pies for lunch at school (also supposedly accounted for in the questionnaire). She makes a tray of pies and goes to the school to sell them; after a few hours, she gives some of the money she received from the pies to one of her children for school supplies. She stops on her way home and buys rice and milk for the next day's

meals. After she gets home, a man from a CILSS survey team comes to ask her some questions about her "business" (selling meat pies). In particular, he asks her what her total revenues have been since his last visit (roughly two weeks ago). What he would like her to do is estimate the number of meat pies she has sold and multiply by some price per pie. What she does may be very different, however. For example, she might think of the money in her pocket at the end of the day, which means that her reply would reflect net business revenues minus payments for household consumption expenditures. Alternatively, if she buys supplies in bulk and infrequently, the money in her pocket might represent gross revenues minus some payments for household consumption expenditures. Recent field experiments suggest that both kinds of responses are not infrequent, and are far more typical of individual's responses than actual measures of gross business revenues. In either case, our prototypical respondent may not think of her business' budget as logically separate from the household's budget.

For present purposes, net income from family businesses is estimated using a judicious mix of information from Section 10 and Section 5, which describes individual time use and earnings. This requires that individuals be merged across households in Section 5 and enterprises be merged across households in Section 10 (it is not possible to obtain an accurate match of individuals with enterprises) and information matched between the two sources at a household level. Thus, the basic unit of observation is the household rather than the individual enterprise in

income estimates, and enterprise level information cannot be fully recovered.

Table 2-4 shows average business revenues and expenditures per household involved in non-farm self-employment for Abidjan, other urban areas, and rural areas, further stratified by a proxy measure for large (net revenues greater than CFA 3,000,000 per annum) and small enterprise households. Note that 37 percent of all households in Côte d'Ivoire report some non-farm business activity, which encompasses 46 percent of households in Abidjan, 54 percent of households in other urban areas, and 27 percent of rural households. 1/ Net and gross business incomes are on average highest in Abidjan and lowest in rural areas, and a greater proportion of households have "large" businesses in Abidjan than in other regions of the country.

Capital and interest income is derived from Section 14 of the CILSS questionnaire, and includes rents on buildings and land (with the exception of land used for agriculture), dividends, and interest payments. Income from forced savings include payments from pension plans and social security, which are likewise reported in Section 14. Information on private transfer payments is also provided in Section 14. Some 23 percent of households in the Côte d'Ivoire recieve income through

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1/ These percentages are slightly different than those obtained by dividing counts in Table 2-4 due to a slight underreporting of business activities in the section of the questionnaire dealing specifically with family enterprise activities (Section 10), rectified through use of information from the general employment section (Section 5).

Table 2-4

Non-Farm Selfemployment Income and Expenditures Per Household by Region
(CFA)

	Number of Households	Gross Revenues	Total Expenditures	Net Revenues
Abidjan				
Large Enterprise Households (>3,000,000 CFA/Year)	17	45,452,463	37,854,213	7,598,250
Small Enterprise Households (<3,000,000 CFA/Year)	137	1,780,137	1,122,959	657,178
Total Households	154	6,601,108	5,177,708	1,423,400
Other Urban Areas				
Large Enterprise Households (>3,000,000 CFA/Year)	7	7,107,402	3,213,464	3,893,938
Small Enterprise Households (<3,000,000 CFA/Year)	179	1,942,746	1,399,013	679,915
Total Households	186	2,138,165	1,467,299	801,527
Rural Areas				
Large Enterprise Households (>3,000,000 CFA/Year)	7	9,371,968	4,518,736	4,853,231
Small Enterprise Households (<3,000,000 CFA/Year)	247	1,676,867	1,341,638	374,960
Total Households	254	1,892,330	1,429,196	500,351
Total Country				
Large Enterprise Households (>3,000,000 CFA/Year)	31	28,646,692	22,504,743	6,141,949
Small Enterprise Households (<3,000,000 CFA/Year)	563	1,787,036	1,306,667	541,530
Total Households	594	3,200,702	2,412,963	836,289

Source: 1985 CILSS Survey estimates.

private support systems, with the vast majority of payments coming from individuals related by blood or marriage.

Two imputations are made for the income estimates, one for the annual value of housing services (net of maintainence costs) for home owners, and one for an imputed annual stream of income from durables owned by the household. These imputations are described in detail in Annexes I and II for housing and durables, respectively. Imputed rents were estimated using what has become a fairly standard technique, entailing the estimation of selectivity-corrected hedonic rent equations (see Heckman, 1979, Lee and Trost, 1978, Malpezzi and Mayo, 1985, or McFadden, 1974). An estimate of the annual flow of services from durables is simply computed as the product of the annual depreciation rate times the present value of the durable, summed over the total stock of durable goods owned by the household (van der Gaag, n.d.).

Table 2-5 shows the percentage of households receiving income in each of the nine income categories, by region and for the country as a whole. From this table, it is clear that income sources vary significantly between regions. In Abidjan, for example, 71.6 percent of households have at least one member who earns wages, and 45.8 precent receive income from non-farm self-employment. In contrast, only 10.5 percent of rural households receive wage income and 27.2 percent reveive non-farm family enterprise income. However, nearly all rural households (93.5 percent) receive income from farm activities, while few urban households do so (4.5 percent). The category labelled "other urban areas"

Table 2-5

Percentage of Households Receiving Income, by Source of Income and Region

	Abidjan (N=334)	Other Urban (N=332)	Rural (N=898)	Total Country (N=1564)
(1) Annual Wage Income	71.6	52.1	10.5	32.4
(2) Net Agriculture Income	4.5	41.6	93.5	63.5
(3) Net Income from Family Enterprises	45.8	53.6	27.2	36.8
(4) Rents and dividends	26.9	25.6	8.5	16.0
(5) Income from Social Security, Pensions, etc.	24.6	16.9	1.6	9.7
(6) Other Unearned Income (Gifts, Scholarships, etc.)	37.7	40.1	25.6	31.3
(7) Gross Annual Transfer Income	21.9	24.4	23.5	23.3
(8) Imputed Rents for Urban Home Owners	22.5	44.6	1/	14.3
(9) Annual Value of Durables	91.3	92.2	73.1	81.0

NOTE:

1/ No imputations were made for rural areas due to the general absence of a housing market, and constraints on property sales.

Source: 1985 CILSS Survey estimates.

typically evidences a pattern of income composition that lies between Abidjan's and that of rural areas -- households are more likely to receive wage income than rural households, less likely to receive farm income, but more likely to receive non-farm self-employment income than either households in Abidjan or rural areas. It is interesting, although not surprising to note that some 24.6 percent of households receive income from pensions or social security payments in Abidjan, while only 16.9 percent do in other urban areas, and 1.6 percent in rural areas. The reasons for this are simple; only individuals who hold government or private sector jobs are eligible for pensions (government) or social security (private sector) coverage upon retirement, and the vast majority of employees work in urban areas. Rural households also receive little income from rents or dividends in contrast to urban households. One must wonder how rural households manage to cope with lifecycle effects given their high dependence on earned income.

Table 2-6 shows the composition of household income for each of the three regions. The results are in line with those of Table 2-5: wages form an important component of income in urban areas, followed by income from non-farm family enterprises. Rural incomes are composed primarily of payments from agriculture activities, with some income from non-farm self-employment and wage activities. It is important to note that some 20 to 25 percent of income in urban areas is derived from indirect or "unearned" sources, while only 5 percent of rural incomes are derived from sources not directly related to income generating activities. We shall return to the welfare implications of differences in

Table 2-6

Composition of Household Income in the Republic of Côte d'Ivoire by Region

	Abidjan (N=334)		Other Urban (N=332)		Rural (N=898)		Total Country (N=1564)	
	CFA	Percent	CFA	Percent	CFA	Percent	CFA	Percent
(1) Annual Wage Income	1,454,201	51.5	907,291	46.9	65,628	6.4	540,830	33.8
(2) Net Agriculture Income	42,431	1.5	188,148	9.7	766,838	75.0	489,295	30.6
(3) Net Income from Family Enterprises	652,961	23.1	437,669	22.6	136,141	13.3	310,517	19.4
(4) Rents and dividends	276,672	9.8	107,593	5.6	19,259	1.9	92,982	5.8
(5) Income from Social Security, Pensions, etc.	90,052	3.1	53,276	2.8	3,911	0.4	32,786	2.0
(6) Other Unearned Income (Gifts, Scholarships, etc.)	99,986	3.5	37,141	1.9	14,540	1.4	37,585	2.3
(7) Gross Annual Transfer Income	69,099	2.5	19,902	1.0	7,343	0.7	23,197	1.5
(8) Imputed Rents for Urban Home Owners	97,145	3.4	150,032	7.8	- 1/	-	52,594	3.3
(9) Annual Value of Durables	40,463	1.5	33,841	1.7	8,936	0.9	20,955	1.3
Total Annual Household Income	2,823,011	100.00	1,934,893	100.0	1,022,597	100.0	1,600,743	100.0

NOTES:

1/ No imputations were made for rural areas due to the general absence of a housing rental market, and constraints on property sales.

Source: 1985 CILSS Survey estimates.

income composition in a later chapter; for the present, it is important to simply note the differences in income composition across regions.

2.2 Consumption Expenditures

Initially, we begin with a broad and fairly traditional definition of consumption expenditures. In particular, we include expenditures on education and health, components of consumption that might better be treated as investments in human capital, and transfer payments, which may represent informal credit activities. Alternative definitions will be discussed briefly at a later point.

For purposes of the research, we define seven major expenditure categories: (i) food expenditures, including both purchased and home produced food commodities, (ii) education expenditures, (iii) health expenditures, (iv) gross private transfer payments, (v) housing costs, including imputed rents, (vi) an annualized cost of durables, and (vii) all other expenditures (clothing, households goods, utilities, leisure, etc.). These are outlined in Table 2-7. Note that imputed rents and the durables imputation are included in both income and expenditures. The reasons for this are straightforward; we wish to use both estimates as welfare measures, and must derive some flow of services over time from stocks of personal assets. In the case of housing, we assume that home owners receive some flow of services equal to the rental payments they would have had to make had they rented their dwelling unit rather than owned it. This can be treated as income (in a welfare sense), but also as

Table 2-7

Components of Household Consumption Expenditures

Consumption Component	Description
1. Food Consumption	The value of purchased foodstuffs and food produced at home
2. Education	The annual cost of education, including tuition, books, clothing, and transportation
3. Health	The annual cost of medicine, visits to health practioners, and items for personal hygiene
4. Private Transfers	Remittances and transfers out of the household
5. Housing Costs	Rents, maintenance costs, and imputed rents
6. Annual Cost of Durables	Annual imputed cost of services from durables
7. Other Expenditures	All other consumption expenditures, including utilities, transportation, households goods, clothing, etc.

a measure of the amount of housing they are consuming. Certainly imputed rents (ignoring capital gains) should cause no change in the net wealth of the household. The argument is essentially the same for durables - households receive a flow of services from durables on the income side, and a stream of consumption value on the expenditure side.

The "other" category is large (composing on average 30.3 percent of total expenditures), and includes a number of items that are traditionally treated separately in expenditure analysis. However, we are not interested in household expenditures per se in this work, but rather in the relationship between expenditures and income, and how the composition of expenditures changes in response to changes in income. Accordingly, we use consumption aggregates that reflect those elements of consumption (health, education, private transfer payments) we are most interested in.

Food expenditures constitute a major share of total household expenditures, particularly for the poor. In fact, poverty is often defined in terms of the share of total expenditures that the household devotes to food consumption. There are a wide number of empirical studies on the relationship between welfare and food consumption, beginning with Engel's work (Engel, 1857, 1895) and continuing through the present day (see, for example, Deaton, 1980, 1985, Sen, 1981, 1984, Srinivasan, 1981). Much of it is motivated by Engel's law -- that the food share declines with levels of welfare. Another important poverty statistic based on food consumption is the share of home-produced foodstuffs in

total consumption; in some very poor areas nearly all food consumed is produced within the household. The statistic is also a measure of the monetarization of the rural economy, and thus has broad policy implications.

The total value of food consumption is derived from Section 12 of the CILSS. In the CILSS, food consumption is measured in value terms rather than through separate price and quantity measures. In the case of purchased foods, respondents were asked what they typically spent for a specific foodstuff, and how frequently the expenditure was made. In the case of home-produced goods, respondents were asked how much they would expect to pay for the amount typically consumed in a day, and how many days they typically consumed the foodstuff. In neither case were separate quantity (e.g. kilos consumed) or price (cost per kilo) measured obtained.

Thirty-two separate categories were detailed for purchased foodstuffs, and twenty-two categories for home produced foods. Two reference periods were used in this part of the questionnaire. Respondants were asked to detail food purchases over a two week period, and to detail food purchases over a twelve month period (how many months did you purchase ..., during those months, how frequently did you purchase ..., and each time you made a purchase, how much did you typically spend on ...). Data used here are based on responses to the twelve month reference period.

The value of home-produced food is derived in a similar manner. For twenty-two food items, respondents were asked how frequently they consumed a particular item (how many months over the past twelve months, and typically how many times), and what it would cost to purchase the amount the household consumed in a day. Community price surveys were performed in the rural sampling units, so quantity estimates could be recovered if deemed desirable.

There has been a great deal of discussion regarding the desirability of measuring home consumption in the fashion described. Such measures are typically obtained from residual farm production estimates; all crop outputs not sold, given away, stored, or used for seed are assumed to be consumed by the household. In our case, we estimated the total value of farm output by adding the value of home consumption (obtained as described above) to value measures of marketed output, gifts, and seeds, and storage. There are advantages and disadvantages to the approach used in the CILSS: in terms of the advantages, we avoid problems caused by differences in local units both in measuring agriculture output and in measuring consumption (household inputs). Also, we simplify data collection effort significantly. In terms of the disadvantages, we have made rather heroic assumptions regarding the degree of monetarization in the Côte d'Ivoire's rural economy, and respondent's knowledge of the "value" of a food item that he or she may seldom if ever buy. Also, there is likely to be strong seasonal variation in prices of basic foodstuffs, so that prices at the time of the interview may not reflect average prices across the year. However, early field tests indicated that respondents

were quite willing to make statements regarding value and the rural consumption estimates appear robust in initial modelling efforts, so we feel that the approach used for estimating the value of home-consumed farm output is valid.

Table 2-8 shows average expenditures on purchased food, the estimated value of home-produced foodstuffs, and the total estimated value of food consumption, stratified by region. According to these tabulations, urban households in Abidjan purchase almost all of the food they consume (99.8 percent of the total), urban households outside Abidjan purchase most of the food they consume (11.5 percent of the total is produced at home, although over 41 percent of households produce some food at home), and rural households purchase on average less than half of the food they consume (53.6 percent of the total is home-produced, and just under 95 percent of rural households produce some food at home). In the total country, an average of 28.2 percent of the value of food consumed is produced within the household, and 63.8 percent of all households produce at least some of the food they consume.

Education expenditures and health expenditures are derived from Section 11 of the CILSS questionnaire. Nearly all households, both urban and rural, spend money on health care, which includes personal hygiene as well as medicine and medical services. However, 80 percent of households in Abidjan report educational expenditures, as compared with 65 percent of households in other urban areas, and only 55 percent of rural households.

Table 2-8

Average Value of Purchased and Home-Produced Food,
Percentage Shares, and Percent of Households Either Purchasing or Producing, By Region

	Abidjan			Other Urban Areas			Rural Areas			Total Country		
	Percent Purchasing Producing	CFA	Percent Share	Percent Purchasing Producing	CFA	Percent Share	Percent Purchasing Producing	CFA	Percent Share	Percent Purchasing Producing	CFA	Percent Share
Purchased Food Expenditures	100.0	1,010,377	99.8	100.0	652,554	88.5	99.9	275,341	46.4	99.9	511,868	71.8
Value of Home-Produced Food Consumption	2.7	2,672	0.2	41.1	84,433	11.5	94.8	317,951	53.6	63.8	201,275	28.2
Value of Total Food Consumption	—	1,013,149	100.0	—	736,937	100.0	—	593,292	100.0	—	713,143	100.0

An annualized cost of durables is included in total consumption, as described previously and in Annex II. Housing costs are also included. For home owners, we estimate housing costs by imputing an annual rental value to the dwelling unit (see Annex I). For renters, we use actual rents and maintenance costs, derived from Section 2 and Section 11 in the CILSS questionnaire. In total, only 23 percent of households in Abidjan own the dwelling unit in which they reside, 47 percent of households in other urban areas, and 93 percent of rural households. Rent imputations were not made for rural homeowners, primarily due to data and market limitations.

Gross transfer payments are derived from Section 11 of the questionnaire. In total, 68 percent of Abidjan's households report making private transfers, 53 percent of other urban households, and 39 percent of rural households.

Table 2-9 shows the composition of average consumption expenditures by region and overall. Population budget shares are defined as the average of budget shares for each household, that is

$$SHRj = \frac{1}{HH} \sum_{i} \left(\frac{exp_{ij}}{\sum_{j} exp_{ij}} \right)$$

where: j denotes consumtion categories,

i denotes households,

exp is expenditures, indexed by j (categories) and i (households),

HH is the total number of households in the population, and

SHRj is the population budget share for consumption category j.

This technique gives each household's expenditure pattern equal weight, and it is generally preferred as a welfare measure to measures of the ratio of aggregate total expenditures to aggregate expenditures in a consumption category (Deaton, 1985).

According to Table 2-9, the food share in Abidjan is 39.8 percent, in other urban areas is 41,7 percent, and is 62.4 percent in the rural areas. Overall, the food share is 53.2 percent. How do these numbers compare to other survey estimates in LDCs? Insofar as the food share is a good indicator of poverty, households in the Côte d'Ivoire appear fairly well off. Using a definition of consumption similar to ours, Deaton (1985) found a food share of 66.7 percent in urban Sri Lanka (1980-81) and 70.8 percent in rural Sri Lanka. Using data from Indonesia (1978), he found food shares of 57.9 and 71.2 for urban and rural households, respectively. In the Sudan, food shares range from 62.7 percent of total expenditures tO 74.3 percent in one of the poorest regions of the country (Deaton and Case, 1985). Recent work in Pakistan (Ali, 1985) reports an overall food budget share of 50.8 percent.

Education expenditures are highest on average in Abidjan (not surprising, because of generally greater availability of schools), and

Table 2-9

Composition of Consumption Expenditures in the Republic of Côte d'Ivoire by Region

	Abidjan (N=334)		Other Urban (N=333)		Rural (N=902)		Total Country (N=1569)[2/]	
	CFA	Percent	CFA	Percent	CFA	Percent	CFA	Percent
(1) Food expenditures	1,013,050	39.8	736,978	41.7	593,293	62.4	713,144	53.2
(2) Education Expenditures	131,854	4.2	61,578	2.6	31,722	2.5	59,374	2.9
(3) Health Care Expenditures	128,140	4.5	90,964	4.5	54,470	4.9	77,840	4.7
(4) Annual Cost of Durables	40,463	1.2	34,286	1.6	8,987	0.9	21,057	1.1
(5) Gross Transfer Payments	109,482	3.3	69,798	2.6	16,250	1.3	47,461	2.0
(6) Housing Costs[1/]	331,038	11.1	279,235	14.2	10,962	0.6	83,608	5.6
(7) Other Household Expenditures	1,018,452	37.1	686,374	34.3	296,926	28.2	533,176	31.4
Total Annual Expenditures	2,772,481	100.0	1,958,942	100.0	1,012,610	100.0	1,588,088	100.0

NOTES:

1/ Includes both rents paid and an inputed annual value of housing services for home owners in Abidjan and other urban areas.

2/ The full sample of 900 households was used for this table. Note that sample means are slightly higher for this full sample than the income constrained sample.

Source: CILSS Survey estimates.

fall significantly in rural areas. The latter is due both to lower enrollment rates (57 percent of individuals 15 years of age and younger are enrolled in school in Abidjan, in comparison to 47 percent in rural areas) and to compositional difference -- students in rural areas are more likely to be enrolled in state-supported primary schools than students in Abidjan. In contrast, while health care expenditures are lower on average in rural areas (where public health care is free and medicine highly subsidized), health care budget shares are roughly constant across regions.

Housing costs constitute some 11 percent of total expenditures in Abidjan, and 14 percent in other urban areas. These figures are much in line with similar estimates for other developing areas. Gross transfer payments constitute a rather small share of household budgets; however, if the bulk of remittance are moving from urban to rural areas (as studies have shown in other Africa countries, see Anker and Knowles, 1983, Oucho and Mukras, 1983), and if households in rural areas receive on average what Abidjan's households remit out, income from remittances would constitute nearly 11 percent of total rural incomes. In fact, reported income from remittances constitutes less than one percent of rural incomes. Analysis suggests that transfers of income into the household have been underreported, and transfers occur between urban households as well as between urban and rural households in the Côte d'Ivoire.

2.3 Distribution of Welfare

The ability to monitor changes in the distribution of welfare in an economy is a critical aspect of development planning. Economic and social policy will inevitably affect different groups in different ways; indeed, it is often the intention of policy to redress imbalances and shift the burden of economic adjustments from one group to another. Survey data can serve an important function in helping to identify the poor and in assessing the impacts of policy interventions.

There is an extensive literature on what is the "best" measure of welfare, focusing primarily on total income, per capita income, total expenditures, or per capita expenditures. At present, a consumption-based measure is preferred, both for theoretical and empirical reasons (for a discussion of these issues, see Deaton, 1980). On theoretical grounds, individuals derive utility from the consumption of goods, typically measured in value terms as money metric utility. Liquidity plays a role in shifting the timing of consumption; this year's income represents the highest level of welfare an individual could attain if he/she were completely liquidity constrained. Such an event is unlikely for most households, however. "Young" households tend to dissave in early years through borrowing, save in peak earning years, and then dissave again in later years by consuming accumlated savings so as to maintain adequate levels of consumption regardless of fluctuations in income. On pragmatic grounds, it is easier to obtain good measures of household expenditures than of income, as household may be reluctant to reveal information on

income (which is tax liable), but be willing to do so for consumption expenditures. Further, the typical recall period for adequate consumption estimates is generally shorter than for income estimates due to differences in timing and variability. Farmers, for example, may receive income only when they harvest and sell their crops, although they purchase foodstuffs and basic consumption needs throughout the year.

We analyze both the distribution of income and consumption expenditures for the following reasons: (i) we wish to compare the welfare implications of using alternative definitions of welfare and (ii) the relative distributions will ultimately define the distribution of residual saving. Analysts concerned with distributional issues typically examine income and expenditure patterns by demographic (i.e., life cycle, household size) and economic groupings (income or consumption categories). In this section, we describe the distribution of both income and consumption by quintiles (for each region) and deciles (for the country as a whole). This analysis is rather brief as it is primarily intended as background to the analysis of household saving behavior in later chapters.

Composition and Distribution of Income and Expenditures

Table 2-10 presents a description of household income composition by per capita income quintiles for Abidjan, other urban areas, and rural areas. Note that Quintile 1 represents the poorest households, while Quintile 5 represents the wealthiest. There are several important

Table 2-10

Composition of Household Income in the Republic of Côte d'Ivoire, by Region and Per Capita Income Quintile Within Each Region 1/

Abidjan	Wage Income	Farm Income	Non-Farm Family Enterprise Income	Capital and Interest Income	Social Security Pensions, etc.	Other Unearned Income	Private Transfer Payments	Inputed Rent	Service Flows from Durables	Total Income
Quintile 1	44.8	-0.7	32.8	1.2	11.2	0.9	1.9	5.9	2.0	100.0
Quintile 2	49.0	0.7	24.0	5.5	7.2	3.6	2.7	6.0	1.3	100.0
Quintile 3	45.4	-0.5	22.1	17.9	3.6	2.4	2.4	5.2	1.5	100.0
Quintile 4	59.9	0.9	16.8	6.8	4.2	4.5	1.9	3.5	1.4	100.0
Quintile 5	50.9	2.8	25.1	10.0	1.1	3.8	2.7	2.2	1.4	100.0
Total	51.5	1.5	23.1	9.8	3.2	3.5	2.4	3.4	1.4	100.0
Other Urban Areas										
Quintile 1	14.3	22.4	18.7	8.2	3.3	0.9	4.2	25.6	2.4	100.0
Quintile 2	22.8	23.2	27.8	3.6	0.7	2.1	1.3	16.4	2.1	100.0
Quintile 3	33.2	12.1	28.6	7.2	4.6	0.9	1.2	10.6	1.5	100.0
Quintile 4	53.7	6.0	22.9	3.1	4.0	2.0	0.8	5.6	1.9	100.0
Quintile 5	61.7	5.0	18.5	1.5	1.5	2.5	2.0	2.3	1.6	100.0
Total	46.9	9.7	22.6	5.6	2.8	1.9	1.0	7.8	1.7	100.0
Rural Areas										
Quintile 1	1.5	84.6	7.0	0.6	0.0	1.1	2.6	2/	2.6	100.0
Quintile 2	0.9	88.4	6.7	0.3	0.2	0.8	1.1	—	1.5	100.0
Quintile 3	3.0	84.6	8.8	0.4	0.4	0.8	1.0	—	0.9	100.0
Quintile 4	3.1	81.0	11.1	1.9	0.3	1.1	0.6	—	0.7	100.0
Quintile 5	10.9	65.0	17.9	2.8	0.5	1.9	0.4	—	0.6	100.0
Total	6.4	75.0	13.3	1.9	0.4	1.4	0.7	—	0.9	100.0

Notes: 1. Quintile 1 is the lowest, Quintile 5 is the highest income group.
2. No imputations made for rural areas.

Source: CILSS Survey estimates.

characteristics of income composition in the Côte d'Ivoire revealed in the table. First, and perhaps most important, the share of wage income increases with rising levels of per capita income, except for in the highest quintile in Abidjan. This effect is most marked for households residing outside of Abidjan (14.3 percent of income is derived from wages in the lowest quintile in other urban areas, as compared to 61.7 percent in the highest quintile, and a scant 1.5 percent of income is derived from wages in the lowest rural quintile, as compared to 10.9 percent in the highest quintile), but still apparent within Abidjan (44.8 percent in the lowest quintile, and 59.9 percent in the second to the highest quintile). There is a drop in the wage share for households in Abidjan's highest income quintile, primarily due to the increasing importance of income from (large) family enterprises as income levels rise.

Table 2-11 shows the composition of household income stratified by consumption quintiles rather than income quintiles. If consumption is indeed a better measure of long term welfare, then the estimates in this table should be less sensitive to transitory shifts in income, and better reflect the relationship between current income and welfare. Concerning the role of wage income in welfare: not surprisingly, the effects noted in Table 2-10 remain and in fact are strengthened by the new groupings; clearly the share of wage income in total income rises as levels of welfare rise, increasing from 38.1 percent of total income in the lowest consumption quintile to 59.4 percent of income in Abidjan's highest quintile, and 20.9 percent rising to 73.5 precent in the highest quintile in other cities.

Table 2-11

Composition of Household Income in the Republic of Côte d'Ivoire, by Region and Per Capita Expenditure Quintile Within Each Region 1/

Abidjan	Wage Income	Farm Income	Non-Farm Family Enterprise Income	Capital and Interest Income	Social Security Pensions, etc.	Other Unearned Income	Private Transfer Payments	Inputed Rent	Service Flows from Durables	Total Income
Quintile 1	38.1	1.0	39.3	5.2	5.9	3.5	1.3	4.7	0.9	100.0
Quintile 2	43.8	0.5	21.4	15.1	9.5	2.1	1.0	5.7	1.2	100.0
Quintile 3	44.9	0.5	31.5	9.6	3.2	1.4	3.0	4.7	1.2	100.0
Quintile 4	55.4	-0.2	20.8	13.3	1.0	4.5	1.2	2.8	1.3	100.0
Quintile 5	59.4	4.3	16.2	6.0	1.4	4.5	4.3	1.9	1.9	100.0
Total	51.5	1.5	23.1	9.8	3.1	3.5	2.5	3.4	1.4	100.0
Other Urban Areas										
Quintile 1	20.9	29.0	26.4	4.2	3.6	0.8	0.8	13.0	1.3	100.0
Quintile 2	31.8	19.3	28.8	3.7	1.5	1.0	1.3	11.3	1.4	100.0
Quintile 3	29.0	10.4	35.3	5.1	3.2	5.0	0.8	9.6	1.5	100.0
Quintile 4	55.7	3.5	19.0	7.5	4.5	1.5	0.5	6.1	1.5	100.0
Quintile 5	73.7	0.3	10.9	5.6	0.7	1.3	1.6	3.2	2.7	100.0
Total	46.9	9.7	22.6	5.6	2.8	1.9	1.0	7.8	1.7	100.0
Rural Areas										
Quintile 1	1.8	82.6	12.6	0.1	0.0	0.6	1.0	—1/	1.3	100.0
Quintile 2	4.1	75.1	13.2	1.0	0.5	4.4	0.7	—	1.0	100.0
Quintile 3	5.8	80.7	10.0	1.1	0.3	0.7	0.6	—	0.8	100.0
Quintile 4	8.7	67.6	19.7	1.0	0.4	0.9	0.8	—	0.8	100.0
Quintile 5	8.2	74.2	10.7	4.3	0.5	0.7	0.6	—	0.8	100.0
Total	6.4	74.9	13.3	1.9	0.4	1.4	0.7	—	0.9	100.0

Notes: 1. Quintile 1 is the lowest, Quintile 5 is the highest consumption group.
2. No imputations made for rural areas.

Source: CILSS Survey estimates.

Note the role of non-farm entrepreneurial earnings is curious in Abidjan; according to Table 2-10, they consititute a major source of income for the very poor (a 32.8 percent share at the lowest end of the distribution) and for the relative rich (25.1 percent of income for the upper 20 percent of the per capita income distribution). This suggests two kinds of family enterprises -- small, one or two person operations which yield relatively little cash revenues, and larger enterprises that employ a number of workers outside the households as well as within. 2/ Analysis of the family enterprise data bears this out; we find more food sellers and petty traders at the lower end of the income distribution, and much of the construction, large traders, and industry at the upper end. Small enterprises operated by poor households tend also to have low capital endowments and limited stocks.

Based on Table 2-10, the impact of non-farm family enterprise income is rather different in regions outside Abidjan, particularly rural areas. There, the share of income from family enterprises clearly increases with increasing levels of income, likely indicating the importance of labor diversification and the age-old adage that wealth begets wealth. Farm households who diversify their labor portfolio are clearly better off than those who do not. In other urban areas, family enterprise income constitutes a small share of total income for the very poor (income quintile 1, with a share of 18.7 percent) and the rich

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2/ Or, alternatively, the effect of measurement error which causes a substantial understatement of net earnings from family enterprises.

(income quintile 5, with a share of 18.5 percnet) and a large share for the middle classes, averaging around 25 percent of total income.

Table 2-11 suggests a different story about the role of income from non-farm family businesses in household welfare. In Abidjan and other urban areas, the income shares tend to fall with increasing expenditure levels, and are lowest in the highest expenditure quintiles (16.4 percent and 11.4 percent for Abidjan and other urban areas, respectively). Further, in rural areas the distribution of family enterprise income shares are roughly equal across the welfare (consumption) distribution. In all likelihood, this reflects the transitory nature of most kinds of non-wage income in the Côte d'Ivoire. If income from family enterprises has a significant transitory component, then the correlation between consumption (a proxy for permanent income) and family enterprise income would be less than the correlation in a particular time period between household income and family enterprise income. The relative stability of wage income shares across income and consumption deciles lends credence to this explanation.

According to Tables 2-10 and 2-11, the share of income derived from agriculture falls with increasing levels of income and consumption expenditures in all regions outside Abidjan. Farm income likely has a relatively high transitory component, although perhaps less than non-farm self-employment income. We find some smoothing in the distribution of farm income shares across rural consumption quintiles, which bears this out.

Table 2-12 collapses the information in Table 2-11 across regions, showing the composition of income by per capita expenditure decile for the country as a whole. Ignoring regional differences for the moment, it is quite clear that the share of wage income in total private income increases with total consumption expenditures (2.2 percent in the lowest decile to 59.6 percent in the highest), the share of farm income falls steadily, family enterprise income initially rises and then falls, and rent and dividend income increases steadily with per capita consumption levels (0.6 percent rising to 9.2 percent of total income). Note however, that possible price differentials among regions prevent us from making definitive statements regarding welfare and income composition based on these statistics; however, initial estimates of regional price indices (Glewwe, n.d.) show relatively little price variation across regions.

A brief comment is in order regarding what we mean when we speak of a "transitory" element in farm and business incomes. In a formal sense, the designations "transitory" and "permanent" income were coined by the group of so-called permanent income theorists headed by Friedman (1957, see also Mayer, 1966, for a good overview of related theories and relevant empirical work), in order to differentiate between the behavioral response to long-run, stable components of income and to more variable components. The marginal propensity to consume out of permanent income is hypothesized to be much greater (in the strictest sense of the theory,

Table 2-12

Composition of Household Income in The Republic of Côte d'Ivoire by Per Capita Expenditure Decile

	Wage Income	Agriculture Income	Family Enterprise Income	Rents and Dividends	Social Security Pensions, etc.	Other Unearned Income	Transfer Payments	Imputed Rent	Annual Value of Durables	Total Income
Decile 1	2.2	79.2	14.1	0.6	0.0	0.6	1.3	0.8	1.2	100.0
Decile 2	5.6	69.2	19.2	1.7	0.8	0.6	0.7	1.1	1.0	100.0
Decile 3	6.5	69.1	12.6	1.4	1.0	5.0	1.0	2.5	0.9	100.0
Decile 4	17.2	56.3	16.2	2.4	1.3	0.7	0.5	4.4	1.1	100.0
Decile 5	21.0	48.0	20.4	2.6	1.0	1.1	1.0	3.8	1.0	100.0
Decile 6	19.2	35.4	30.6	3.0	3.6	1.9	1.0	4.3	1.0	100.0
Decile 7	26.2	32.3	21.9	8.4	1.5	3.1	1.0	4.5	1.1	100.0
Decile 8	38.5	18.5	20.9	6.7	6.6	1.6	1.3	4.6	1.3	100.0
Decile 9	46.2	17.5	18.5	7.8	1.3	2.4	1.2	3.8	1.5	100.0
Decile 10	59.6	3.6	16.7	9.2	1.1	3.4	2.8	1.9	1.7	100.0
Total	33.7	30.6	19.4	5.8	2.0	2.3	1.4	3.3	1.3	100.0

Source: CILSS Survey estimates.

converging to one) than the marginal propenisty to consume out of transitory income (likewise in the strictest sense converging to zero).

Our use of the term transitory here encompasses a broader set of issues than strict adherence to theory might indicate; a more rigorous approach is described in the next chapter. For the present, we assume that income from farm and non-farm family enterprises likely has a consumption and an investment component. Farmers accrue farm profits and ultimately plow (in a figurative sense) them back into the farm or other family business through capital and land purchases. One expects similar behavior on the part of small entrepreneurs -- the cash for investment capital must come from somewhere, and credit is difficult to obtain and costly in most West African countries. Thus, income from farm and non-farm self-employment is likely to be less correlated with consumption than wage income for two reasons; (i) inherent income variability, which leads the household to save cash in times of plenty in anticipation of future shortfalls, and possibly spend more than annual earnings alone might indicate in times of relative scarcity and (ii) the role of self-employment profits in expanding investment capital and ensuring adequate levels of future liquidity.

As noted earlier, other sources of income constitute a fairly small share of the total in the Côte d'Ivoire. Capital (rents) and interest income appear evenly spread throughout mid-to-upper levels of both income and consumption distributions, and transfers and remittances constitute a slightly higher share of income for households at the lower

end of the distribution living outside of Abidjan. Social security and pension payments, whether grouped by current income or consumption quintiles, constitute a larger share of total income for households at the lower end of the relevant distributions. This likely reflects lifecycle differences rather than primarily wealth, as only retired employees (who we have already seen to be in the most wealthy segment of the population) are eligible for social security and pension benefits.

Table 2-13 shows expenditure shares (computed as the mean of individual household shares, as noted earlier) by expenditure quintiles, for Abidjan, other urban areas, and rural areas. The most important statistic in the table is the average budget share devoted to food consumption, which falls steadily with rising incomes in Abidjan (47.5 percent decreasing to 28.1 percent) and other urban areas (49.4 percent decreasing to 30.0 percent), but falls rather unevenly and much less in absolute terms in the rural areas (67.9 percent decreasing to 57.7 percent). This provides yet another piece of evidence that households are on average worse off in rural areas than in urban areas, and that the difference between the poorest 20 percent of households and the wealthiest is much greater in Abidjan and other cities than in the countryside. Without adjustments for price differentials and availability of public services, however, it is not possible to make definitive comparisons between urban and rural households. Such adjustments are unfortunately beyond the scope of the present work.

Table 2-13

Composition of Household Income in the Republic of Côte d'Ivoire, by Region and Per Capita Expenditure Quintile Within Each Region 1/

	Percent of Expenditure by Category						
	Food Expenditures	Education Expenditures	Health Care Expenditures	Cost of Durables	Gross Transfer Payments	Housing 2/ Costs	Other Household Expenditures
Abidjan							
Quintile 1	47.3%	5.4%	4.3%	0.9%	1.5%	10.9%	29.5%
Quintile 2	44.3	4.8	4.4	1.0	3.1	8.6	33.7
Quintile 3	40.2	4.2	5.2	1.0	3.6	9.3	36.4
Quintile 4	37.5	3.5	4.7	1.5	3.5	10.8	38.6
Quintile 5	29.2	3.1	3.9	1.7	4.9	16.0	41.2
Total	39.8	4.2	4.5	1.2	3.3	11.1	35.9
Other Urban Areas							
Quintile 1	49.5	3.0	4.7	1.4	0.8	15.4	25.2
Quintile 2	45.5	3.3	4.5	1.4	1.4	14.0	30.0
Quintile 3	42.6	2.4	4.9	1.5	1.8	13.3	33.5
Quintile 4	40.5	2.9	4.4	1.6	2.7	13.5	34.4
Quintile 5	30.4	1.4	3.9	2.2	6.6	15.0	40.6
Total	41.7	2.6	4.5	1.6	2.6	14.2	32.7
Rural Areas							
Quintile 1	67.9	2.1	4.8	1.3	0.7	0.1	23.1
Quintile 2	61.3	2.9	4.9	1.1	0.8	0.8	28.1
Quintile 3	63.8	2.6	4.6	0.7	1.0	0.3	26.9
Quintile 4	61.1	2.7	4.6	0.9	1.7	0.6	28.4
Quintile 5	57.9	2.3	5.4	0.6	2.5	1.3	30.0
Total	62.4	2.5	4.9	0.9	1.3	0.6	27.3

Notes: 1. Quintile 1 is the lowest and Quintile 5 is the highest consumption group.
2. Includes both rents paid and an inputed annual value of housing services for home owners in Abidjan and other urban areas.

Source: CILSS Survey estimates.

Several other results in Table 2-13 deserve brief mention: First, the share of education expenditures falls with increasing levels of income, likely due in part to the high levels of public subsidies and scholarships in the education sector. Health care expenditures fall slightly with increasing levels of total expenditures, and transfer payments tend to increase with rising levels of expenditures. For the upper 20 percent of the urban welfare distribution, private transfers and remittances make up a rather signficant share of expenditures -- 4.8 percent (or, an average of CFA 135,460 per household) in Abidjan, and 6.5 percent (an average of CFA 128,580 per household) in other urban areas. This suggests that private transfers may play a significant role in redistributing wealth in the economy. Interestingly, the cost of durables is distributed rather evenly over households, with some slight increase in shares for the very wealthiest households.

Cumulative Shares of Income and Consumption Expenditures

Table 2-14 shows average household income and consumption expenditures by income and consumption deciles and the cumlative share in each decile for the country as a whole. If these results are to be believed, total expenditures is much more evenly distributed in the Côte d'Ivoire than prior analyses would lead us to expect. Consider the first panel in the table, which shows average income and consumption by income deciles. Clearly income is much more unevenly distributed than consumption expenditures, as intuition would suggest. In particular, the bottom 20 percent of the per capita income distribution receives some 3.6

Table 2-14

Distribution of Household Income and Consumption Expenditures in The Republic of Côte d'Ivoire by Per Capita Income and Expenditure Deciles 1/

	Per Capita Income Deciles				Per Capita Expenditure Deciles			
	Average Annual Income (CFA)	Cumulative Share in Decile	Average Annual Consumptions Expenditures (CFA)	Cumulative Share in Decile	Average Annual Income (CFA)	Cumulative Share in Decile	Average Annual Consumption Expenditures (CFA)	Cumulative Share in Decile
Decile 1	162,339	1.0%	736,615	4.7%	596,664	3.7%	467,711	2.9
Decile 2	420,744	3.6	785,395	9.6	807,082	8.8	711,112	7.4
Decile 3	631,889	7.6	1,087,679	16.5	1,020,302	15.1	891,140	13.0
Decile 4	805,802	12.6	1,147,582	23.7	1,065,524	21.8	1,124,906	20.1
Decile 5	873,528	18.1	1,305,554	32.0	1,177,594	29.1	1,294,380	28.2
Decile 6	1,412,216	26.9	1,546,240	41.7	1,601,438	39.1	1,581,282	38.2
Decile 7	1,517,711	36.3	1,682,859	52.4	1,531,848	48.7	1,711,649	49.0
Decile 8	2,031,526	49.0	1,967,835	64.8	1,973,441	61.0	2,104,781	62.2
Decile 9	2,839,940	66.7	2,292,813	79.3	2,444,464	76.3	2,701,713	79.2
Decile 10	5,330,844	100.0	3,278,632	100.0	3,795,199	100.0	3,303,476	100.0
Total	1,600,743	—	1,582,554	—	1,600,743	—	1,588,088	—

Notes: 1. Decile 1 is the lowest, Decile 10 is the highest income/expenditure group.

Source: CILSS Survey estimates.

percent of income and accounts for 9.6 percent of total consumption expenditures. The distribution between consumption and income evens out somewhat towards the middle and upper end of the distribution -- households in the wealthiest decile receive a third of all income and spend some 20 percent of the total spent on private consumption. If we rank households by per capita consumption (the second panel in Table 2-14), we find a surprising degree of equality across the distributions. Income is clearly more evenly distributed across expenditure deciles than income deciles. We might expect this distributional effect if (i) incomes are more variable than expenditures, and (ii) expenditures serve as a proxy for long-run welfare. Households in the lower 20 percent of the welfare (consumption) distribution receive some 8.8 percent of total income and consume 7.4 percent of total private consumption. The lower 50 percent of the welfare distribution receives 29.1 percent of total income and accounts for 28.2 percent of total expenditures. Finally, the upper 10 percent of the welfare distribution receives 23.7 percent of total income and accounts for 20.8 percent of consumption expenditures in the country, significantly less than the 33.3 percent of income received by the highest income decile. Interestingly, at least some households at the lower end of the expenditure distribution are rather substantial savers, which could be explained by a number of factors: (i) basic thriftiness amongst the poor, and a tendency to save against possible future income shortfalls, which suggests that at least some households at the bottom of the expenditure distribution are there through choice rather than purely through necessity, and (ii) borrowing constraints, which particularly constrain the consumption behavior of the poor. Note also that many of

these households are quite large; due to scale effects and possible measurement error which is compounded by each additional household member, not all households in the lowest decile may actually be "poor". These issues will be discussed in greater detail later in the thesis. Note also that households in the lowest income decile evidence substantial dissavings, as one might expect if income has a substantial transitory component.

There is no reason to assume that prices are the same across regions, which is a necessary prior condition for interregional welfare comparisons without price adjustment. Thus, measures in Table 2-13 must be viewed with caution. Tables 2-15 and 2-16 present similar information to that in 2-14, stratified by Abidjan, other urban areas, and rural areas. There is certainly a greater likelihood that prices will be more constant within the three regions, than between them.

Table 2-15 shows average income and expenditures by per capita income quintile and region, while Table 2-16 shows similar averages by per capita expenditure quintile and region. These tables suggest that the degree of difference in average income for the highest and lowest deciles in Table 2-14 is to a large extent caused by urban/rural differences in income and consumption. For example, Table 2-16 shows that rural households in the highest quintile earn on average CFA 1,452,483 per household annually, while urban households in Abidjan's highest quintile earn on average CFA 4,477,391 annually. This is a marked differences in earnings, and is roughly paralleled by differences in expenditures. While

Table 2-15

Composition of Household Income and Consumption Expenditures in the Republic of Côte d'Ivoire, by Region and Per Capita Income Quintile Within Each Region 1/

Abidjan	Average Annual Income (CFA)	Cumulative Share Income	Average Annual Consumptions Expenditures (CFA)	Cumulative Share in Quintiles
Quintile 1	640,343	4.5%	1,835,820	13.2%
Quintile 2	1,264,920	13.4	2,160,975	25.2
Quintile 3	2,237,140	29.2	2,592,486	47.4
Quintile 4	2,966,330	50.1	2,851,982	68.0
Quintile 5	7,069,707	100.0	4,446,120	100.0
Other Urban Areas				
Quintile 1	605,216	6.3%	1,321,827	13.6%
Quintile 2	1,053,046	17.1	1,603,546	30.1
Quintile 3	1,906,523	36.8	2,065,907	51.4
Quintile 4	2,390,959	61.5	2,161,091	73.7
Quintile 5	3,725,169	100.0	2,551,578	100.0
Rural Areas				
Quintile 1	226,583	4.4%	685,908	13.6%
Quintile 2	551,553	15.2	829,361	30.1
Quintile 3	720,897	29.3	909,098	48.1
Quintile 4	1,214,277	53.0	1,162,448	71.2
Quintile 5	2,402,921	100.0	1,452,177	100.0

Notes: 1. Quintile 1 is the lowest, Quintile 5 is the highest income/expenditure group.

Source: CILSS Survey estimates.

Table 2-16

Distribution of Household Income and Consumption Expenditures in the Republic of Côte d'Ivoire, By Region and Per Capita Expenditure Quintile Within Each Region 1/

Abidjan	Average Annual Income (CFA)	Cumulative Share Income	Average Annual Consumptions Expenditures (CFA)	Cumulative Share in Quintiles
Quintile 1	1,451,715	10.2%	1,613,095	11.6%
Quintile 2	1,979,245	24.3	2,282,652	28.1
Quintile 3	2,325,277	40.7	2,768,962	48.0
Quintile 4	3,906,122	68.3	3,271,974	71.6
Quintile 5	4,477,391	100.0	3,943,192	100.0
Other Urban Areas				
Quintile 1	1,160,178	12.0%	1,020,332	10.4%
Quintile 2	1,623,799	28.8	1,663,365	27.4
Quintile 3	1,821,558	47.6	1,849,961	46.3
Quintile 4	2,707,282	75.6	2,481,917	71.6
Quintile 5	2,354,657	100.0	2,777,339	100.0
Rural Areas				
Quintile 1	553,502	10.8%	472,188	9.3%
Quintile 2	923,676	28.9	775,788	24.6
Quintile 3	1,003,775	48.5	1,036,956	45.1
Quintile 4	1,179,332	71.6	1,188,936	68.6
Quintile 5	1,452,483	100.0	1,589,518	100.0

Notes: 1. Quintile 1 is the lowest, Quintile 5 is the highest income/expenditure group.

Source: CILSS Survey estimates.

it is not possible to make definitive statements regarding the welfare gap between urban and rural areas, the differences in the means are suggestive of substantial differences in urban and rural welfare. Simple comparisons of extremes suggest that while the disparity in income between the wealthiest and poorest groups is greater in Abidjan than in rural communities, the disparity in consumption expenditures or welfare is greater in rural areas. A simple count of the number of households reporting food budget shares greater than 80 percent (another standard poverty indicator) lends further support; in Abidjan, none of the households interviewed reported food budget shares of more than 80 percent of the total value of consumption, and in other urban areas, only 1.2 percent of households reported food budget shares greater than 80 percent. In contrast, over 14 percent of rural households reported a value of food consumption that constituted more than 80 percent of the total value of consumption.

Table 2-17 shows gini-coefficient estimates for household income and consumption expenditures. The gini coefficient is a commonly used measure of inequality in studies of income and asset distribution. For purposes of this study, we used Sen's (1973) definition of the gini coefficient, which is

$$\text{Gini} = \frac{n+1}{n} - \frac{2}{n^2\mu} \sum_{i=1} (n+1-i)x_i$$

where n is the sample size, x is the variable of interest, and μ is its estimated mean value. Note that households are ranked in ascending order

Table 2-17

Gini Coefficients for Household Income and Consumption Expenditures, By Region and Total Country

	Income-Gini	Expenditure-Gini
Abidjan	.536	.354
Other Urban Areas	.449	.347
Rural Areas	.525	.379
Total Country	.555	.433

Source: CILSS Survey estimates.

of x. A coefficient of zero implies perfect equality while a measure of 1 implies perfect inequality. Anand (1983) has shown that computed values of gini coefficients are the same, regardless of which of a variety of numerical methods are used to estimate them.

As expected, the gini coefficients for income are substantively higher than like coefficients for consumption expenditures. Further, the gini coefficients for the country as a whole are typically higher (particularly in the case of consumption) than region-specific values. This high degree of between-region variation was also identified in Tables 2-15 and 2-16; income (and consumption) may well be more unequal between regions than within regions. Note that the level of inequality tends to be higher in Abidjan and in rural areas compared to other urban areas.

3. HOUSEHOLD ASSETS AND EXPECTED INCOME

Household income represents returns to labor inputs and private capital. Capital is held in the form of physical assets, financial assets, and human assets, which include education and specific skills (typically represented by work experience). Human assets may also include less tangible items such as access to certain kinds of employment, credit sources, or educational opportunities. Because of the importance of assets in determining income flows, the first section of this chapter describes the extent, composition, and distribution of (measurable) private assets for households surveyed in the first year of the CILSS. The intangibles, while possibly of considerable importance, cannot be measured directly.

The description of asset holdings should serve as background to household production function estimates described in the latter part of the chapter. These estimates provide a means for estimating "expected" (or, if you will, permanent) income levels given household labor inputs and asset holdings. Measures of expected income are used in later chapters to estimate permanent income-based consumption functions and to characterize savers and dissavers in the economy -- if the high proportion of dissavers typically found in household surveys in developing areas is at least in part caused by high levels of transitory incomes, then households with a large disparity between expected and current income (e.g., households earning less in the survey year than time inputs and

assets would lead one to expect) would be more likely to be dissaving, all other things being equal, than a household with a comparatively small disparity. Households with "negative disparities", that is, households with current incomes above expected income levels, are more likely to be saving.

Note that the measure of expected income derived in this chapter suffers from a number of limitations, most imposed by data constraints; we have only a single-year cross-section of data to work with. The estimates are prone to two major sorts of error -- errors in measurement and lack of temporal variability. Empirical results must be viewed in light of these limitations. We do not feel that limitations imposed by data are sufficient to seriously call into question the general findings of the research. However, questions of data limitations and interpretation of results are considered numerous times throughout the thesis.

3.1 Composition and Distribution of Household Assets

Physical assets are grouped into three major categories: (i) personal assets, which include all private capital not directly used in productive market activities, (ii) non-farm family enterprise assets, which include capital used in non-farm self-employment activities, and (iii) farm assets, which include all farm capital and land. Assets held in the form of stocks of human capital are discussed later in the section.

Personal Assets. Subsumed under this category are jewelry purchases over the past 12 months (admittedly, this is a flow rather than

stock value; unfortunately, no measure of the gross value of jewelry owned is available in the CILSS), total cash savings, the present value 1/ of all durables owned by the household, the present value of automobiles owned, the estimated value of owned housing stocks 2/, and the household's net debt position (money loaned out minus money borrowed). Country-wide, the value of personal assets held in 1985 was reported to be some CFA 937,462; jewelry purchases accounted for 1 percent of the total, savings for 23 percent, durables for 17 percent, automobiles for 16 percent, housing stock for a substantial 47 percent, and debts for some -4 percent of the total (overall, households in the CILSS were net debtors). Not surprisingly, housing counted for nearly half of total personal assets held.

Non-farm Family Enterprise Assets. These include unsold inventories, buildings and land, business durables such as tools and

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1/ Survey respondents were asked how much they would receive for each durable item owned if they "were to sell it today."

2/ Data limitations required that we use an indirect method to estimate the value of owned housing stock in Abidjan and other cities. The housing stock in rural areas was attributed a zero asset value primarily due to the lack of housing markets in these areas and even more severe data constraints. In urban areas, we first obtained an imputed annual rental value for the housing stock (see Annex I for details on how this was done), and from this, assuming that rents represent a 12 percent return on housing investments, imputed a capital value. Based on previous work (see citations in Annex I), the 12 percent figure is likely low for poor households (where rent-to-value ratios tend to be on a scale of 3-to-1 or 4-to 1 in many cities of the developing world) and high for wealthier households.

equipment, and rental property. All values were reported in the questionnaire except rental properties. For these, we had available only an annual flow measure (e.g., income from property rented out). For purposes of imputing capital values to rental stocks, we assumed that reported rents represent a 25 percent annual return on the stocks. The value is higher than that used for housing because (i) it is likely that some of the rental capital is owned for speculative purposes and yields high returns, and (ii) capital markets are imperfect and access is limited, which means that capital can demand higher rents than under more perfect market conditions. According to our survey, households own on average CFA 761,827 in non-farm production capital; inventories account for 3 percent, buildings and land used in production for some 7 percent, tools, equipment, and machinery for 41 percent, and rental stocks for the remaining 47 percent of total assets. The latter category could have been included above in personal assets; however, it seemed more appropriate to assume that rental stock is owned for productive purposes, that is, to generate income, than as a personal asset used in the day-to-day maintenance of household activities.

Farm Assets. These include land, stored crops 3/, livestock, handtools, and farm equipment. For the country as a whole, the average value of farm assets per household was CFA 3,580,567. Land accounted for

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3/ Crops in storage were measured in terms of the number of weeks they would feed the household. Value estimates were derived by multiplying the number of weeks by the cost of a week of consumption for the relevant food category as reported in the expenditure section of the questionnaire.

the vast majority of this; 95 percent of total farm assets were held in the form of land 4/. The other categories account for roughly equal shares of the remainder, with livestock having the highest share (1.5 percent) and farm equipment the lowest (.7 percent).

For the country as a whole, then, total physical and monetary household assets are valued at CFA 5,264,821 per household, of which personal assets comprise some 18 percent, non-farm business assets some 14 percent, and farm assets the remaining 68 percent. Average household income is some CFA 1,600,000 per annum for the total country. Thus, households in the Côte d'Ivoire maintain a stock of assets that is nearly three and one-half times annual income, primarily tied up in farm land (65 percent), rental capital (7 percent), and a dwelling unit (8 percent).

Clearly the distribution of asset holdings will vary by region in the Côte d'Ivoire, depending on the spatial orientation of productive activities. Table 3-1 shows composition of household assets for our standard regional classifications, namely, Abidjan, other urban areas, rural areas, and the country as a whole. In addition, averages are computed for total households within appropriate regional categories and for households in the lower 90 percent of the asset distribution; in

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4/ Land was valued according to the households response to the question "how much could you sell your land for today?" All but a few of the farm households responded to this question. However, as nearly two-thirds of farm households claimed they could not sell their land due to family, social, or cultural constraints, one must wonder how land valuations were made. The maximum "permitted" land value was assumed to be CFA 9,375,000 per hectare. Only a few households reported per hectare land value greater than this, and were accordingly set to this limiting value.

Table 3-1

Côte d'Ivoire: Composition of Household Assets, By Region and Total

Type of Asset	Abidjan		Other Urban		Rural		Total Country	
	Total	Lower 90%	Total	Lower 90%	Total	Lower 90%	Total	Lower 90%
Personal Assets (CFA)								
Annual jewellery purchases	19,414	13,968	12,849	9,807	5,459	5,164	10,010	7,669
Total personal savings	312,164	123,684	342,964	331,418	125,449	115,521	211,551	161,004
Present value of durables	299,630	183,678	259,056	223,740	73,918	72,013	161,476	122,724
Present value of automobiles	425,428	187,186	164,548	108,815	49,666	37,715	154,365	78,670
Estimated value of housing stock	809,539	746,246	1,205,269	1,335,434	-	-	438,564	404,467
Net debt position	-163,370	-49,569	-64,992	6,674	17,792	23,375	-38,505	7,059
Total	1,702,805	1,205,194	1,964,694	2,015,889	272,283	253,788	937,462	781,594
Non-Farm Family Enterprise Assets (CFA)								
Unsold inventories	23,484	14,145	54,295	57,671	15,281	13,876	25,322	22,857
Value of buildings and land	30	40	26,434	18,380	85,630	77,050	54,799	51,454
Value of business durables	1,228,032	121,940	164,049	148,964	27,383	17,071	312,981	62,534
Value of rental property	1,064,751	691,192	528,410	290,202	57,965	38,145	372,880	205,131
Total	2,301,631	827,318	773,188	515,207	185,990	146,142	761,827	341,975
Farm Assets (CFA)								
Estimated value of land holdings	317,136	391,259	1,410,245	1,403,246	5,319,900	5,177,271	3,420,394	3,560,453
Value of stored crops	131	175	9,606	10,234	71,674	71,830	43,201	46,585
Value of large livestock	16,189	61	33,639	37,511	80,142	78,827	56,598	56,460
Value of tools	3,227	3,539	24,183	26,542	51,308	50,959	35,272	37,586
Value of farm equipment	1,240	458	5,635	6,360	41,191	35,766	25,101	23,519
Total	337,923	395,493	1,483,308	1,483,892	5,564,216	5,414,652	3,580,567	3,724,603
Total Household Assets (CFA)	4,264,392	2,428,005	4,221,190	4,014,998	6,022,488	5,814,582	5,264,821	4,848,173

Source: CILSS tabulations.

effect, the wealthiest households (in terms of total asset holdings) are dropped from averages in the second column.

According to Table 3-1, households in Abidjan have assets valued at an average of CFA 4,264,392 per household (for the total Abidjan sample) and CFA 2,428,005 per household for those in the lower 90 percent of the asset distribution; clearly, the distribution of assets is highly skewed in the capital city. In terms of asset composition, some 40 percent of the total are personal assets, 8 percent agriculture assets, and the remaining 52 percent non-farm business assets. The share of non-farm business assets drops to 34 percent of the total for households in the lower 90 percent of the asset distribution; some of the wealthiest households evidently own a significant amount of production-related capital.

Households in other urban areas have assets valued at CFA 4,221,190, which is roughly on a par with per household asset holdings in Abidjan. Interestingly, deleting households in the upper 10 percent of the asset distribution changes averages very little; the remaining households report holding assets valued at an average of CFA 4,014,998 per household, which suggests that assets are more evenly distributed in other urban areas than in Abidjan. Some 46 percent of total assets are held in the form of personal assets, 18 percent in non-farm business assets, and the remaining 46 percent in farm capital, primarily land. These shares clearly reflect an increasing orientation towards agriculture activities

in lieu of non-farm enterprises as we move from Abidjan to the Côte d'Ivoire's small and medium-sized cities and towns.

Households in rural areas report the highest asset levels on average in the country (CFA 6,022,488), and land is the main component, comprising some 88 percent of the total value. The remainder is split evenly between personal assets and non-farm business assets. Note that like households in urban areas outside Abidjan, rural households do not evidence high skewedness in the distribution of assets. We return to questions of distribution shortly.

First, there are several cross-regional differences worth noting in Table 3-1. Most notably, the ratio of asset values to average incomes is lowest in Abidjan (1.51) and clearly highest for rural households (5.69). This is not surprising given the regional dispersion of productive activities and the high degree of evident land intensiveness of agriculture activities in the Côte d'Ivoire. One must view the capital stock to flow ratio in rural areas with some caution, however; some two-thirds of rural households cannot sell any of their major stock -- land -- which makes it an exceedingly illiquid asset. In addition, there is little evidence that land is used as collateral for obtaining credit in the Côte d'Ivoire. This may in part account for some of the high land prices observed in the survey; the scarcity of land offered for sale may artifically inflate market prices. However, rural households may tend to maintain a smaller stock of liquid assets than their urban counterparts. If we define liquid assets as (i) jewelry, (ii) savings, (iii) durables

and automobiles, (iv) business inventories, and (v) stored crops, then households in Abidjan have on average CFA 1,080,251 in liquid assets, households in other urban areas have CFA 843,318, and rural households have CFA 341,447. These absolute values are somewhat misleading: The ratio of liquid assets to annual income in Abidjan is .38, in comparison to .43 in other urban areas and .33 for rural households. Thus rural households have high overall asset holdings, but a considerable proportion of these tied up in very illiquid stocks. Interestingly, 46 percent of total personal assets are in the form of cash savings in rural areas, likely the most liquid of all kinds of household assets, in comparison to only 18 percent in Abidjan and 17 percent in other urban areas.

It is often claimed that credit constraints seriously hamper overall growth in developing countries. Estimates of the average net debt position of Ivorian households lend some support to this view. For example, households in Abidjan are heavily indebted in comparison to their rural counterparts, particularly households in the upper 10 percent of the asset distribution. In urban areas, wealthier (measured in asset holdings) households are most indebted, which likely indicates that access to credit is important in building up capital stocks. Further, households in urban areas (including Abidjan) are more likely to be net debtors than net creditors, clearly obtaining at least some funds from outside the household sector. In comparison, rural households are net creditors on average, which suggests that borrowing in rural areas is primarily within the household sector. The CILSS includes a special section on borrowing and lending which provides further evidence of urban/rural differences in

credit activities. According to responses in this section, households in Abidjan have outstanding debts of CFA 412,712 in contrast to outstanding credits (money owed to them) of CFA 253,094 (they are net debtors); households in other urban areas report outstanding debts of CFA 222,400 and credits of CFA 109,772 (likewise net debtors); and rural households have net debts of CFA 37,067 in comparison to credits of CFA 55,237 -- they are in fact net creditors. (Note that this result may in part be caused by rural sampling biases.) According to the survey, some 90 percent of rural households who borrowed money over the past 12 months received loans from private individuals, in comparison to only 56 percent of borrowing households in Abidjan. Clearly, the formal credit market is neither extensive nor well-developed in the Côte d'Ivoire's rural areas.

To a great extent, regional classifications serve as proxies for classification by the structure of production. For example, households in rural areas have land assets because they are farmers, not because they live in rural areas _per se_. Table 3-2 shows average asset levels per household for five categories of households defined on the basis of production attributes. These include: (i) households receiving all earned income from wages, (ii) households receiving all earned income from on-farm activities, (iii) household receiving all earned income from non-farm self-employment or non-farm self-employment in conjunction with on-farm activities, (iv) households receiving wages _plus_ some form of self-employment earned income, and (v) households receiving no earned income from any source. 5/

5/ These are the same categories as are described in Chapter 1.

Table 3-2

Côte d'Ivoire: Composition of Household Assets, By Income Source Category

	Wage Income Only (N=260)	Farm Income Only (N=618)	Other Self-Employment Income Only (N=407)	Wage and Other Income (N=251)	No Earned Income (N=27)
Personal Assets (CFA)					
Annual jewellery purchases	22,141	4,718	9,282	12,365	3,417
Total personal savings	295,636	112,257	207,043	389,280	90,307
Durables and automobiles	789,044	96,732	302,709	411,203	85,704
Estimated value of housing stocks	423,328	115,372	625,962	896,583	900,044
Net debt position	-298,198	24,943	30,688	-43,566	13,981
Total	1,231,952	354,023	1,175,685	1,665,866	1,093,454
Non-Farm Family Enterprise Assets (CFA)					
Value of rental property	822,523	140,246	349,199	471,586	807,066
Business assets	-	-	1,435,320	120,753	-
Total	822,523	140,246	1,784,519	565,425	807,066
Farm Assets (CFA)					
Estimated value of land holdings	4,019	5,402,820	3,669,498	2,042,241	0.0
Other farm assets	160	251,361	172,660	90,924	684.6
Total	4,179	5,657,181	3,842,158	2,133,164	684.6
Total Household Assets	2,058,655	6,151,451	6,802,361	4,267,638	1,901,205

Source: CILSS tabulations.

The figures in this table bring out in a clearer way what was evident in Table 3-1. Households who sell labor outside the household (that is, do not own their means of production) have less physical assets overall, and what assets they do own are different in composition than evidenced by households that do not sell labor to outside capitalists. From prior analyses, we know that wage-earning households receive high incomes relative to others, and primarily reside in Abidjan. They own substantial rental properties, durables and automobiles, jewelry, and have much higher debts that households in other categories. In addition, they have extensive savings, typically in formal savings institutions. In contrast, households who receive earned income only from own-farm agriculture activities have the bulk of their assets tied up in land, and own very little else; they are an extreme version of the rural household profile in Table 3-1. They are net creditors, have some savings (although typically not in formal savings institutions), own some farm equipment and tools, and seldom rent their property to others.

Households in the third category provide contrast to "pure" farm households; they are, in combination with households in the fourth category, the Côte d'Ivoire's entrepreneurs or petty capitalists. All households that earn income from non-farm self-employment but do not receive wages are in this category (including those that also receive farm income). Their overall average asset levels are the highest amongst the groupings; they own substantial amounts of land and substantial production capital for non-farm family enterprises. In addition, their cash savings are high compared to farm households, and they have invested extensively

in housing. To characterize households in this category simply, they have highly diversified asset portfolios. However, like households that only receive income from farm activities, they are net creditors rather than debtors.

Households in the fourth category are among the wealthiest (and most diversified in terms of asset holdings) in our sample. They include households who receive wage income and earned income from at least one other source. The second source tends to be farm activities, although some households also receive income from non-farm enterprises. Interestingly, households in this category are net debtors, like those who receive only wage income. This suggests some connection between having a job outside the household (which means a steady source of income) and borrowing, particularly borrowing from formal sources of credit outside the household sector. Households in this category also have very high levels of cash savings and are "heavily" invested in housing stock and durables. Like other wage households, they own some rental stock and have both business and farm capital -- in short, they have diversified their asset portfolio in order to obtain income from various sources.

Only 27 households in a sample of 1564 did not receive earned income in the 12 months preceding the CILSS. Although absolute numbers are too few for extensive generalization, it appears that these households own limited assets (with the exception of a dwelling unit and rental stocks), and primarily subsist on rental income and public and private transfer payments.

Distribution of Assets

Gini coefficients were computed for various categories of physical assets in the Côte d'Ivoire, and for "human assets", which are defined in terms of years of formal education completed. Two measures of the household-level stock of human assets are used; (i) aggregate years of education across all household members aged 20 to 60 years old, and (ii) years of education of the most educated person in the household in the same age brackets. The first measure treats education as a sort of aggregate stock that is augmented by each year acquired by a household member. For example, a household with three persons each having 2 years of education would have the same aggregate measure as a similarly sized household with one member having six years of education and the other two having none. The second measure treats education as a sort of household public good having limited use within the household production process; any one person can supply all required education inputs. Further, the definition implicitly assumes that education is commensurate with managerial ability and does not augment labor inputs directly. The second measure is likely most appropriate in the analysis of self-producing households, while the first measure might work best in analyzing households who receive the bulk of their income from wage activities.

Past work has shown that a year of primary education typically has different return than a year of secondary or tertiary education (for a general review, see Psacharopolous, 1980). Accordingly, education was

classified into three categories -- primary, secondary, and tertiary. 6/ The education variables are measured in terms of years of schooling in the relevant category. These variable definitions and classifications are retained throughout the chapter.

Table 3-3 shows gini coefficients for selected asset categories and education measures by region and country-wide totals. As suggested by averages in Table 3-1, physical assets are much more highly concentrated in Abidjan than in other regions; the gini coefficient for total assets (excluding land and education) is .820 in Abidjan, .615 in other urban areas, and .706 in rural areas. In contrast, and as expected given the higher concentration of schools in urban areas, education tends to be less highly concentrated in Abidjan than other regions; the gini coefficient for the single individual, maximum education variable is only .227 for primary schooling in Abidjan as compared to .715 for rural households, and .515 for secondary education in Abidjan as compared to .927 for rural households. The difference in the distribution of physical and human assets in part reflects the higher dependence on wage income in urban areas; many urban households sell labor and skills rather than goods they produce. Returns to education are typically found to be highest in the urban wage sector, and lowest in rural agriculture, although there is still much debate on this subject. The household level production

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6/ The Ivorian education system is similar to the French system. The first 7 years of schooling are considered primary (JE, CP1, CP2, CE1, CE2, CM1, CM2), the next 7 secondary (6E, 5E, 4E, 3E, 2E, 1RE, TER), and the last 8 tertiary (U1, U2, U3, U4, U5, U6, U7, U8).

Table 3-3

Côte d'Ivoire: Gini Coefficients for Selected Household Assets, By Region

Type of Asset	Abidjan	Other Urban	Rural	Total
Personal Assets				
Total savings	.852	.812	.839	.850
Value of durables and automobiles	.752	.666	.798	.800
Value of housing	.894	.709	-	-
Non-Farm Family Enterprise Assets				
Value of rental property	.918	.939	.981	.963
Value of other business assets	.988	.938	.988	.987
Farm Assets				
Total land used	.975	.816	.467	.651
Value of other agricultural assets	.992	.844	.607	.745
Education				
Total years of household members				
- primary	.458	.531	.686	.621
- secondary	.609	.679	.917	.812
- tertiary	.901	.959	-	.972
Most educated person, 20-60 years old				
- primary	.227	.387	.715	.543
- secondary	.515	.661	.927	.785
- tertiary	.890	.959	-	.968
Total assets, Excluding Land and Education	.820	.615	.706	.793

Source: CILSS tabulations.

functions estimated for this research show significantly higher returns to education for wage households than for farm households. However, rural and urban entrepreneurs also evidenced quite substantial returns to education investments.

The concentration of land holdings (measured in hectares per household) is low in the Côte d'Ivoire's rural areas in comparison to other LDC's. We estimated a gini coefficient of .467 for rural land, and .607 for other agriculture assets in rural areas. Typical gini coefficients for land distribution in other LDCs range from a low of .35 or .4 in some Southeast Asian countries to a high of .8 in parts of Latin America.

Other gini coefficients indicate a high degree of concentration of non-farm family enterprise assets and most personal assets. The distribution of durables is less highly skewed than some other assets, but an average gini coefficient of around .75 (by region) does not indicate a notably even distribution of resources.

To summarize the findings in this section: most physical assets are highly concentrated in the Côte d'Ivoire, with the possible exception of rural land holdings and other farm capital. In contrast, human assets (measured in terms of education) are not so highly concentrated, particularly primary schooling in Abidjan. However, the distribution of education is more skewed in rural areas than in urban areas, particularly secondary and tertiary education. In fact, none of the 900 household

sample of rural households reported a member over 20 years old having any tertiary education. Note that education is somewhat concentrated in urban areas outside of Abidjan, but not nearly to the degree evidenced in the countryside.

3.3 Measuring Expected Income

If household income reflects the returns to household capital and labor, then a basic model which relates levels of output (income) to capital inputs and labor can be estimated to determine returns to various input factors. Using this model, we hope to separate out returns to input factors (which for convenience we call permanent income, although it is an imperfect measure of "true" permanent income -- it might more appropriately be labelled normal or expected income) from other (likely transitory) income flows. Chapter 5 presents a general derivation of the permanent income model. For present purposes, let us assume that current income consists of a permanent component, call it y^p, and a transitory component, y^t. Thus,

$$Y = y^p + y^t \tag{3.1}$$

Further, permanent (expected) income is produced according to some process

$$y^p = f(L,A) \tag{3.2}$$

where L represents households labor inputs and A represents production capital measured in terms of household assets. This implies that

$$y = y^p + y^t = f(L,A) + y^t, \tag{3.3}$$

so $$y^t = y - f(L,A). \tag{3.4}$$

What is the best model for permanent income? There are basically two possibilities; a generalized household earnings function (similar to those estimated in the labor supply literature), or a household production function. The latter seems most appropriate in the present circumstances for reasons of comparability with past work and adherence to theory. There are numerous functional forms within the class of production functions; we chose to estimate a modified Cobb-Douglas function rather than one of the more flexible functional forms, again for reasons of comparability and computational ease. Cobb-Douglas models have been used extensively for this kind of household level analysis.

While it is clear how to introduce conventional measures of household assets and labor into the model, it is less clear how to enter human capital effects. Consider a Cobb-Douglas function of the standard form

$$y = e^{(\alpha_o+\varepsilon)} L^{\alpha_1} \left(\prod_n A_n^{\alpha_n}\right) \tag{3.5}$$

where L represents labor inputs,
$A_1,\ldots,A_n$ represent household assets including land, business and farm capital, and the like,
and ε is a stochastic error term.

We could treat education as just another asset; however, it may be more appropriately treated as a neutral factor, that is, one that enters the model so as not to effect other output elasticities (see, for example, Jamison and Lau, 1982, Moock, 1981). This implies a model of the general form

$$y = g(E)f(L,A) \tag{3.6}$$

where E represents human capital measured in terms of education, and all other variables are as previously defined.

The relevant Cobb-Douglas specification for the general model is:

$$y = e^{(\alpha_o+\varepsilon)} L^{\alpha_1} (\pi_n A_n^{\alpha_n}) e^{(\alpha_{n+1})E} \tag{3.7}$$

The equation can be linearized by taking natural logs. Thus the estimating equation becomes

$$\ln y = \alpha_o + \alpha_1 \ln L + \sum_n \alpha_n \ln A_n + \alpha_{n+1} E + \varepsilon \tag{3.8}$$

In this specification, α_{n+1} measures the percentage change in output in response to a unit change in education, all other inputs held constant, that is,

$$\alpha_{n+1} = \partial \ln y / \partial E \qquad (3.9)$$

This is typically interpreted as a measure of returns to education.

The Cobb-Douglas model in (3.8) was used to develop a measure of permanent or expected income. Clearly other specifications could have been used. In particular, education might have been entered in the model to affect shifts in the elasticities of other factor inputs. A simple test of the neutrality hypothesis, which essentially just entails introducing interaction effects into the basic model, is described at the end of the section.

Consumption models analogous to the Cobb-Douglas production models are also described in this section. Model structure and exogenous variables are identical; total income has simply been replaced by consumption on the left-hand side of the equation. The consumption estimates provide a basis of comparison for the income estimates.

Estimation Results

Table 3-4 describes the variables used in the production functions. All are measured in value terms (CFA) except land inputs

Table 3-4

Description of Variables in Cobb-Douglas Production Functions

Annual Income	Total annual income net of annual production costs
Business Assets	Gross value of business assets including rental capital
Personal Assets	Value of savings and automobiles
Land Used	Total land used measured in hectares
Other Farm Assets	Value of farm assets net of land (tools, equipment, crop in storage)
Time Inputs:	
Children	Estimated hours worked per year for children (less that 15 years old)
Men	Estimated hours worked per year for adult men
Women	Estimated hours worked per year for adult women
Experience of Head	Proxy for work experience, computed as (age-6-years of schooling)
Education	Years of education of most educated person (male and female) 25-60 years old in the household, entered as a spline variable in models:
Men, Primary	Years of primary education, men, 25-60 years
Men, Secondary	Years of secondary education, men, 25-60 years
Men, Tertiary	Years of tertiary education, men, 25-60 years
Women, Primary	Years of primary education, women, 25-60 years
Women, Secondary	Years of secondary education, women, 25-60 years
Women, Tertiary	Years of tertiary education, women, 25-60 years

(hectares), labor inputs (estimated hours worked per year), experience of the head of household (years), and education (years of education). Education variables were described in the previous section; the second measure, defined as the years of formal education of the most educated person in the household aged 25 to 60 years, was used in household production estimates.

Time Use and Education

Table 3-5 shows variable means for production/consumption estimates, by region and production categories. While the asset variables have been discussed previously, time and education variables appear here for the first time and thus are accorded a brief description.

Regarding time use: it is generally difficult to measure household time inputs in a conventional survey format, particularly for farm and non-farm self-employment activities. First, there is a recall problem; while a respondent may have a good idea of how he or she spent his/her time today, and possibly yesterday and the day before, last week or last month may not be remembered with much accuracy. The problem is not severe if work patterns are roughly constant; for example, if the respondent has a wage job and goes to work on a regular schedule. Measurement problems are more severe, however, for work with seasonal variation; farmers work many more hours around planting and harvesting time than during slack periods. Time use is only reported over "the last 7 days" in the CILSS, which, while minimizing recall error, may yield time use estimates that suffer from seasonal biases. While means are likely to

Table 3-5

Côte d'Ivoire: Variable Means for Household Production Function Estimates

	Regions			Household Production Categories			
	Abidjan	Other Urban	Rural	Wage Only	Agricultural Only	Self-Employment Only	Wage and Other
Annual income (CFA)	2,823,012	1,934,893	1,028,662	2,902,274	901,715	1,496,964	2,264,279
Annual consumption expenditures (CFA)	2,772,481	1,940,439	1,011,132	2,784,834	988,641	1,429,640	2,065,773
Land used (ha)	0.512	2.581	7.401	.011	7.419	5.60	3.20
Value of business assets (CFA)	2,301,631	773,188	185,407	822,523	139,793	975,424	565,425
Value of personal assets (savings and automobile) (CFA)	675,788	507,513	171,940	693,830	137,419	359,907	533,425
Value of non-land agricultural assets	20,788	73,063	244,560	161	254,858	172,749	90,925
Annual hours worked							
- children, <15 years	46.3	151.2	630.8	13.6	672.2	389.5	206.9
- Men, 15+ years	2462.5	2949.9	2854.9	2259.6	2867.7	2911.6	3236.8
- Women, 15+ years	1530.3	1905.5	2985.6	693.6	2952.3	2928.8	2482.8
Years of experience (head of household)	29.8	34.1	43.4	22.4	45.2	41.4	33.7
Years of education (max. 25+ years old)							
Males, primary	3.50	2.81	1.03	4.32	0.84	1.41	3.04
Males, secondary	2.13	1.47	0.19	3.07	0.10	0.38	1.29
Males, tertiary	0.49	0.13	0.00	0.68	0.00	0.02	0.07
Males, total years of education	6.12	4.41	1.22	8.07	0.94	1.81	4.40
Females, primary	2.06	1.23	0.41	2.30	0.29	0.82	1.37
Females, secondary	1.15	0.27	0.03	1.33	0.03	0.14	0.35
Females, tertiary	0.24	0.02	0.00	0.23	0.00	0.02	0.06
Females, total years of education	3.45	1.52	0.44	3.86	0.32	0.98	1.78

Source: CILSS tabulations.

be unbiased estimates of annual values (assuming all seasons are represented equally in the sampling cycle), time use variables will have high variance, particularly for households reporting extensive farm and other seasonally variable self-employment activities.

Regarding sample means of reported time use: rural children work many more hours than their urban counterparts; children in Abidjan worked an average of 46 hours annually per household, while those in rural areas worked 631 hours per household (the average number of children per household is 3.1 in Abidjan, and 3.9 in urban areas outside Abidjan and rural areas, which slightly reduces differences on a per-child basis). Child labor inputs are lowest for households who receive all earned income from wages, and highest for farm households and households in the non-farm or mixed self-employment category. Adult labor inputs, particularly those of adult women, are significantly higher in rural areas than in urban areas, and are likewise higher for households with high levels of self-employment. For example, households in Abidjan report annual male labor inputs of 2462 hours (1324 hours on average per male person, for a fifty week average of 26 hours per person) while rural households report 2855 male hours per year (1622 hours on average per male person, for a fifty week average of 32 hours per person). The contrast between women's time inputs is more extreme; in Abidjan, women work some 1530 hours a year (805 hours per female person, 16 hours per week) in market activities (note that this does not include work inside the home, which can be substantial) while rural women work 2986 hours per year (1298 hours per female person, 26 hours per week). Like the case of children's time use, the urban/rural

classification really reflects differences in the structure of production; time inputs are lowest for households dependent on wages (who predominately reside in the city) and highest for households dependent on income from farm and non-farm family enterprises.

The experience-of-household-head variable in conjunction with years of education indicates that urban households are (i) younger or (ii) better educated (or both younger and better educated) than rural counterparts. Means by production categories show that wage-earning households are younger and/or better educated then households dependent on self-employment income.

Similarly, means of education variables suggest that urban/wage households are both younger and better educated than the typical rural household. Overall years of education fall steadily for both men and women, moving from Abidjan, 6.12 years (men) and 3.45 years (women), to other urban areas, 4.41 years (men) and 1.52 years (women), to rural areas, 1.22 years (men) and 0.44 years (women). According to category classifications, households receiving all income from farm activities or other self-employment report the lowest levels of education, while households with at least one employee report the highest levels. Note the negative correlation between education and time use; time inputs are highest in households with low levels of education and lowest in households with high educational achievement. Clearly time spent in leisure activities increases with increasing implicit wage rates, or the

income effect outstrips the price effect in household labor supply decisions.

Production Functions

Table 3-6 presents parameter estimates of the basic household production function for each of the three major regions in the Côte d'Ivoire. For purposes of comparison, total consumption regressions are presented as well. Note that time inputs are separated into adult male and adult female categories (children's time inputs were not correlated with household income in a statistically significant fashion, regardless of model specification, and accordingly were dropped), and education is likewise stratified by gender and level. Education is estimated as a spline variable; for example, the "male, primary" coefficient represents the returns to each year of primary education for men, while the "male, secondary" variable is a similar estimate for each year of secondary education. Thus the overall returns to education for an adult male, living in an urban area outside Abidjan, who completed eight years of education (6 years primary, 2 years secondary) is 61 percent -- 47 percent (6*.079) for the first six years of primary education, and 14 percent (2*.070) for two years of secondary education.

The model results are encouraging; the equations fit the data reasonably well (R^2's range from .35 to .44) and parameters are generally of the appropriate sign and magnitude. Somewhat surprisingly, given measurement problems and the results of similar efforts in sub-Saharan Africa (see, for

Table 3-6

Côte d'Ivoire: Household Production Functions, By Region [1/]

	Abidjan		Other Urban		Rural	
	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)
Physical Assets						
Personal assets (CFA)	.071 (5.9)	.032 (6.1)	.107 (6.3)	.092 (7.9)	.052 (5.3)	.033 (5.8)
Non-farm business (CFA)	.019 (1.7)	-.003 (4.6)	.125 (3.2)	.011 (2.0)	.044 (5.6)	.020 (4.5)
Land holdings (CFA)	.121 (0.9)	.076 (1.4)	-.024 (0.4)	-.012 (0.3)	.520 (8.6)	.336 (9.7)
Other agricultural assets (CFA)	-	-	-	-	.033 (1.8)	-.003 (0.3)
Time Inputs						
Adult male (hours/year)	.073 (3.4)	.009 (0.9)	.042 (2.1)	.011 (0.8)	.100 (5.1)	.016 (1.4)
Adult female (hours/year)	.038 (2.1)	.007 (0.8)	.052 (3.8)	.002 (0.2)	.069 (3.9)	.019 (1.8)
Human Capital						
Experience (age 6, education of head of household)	.175 (1.3)	.269 (4.7)	-.003 (0.0)	.197 (3.1)	-.093 (1.0)	-.009 (0.2)
Education (max. years completed, 25+ years old, spline)						
- Male, 0-6 years (primary)	.000 (0.0)	.037 (2.8)	.079 (3.6)	.065 (4.4)	.045 (2.3)	.038 (3.4)
- Male, 7-13 years (secondary)	.056 (1.6)	.050 (3.3)	.070 (2.5)	0.49 (2.6)	.087 (2.3)	.041 (1.8)
- Male, 14+ years (tertiary)	.121 (2.2)	.050 (2.1)	.031 (0.4)	.022 (0.4)	-	-
- Female, 0-6 years (primary)	.074 (2.4)	.038 (2.9)	.039 (1.8)	.048 (3.3)	.036 (1.6)	.048 (3.7)
- Female, 7-13 years (secondary)	.045 (1.0)	.038 (1.9)	.028 (0.7)	.013 (0.5)	.068 (0.7)	.065 (1.2)
- Female, 14+ years (tertiary)	.029 (0.4)	-.001 (0.0)	.333 (1.4)	.291 (1.8)	-	-
Intercept	11.84	12.94	11.71	12.02	10.37	12.32
R^2	.355	.451	.439	.464	.366	.331

[1/] t-statistics are in parentheses.

Source: CILSS tabulations.

example, Mueller, 1984), the coefficients on time inputs are significant and positive for the income regressions, and tend to be insignificant and positive for consumption regressions. This makes good sense; we expect this year's income to be correlated with this years efforts (as measured in time inputs), but not necessarily that this year's consumption be as highly correlated with this year's efforts. Interestingly, we found that the correlation between time and consumption levels was higher in rural areas than in urban areas. This may be caused by rural liquidity constraints which increase the correlation between current income and consumption.

The actual magnitude of coefficients can be deceptive. For example, the female time parameter is .038 in Abidjan and .069 in rural areas. This does not necessarily mean that women produce twice as much per unit of time in rural areas, but rather that the share of total output accruing to women's labor (or the elasticity of output with respect to women's labor) is higher in rural areas is higher than in Abidjan, controlling for levels of education. The Cobb-Douglas specification allows us to easily compute the marginal products of factor inputs. For example, if L represents labor, A other assets, and α_o the model intercept,

$$y = \alpha_o L^{\alpha_1} (\pi_n A_n^{\alpha_n}) \qquad (3.10)$$

then the marginal product of labor (MPL) is defined as

$$(\partial y/\partial L) = \alpha_o \alpha_1 L^{\alpha_1 - 1} (\pi_n A^{\alpha_n}) = \alpha_1 (y/L) \qquad (3.11)$$

Table 3-7 shows marginal products of labor by region in CFA per hour. Implicit wages tend to be highest in Abidjan, and lowest in rural areas, and higher for women than men in urban areas (although lower in rural areas). Note that the MPL in Abidjan is significantly lower than the average formal sector wage rate, which is some CFA 350 to CFA 400 per hour. This may in part be due to the limited nature of the income measure used -- it only represents monetary income, and not full income (e.g., the value of leisure and work inside the household). However, the sizable gap between actual wages and imputed household wage rates suggests that labor markets are not perfect in the Côte d'Ivoire, as in most developing countries. Our analysis suggests that wages paid to employees are significantly higher than the implicit wage for the urban self-employed.

A similar but lesser differential exists in rural areas of the Côte d'Ivoire, although the wage sector is too limited to obtain good estimates of rural wage rates. A measure of typical daily wages for agricultural laborers (by gender) was obtained from the CILSS community questionnaires. If we assume a working day of 10 hours, average hourly wages in agriculture are CFA 57.8 and CFA 48.5 for men and women, respectively. These can be compared to estimated MPL's for men and women in rural households of CFA 40.4 and CFA 22.3 respectively. Clearly estimated wage differentials are lesser in rural areas than in urban

Table 3-7

Côte d'Ivoire: Value of the Marginal Product of Labor, By Region

	Abidjan (CFA)	Other Urban (CFA)	Rural (CFA)
Adult Male Time Inputs	83.7	27.5	36.0
Adult Female Time Inputs	70.1	52.8	23.8

Source: CILSS tabulations.

areas, which suggests that (i) our measure of rural income is closer to full income than our measure of urban income, and/or (ii) the distribution of wages is more skewed in Abidjan, and/or (iii) urban labor markets are more "imperfect" than rural labor markets.

Returns to education are typically estimated from standard Mincer-type earnings functions, which have the natural log of wages on the left hand side of the equation and education, experience, and time inputs on the right hand side. The unit of observation is the individual employee. Our equations, estimated at a household level, yield lower estimates of the returns to education than conventional individual-based earnings functions (see van der Gaag and Vijverberg, 1986) for the Côte d'Ivoire. There are two reasons for this: First, earnings functions are typically estimated for wage employees alone, as it is difficult to obtain individual wage rates for farm and non-farm family enterprise workers. If labor markets do not operate perfectly, payments to labor may be higher in certain sectors than in others (for example, higher in the formal sector than in the informal sector). Second, as noted in the previous paragraphs, the left-hand side of the household level consumption function does not measure full income -- the value of leisure and housework/childcare is omitted -- which may downward bias the education coefficients. In essence, the left-hand side variable in an earnings function is a closer approximation of individual-level full income insofar as the model is only estimated over individuals who have chosen to work and the reservation wage is assumed to be the actual wage. In contrast, only income from market activities

outside the household is included on the left-hand side of the household production functions.

The full-income problem is not soluble within a household production framework; any income imputation for housework and leisure time will pre-define the very parameters we are attempting to estimate. However, as a simple exercise, we estimated a more conventional production function for non-farm family enterprises. The model is once again specified as modified Cobb-Douglas, with gross revenues per household from all family enterprises within the household on the left-hand side of the equation, and family enterprise assets, variable inputs (both measured in value terms), time inputs (total hours per year), and education (maximum achieved by the most educated adult male and adult female working in a household enterprise) on the right-hand side. The results of this model are described in Table 3-8, which includes variable means and parameter estimates. According to these estimates, the marginal product of labor used for non-farm family enterprise activities is CFA 450 per hour (controlling for education inputs), much more in line with reported average wage rates, and education earns a return of 10.9 percent a year (computed based on a model not described here that constrains education effects across gender), likewise more in line with external estimates. It is interesting to note that the returns to education for women are significantly higher than returns for men in this sector. The difference likely follows from the high levels of female participation in non-farm family enterprise activities -- nearly two-thirds of the enterprises in our sample were managed and primarily staffed by women. In particular, women

Table 3-8

Côte d'Ivoire: Production Function and Variable Means; Non-Farm Family Enterprises [1/]

Inputs	Parameters	Variable Means
Business Capital	.045 (3.9)	541,751
Other Annual Inputs (utilities, wages, raw materials, etc.)	.398 (23.2)	2,846,451
Time Inputs (hours/year)	.302 (9.2)	2440
Human Capital (maximum education, 25+ years old)		
Men	.053 (1.2)	3.57
Women	.130 (2.6)	2.12
Intercept	5.909 (24.7)	-
R^2	.704	
N of Cases	520	
Dependent Variable		3,631,356

[1/] t-statistics in parentheses.

Source: CILSS tabulations.

dominated the informal food commerce sector, and controlled half of the other commerce enterprises.

Returning to the full household level model: Past work has shown returns to education to be highest for completion of primary school, and to fall thereafter. According to our estimates, this is not the case in Abidjan, nor, in rural areas for men, although it is generally the case for women throughout the country. Annex Table 3.1 is shows similar estimates to those in Table 3-6, but education is combined across gender. Based on results in both tables, it is clear that a year of secondary education (given, of course, that one has completed primary school) generally elicits higher returns than a year of primary schooling across all regions, and a year of university level education yields even a higher payoff in Abidjan. These findings are consistent with van der Gaag-Vijverberg's (1986) estimates within a conventional earnings function framework.

Other variables in the model should be noted briefly. The experience-of-household-head variable is not highly correlated with income levels, although it is quite highly correlated with consumption levels. Personal assets tend to influence output levels more than business assets, and land is the dominant input factor in rural areas. In fact, the land coefficient is large relative to other African rural productivity studies, and rather more significant. This likely reflects the strength of cash crop production (primarily coffee and cocoa) in the Côte d'Ivoire, and relative homogeneity of cash crop cultivation techniques.

Comparisons between income and consumption models are enlightening; the parameters in the consumption models are generally lower than those in income models, as might be expected given the hypothesized relationship between "permanent" consumption and "permanent" income -- $q^p = \mu y^p + q^t$ (see Chapter 5). Clearly if the marginal propensity to consume out of permanent income is less than one, the value of the consumption model parameters will be generally less than the value of income model parameters. Most variables show similar effects across the two models, with the exception of work experience (defined as age-education-6), which has a significant and rather substantial effect on consumption levels in urban areas (Abidjan and other urban), and time inputs, which are significant in income equations and generally not significant in consumption equations. The experience variable is likely picking up life cycle and household size effects on consumption, which do not directly impact income levels except through time input variables.

Tests of the Neutrality Hypothesis

A simple test is performed to determine whether education is indeed factor neutral, that is, whether different levels of education shift the output elasticities for selected physical inputs. In particular, we are concerned about possible interaction effects between labor inputs and schooling. Under the non-neutrality hypothesis, the constant elasticity assumption is relaxed. The new form of the model becomes (from 3.5)

$$y = e^{(\alpha_o+\varepsilon)} L^{(\alpha_1+\alpha_{1+n}E)} (\pi_n A_n^{\alpha_n}) \tag{3.12}$$

which in log-linear form is

$$y = \alpha_o + \alpha_1 \ln L + \alpha_{n+1} (E \ln L) + \sum_n \alpha_n \ln A_n + \eta \tag{3.13}$$

New elasticities become

$$(\partial y/\partial L) = \alpha_1 + \alpha_{1+n}(E) \tag{3.14}$$

which means that the change in income with respect to labor inputs is a function of the estimated labor elasticity and the level of education in the household.

Education-labor interaction variables were introduced for female and male time inputs by the basic six education variables. The maintained hypothesis is that the six added interaction variables do not significantly change the explanatory power of the basic regional equations described previously. F-tests performed on all three equations did not allow us to reject the hypothesis of unchanged explanatory power at the 95 percent confidence level. 7/ Accordingly, the hypothesis of the factor neutrality of education inputs seems empirically acceptable.

7/ Respective F-statistics are 1.3026 (df=6,312) for Abidjan, 1.4021 (df=6,311) for other urban areas, and 1.5268 (df=6,875) for rural households. The critical value for the 95 percent confidence interval for Abidjan and other urban areas is 2.13, and is 2.11 for rural areas.

Production Functions by Sector

Household production functions were also estimated for the four production categories used throughout the research. These results are presented in Table 3-9. While similar to regionally-based estimates, there are some notable differences between the sets of equations. First, the coefficient for male time inputs is negative and insignificant for households in the first two categories -- wage income only and farm income only. In the case of the wage category, labor supply estimates for the Côte d'Ivoire have provided some evidence of a backward bending labor supply curve in the wage sector (a stronger income than price effect in labor supply decisions). Certain occupations (in particular, teachers, some other government workers, and doctors) report high monthly earnings and low time inputs. This creates a rather tenuous relationship between hours worked and earnings when all wage earners are considered. The insignificance of reported time inputs in generating farm income is common in studies of this sort. It may be caused by two factors: (i) severe problems in obtaining accurate measures of time inputs due to recall error and seasonality effects, which would bias the coefficients downwards, and (ii) the effect of sharecropping, prevalent amongst cash crop farmers, which weakens the link between the farmer's efforts and his or her realized output. Under sharecropping arrangements, the farmer gets a fixed share of the crop regardless of his/her labor inputs into the process. In contrast to variations in the level of significance of adult male time inputs, women's efforts show a consistent, significant positive

Table 3-9

Côte d'Ivoire: Household Production Functions: By Production Category [1/]

	Wage Earnings Only (N=260)		Agricultural Earnings Only (N=618)		Business or Business & Agricultural Earnings (N=406)		Wage & Self-Employment Earnings (N=250)	
	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)
Physical Assets								
Personal assets (CFA)	.055 (5.2)	.012 (1.7)	.040 (4.4)	.009 (1.2)	.072 (6.7)	.051 (6.5)	.042 (3.5)	.032 (3.2)
Non-farm business (CFA)	.036 (3.7)	.004 (0.7)	.035 (4.8)	.025 (2.6)	.053 (4.9)	.034 (4.3)	.049 (5.3)	.032 (4.0)
Land holdings (CFA)	-	-	.633 (12.1)	.345 (8.6)	.092 (1.8)	.004 (0.1)	-.016 (0.3)	-.067 (1.5)
Other agricultural assets (CFA)	-	-	.229 (7.3)	.142 (5.9)	-	-	-	-
Time Inputs								
Adult male (hours/year)	-.013 (0.5)	-.058 (3.5)	-.013 (0.8)	.012 (0.8)	.057 (3.1)	.017 (1.2)	.044 (1.5)	.021 (0.8)
Adult female (hours/year)	.031 (2.0)	.012 (1.1)	.031 (2.2)	.020 (1.8)	.062 (3.6)	.012 (0.9)	.027 (1.4)	-.000 (0.1)
Human Capital								
Experience (age 6, education of head of household)	.101 (1.1)	.277 (4.5)	.069 (0.8)	.039 (0.5)	.151 (1.3)	.226 (2.7)	.358 (3.4)	.357 (3.9)
Education (max. years completed, 25+ years old, spline)								
- Male, 0-6 years (primary)	.072 (2.8)	.079 (4.5)	.040 (2.4)	.038 (2.9)	.019 (0.8)	.044 (2.7)	.077 (3.4)	.067 (3.4)
- Male, 7-13 years (secondary)	.085 (3.4)	.072 (4.3)	.043 (1.0)	.039 (1.2)	.105 (2.8)	.047 (1.7)	.075 (2.6)	.060 (2.4)
- Male, 14+ years (tertiary)	.078 (2.2)	.051 (2.1)	-	-	-.513 (1.6)	-.096 (0.4)	.238 (2.6)	.113 (1.4)
- Female, 0-6 years (primary)	.009 (0.4)	.039 (2.6)	.032 (1.4)	.074 (4.3)	.062 (2.7)	.048 (2.8)	.038 (1.7)	.041 (2.1)
- Female, 7-13 years (secondary)	.053 (1.7)	.023 (1.1)	.022 (0.3)	-.029 (0.5)	.009 (0.1)	.040 (0.9)	.060 (1.3)	.061 (1.6)
- Female, 14+ years (tertiary)	.009 (0.2)	.010 (0.3)	-	-	.514 (2.3)	.231 (1.4)	.079 (0.9)	-.055 (0.7)
Intercept	12.70	13.24	8.46	10.78	10.90	11.93	11.15	11.94
R^2	.546	.510	.466	.372	.337	.304	.478	.417

[1/] t-statistics are in parentheses.

correlation with income levels across all sectors; further, output elasticities vis-a-vis women's work time are roughly .03 for all sectors except the non-farm/farm self-employment category. For this latter group, which is dominated by female operated small businesses (predominately food sellers and traders), the output elasticity is around .06.

The education parameters also show significant variation across sectors; returns to formal education are clearly higher for households participating in the wage sector (categories 1 and 4) than for farm households, and possibly stronger (although variable) for households dependent on income from self-employment activities outside (and inside) the farm sector. Wage-earning households evidence returns to education of roughly 8 percent a year, in contrast to farm households, where returns appear to be about 4 percent a year for the first six years of schooling, and not significantly different from zero thereafter. Households with non-farm family enterprises exhibit minimal returns to male primary education, and quite high returns (10.5 percent a year) to male secondary education. In contrast, women's primary education shows a 6 percent return, and women's tertiary education a 51 percent annual return for households in the third category.

Concerning the relationship between income and consumption models and education: With the exception of the non-farm self-employment sector, income and consumption effects are much more similar in size than found in the regionally segmented models. This suggests that the sectorally segmented models may yield a higher correlation between consumption and

permanent income than the region models, which implies a better estimate of permanent income. Interestingly, women's secondary and tertiary education has a stronger effect than primary education on output levels, while women's primary education has a stronger effect on consumption levels. This likely reflects the endogeneity of labor supply decisions in determining permanent income and consumption levels.

ANNEX Table 3.1

Côte d'Ivoire: Household Production Function for Urban/Rural Areas: Not Gender Segmented [1/]

	Abidjan		Other Urban		Rural	
	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)	Log (Inc.)	Log (Expend.)
Physical Assets						
Personal assets (CFA)	.074 (6.2)	.031 (5.7)	.105 (6.2)	.090 (7.6)	.054 (5.5)	.034 (6.0)
Non-farm business (CFA)	.023 (2.2)	.005 (1.0)	.026 (3.6)	.015 (2.9)	.043 (5.5)	.020 (4.5)
Land holdings (ha)	.082 (0.6)	.067 (1.1)	-.015 (0.3)	.014 (0.4)	.504 (8.5)	.337 (9.8)
Other agricultural assets (CFA)	-	-	-	-	.032 (1.7)	-.004 (0.3)
Time Inputs						
Adult male (hours/year)	.074 (3.5)	.018 (1.9)	.054 (3.0)	.018 (1.4)	.102 (5.3)	.015 (1.3)
Adult female (hours/year)	.055 (3.1)	.016 (2.0)	.052 (3.9)	.004 (0.5)	.069 (3.9)	.020 (1.9)
Human Capital						
Education (max. years completed, (20+ years old, spline)						
0-6 years education	.025 (0.8)	.037 (2.5)	.093 (4.7)	.071 (5.1)	.063 (3.8)	.053 (5.5)
7-13 years education	.070 (2.2)	.053 (3.5)	.094 (3.7)	.054 (3.0)	.089 (2.5)	.047 (2.3)
14+ years education	.147 (3.4)	.053 (2.6)	.071 (1.0)	.019 (0.4)	-	-
Intercept	12.36	13.77	11.58	12.62	10.02	12.28
R^2	.331	.363	.445	.433	.367	.326

[1/] t-statistics are in parentheses.

Source: CILSS tabulations.

4. SAVINGS: CONCEPTUALIZATION AND MEASUREMENT

We use a single year cross-section of households from the Côte d'Ivoire in this study, and so are limited by data availability in the way we operationalize the study's savings concept. At best, we can provide an estimate of household saving in the year of the survey (1985), based on the measured residual between household income and consumption expenditures. The accuracy of the estimate rests on the accuracy of both income and expenditure estimates. Past work has shown that incomes are difficult to measure in a standard survey format, particularly incomes derived from farm and non-farm self-employment. In general, incomes are underestimated in household surveys, which would tend to bias savings estimates downward. However, efforts were made in the CILSS to measure income as accurately as possible (and at a high level of disaggregation). Note, however, that income from farm and non-farm self-employment typically has a high transitory component, which will also lower the correlation between current income and current expenditures in any particular year.

Although we cannot have complete faith in the accuracy of measured saving rates based on survey data, it should be possible to learn something from them concerning the relative distribution of private savings across sufficiently homogeneous segments of the population. For example, past work has shown that farm income is measured with error, and tends to be underreported, while the measurement of wage income is less likely to be error-prone. If the underreporting is relatively consistent

across farm households, then although actual saving rates will appear unrealistically low, they will provide up with a means for comparing relative propensities to save within each group. Thus, while claims such as "employees save more than the self-employed" may be questionable given our data sources, other sorts of claims such as "middle-aged farmers evidence higher propensities to save than elderly farmers" are likely to be more valid. In the former case, our classification variable is type of income, which we suspect is measured with more or less error, depending on its source. In the latter case, classification is effected through an exogenous variable -- age of the individual -- and income source is controlled for. In reality, many of the savings comparisons we present will lie somewhere between these two extremes, and so must be interpreted with care.

Note that household consumption may also be measured with error; pride may cause poorer households to overstate consumption levels, while caution causes wealthier households to understate said levels. Further, it may be difficult to keep accurate accounts of consumption expenditures in large households, and many in the Côte d'Ivoire are large in comparison to Western standards. However, as with household income estimates, we can only endeavor to use consumption estimates with care, and note carefully where results may be reflecting measurement error rather than actual economic behavior of households.

The first section of the chapter presents estimated residual savings rates (computed as current income minus consumption, divided by

current income) for households stratified by per capita income and consumption deciles, and by age of the household head, main sources of income (wage versus non-wage), and male labor availability. All estimates are further stratified by the three major geograpic region (Abidjan, other urban areas, and rural areas), as well as presented for the Côte d'Ivoire in its entirety. These regional stratifications are used throughout the research. In addition, estimates of the proportion of savers and dissavers by per capita income and consumption deciles are described. This section is closed by a description of food shares and income composition by region and savings rates.

Due to data limitations, we cannot measure the possible extent of reporting error in household income or consumption measures directly. We can, however, estimate a general model of savings behavior that is suggestive of the extent to which apparent savings (or dissavings) rates are a product of measurement error. The model classifies households into savings or dissavings categories using maximum likelihood techniques. It also provide evidence concerning the applicability of the permanent income hypothesis in the Côte d'Ivoire. The savings model and empirical results are described in the second section of the chapter.

4.1 Household Saving Rates in the Côte d'Ivoire

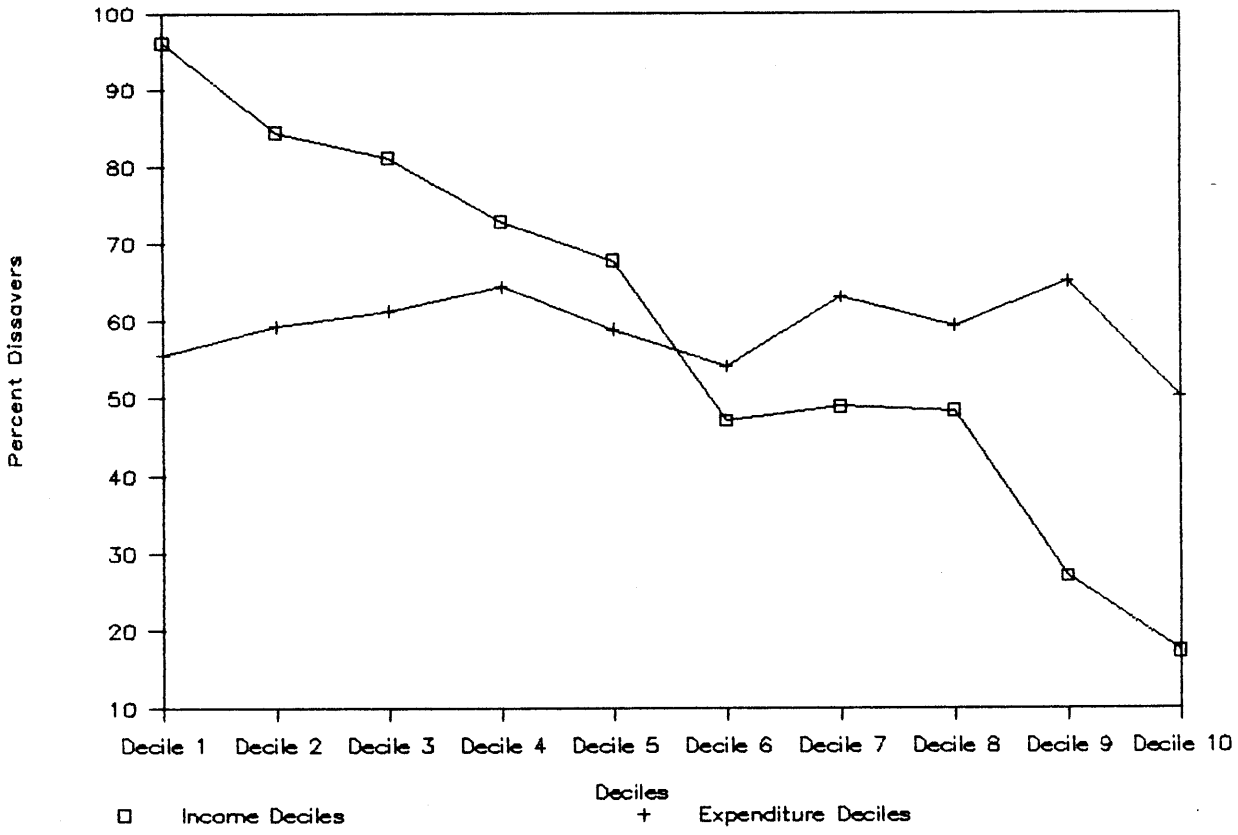
Throughout this study, household savings are defined as the difference between current income and consumption expenditures, and the savings rate as the ratio of household savings to current income.

Alternative measures such as the ratio of expenditures to income have been used previously; however, measures of saving were chosen for reasons of clarity and simplicity -- we might say, for example, that households in a particular region save on average CFA 150,000 per annum out of an annual income of CFA 2,000,000, with an implied savings rate of 7.5 percent (92.5 percent of current income is used for consumption purposes, and 7.5 percent is saved).

If we define savers as households reporting income greater than 1.025 times consumption expenditures, "light" dissavers as households reporting income between .925 and .50 times consumption expenditures, "heavy" dissavers reporting income less than .50 times consumption expenditures, and the remainder as neither savers nor dissavers, some 35 percent of Ivorian households are identifed as savers in the CILSS, 59 percent as dissavers (22 percent light dissavers and 37 percent heavy dissavers), and 6 percent as neither. These figures are in line with previous survey findings (see, for example, Visaria, 1980). The proportion of savers and dissavers varies significantly across different subgroups in the population. Figure 4.1 shows the these relative percentages by income and expenditure deciles for the total population. Note that households who spend roughly what they earn in the current year make up only a small percentage of households surveyed. They will not be discussed in detail. Not surprisingly, the vast majority of households in the lowest income deciles (96.4 percent in the lowest ten percent of the income distribution, and 84.6 percent in the second decile) are dissavers. In contrast, only slightly over a quarter of households in the

Figure 4.1

Proportion of Savers By Per Capita Income and Expenditure Deciles



ninth decile and some 13 percent of households in the upper ten percent of the income distribution report spending more than they earned in the survey year.

The distribution of savers and dissavers by expenditure deciles suggests that the likelihood of saving in a particular year has little to do with relative levels of consumption, with the possible exception of households at the very upper end of the expenditure distribution; these households have a slightly higher proportion of savers than evidenced in other expenditure groups. The lack of correlation between propensities to save and level of total household expenditures lends credence to our (and other's) hypothesis that consumption expenditures act as a proxy for permanent income; if current income is inherently variable for most households regardless of level of expenditures, and, if expenditures are highly correlated with permanent income, then propensities to save or dissave at a particular point in time should in general be independent of permanent income levels.

There are, however, a number of factors which might affect the relationship between long-run or permanent income and savings behavior in the Côte d'Ivoire. The most important among these are (i) liquidity constraints, which increase the correlation between current income and consumption and decrease the correlation between permanent income and consumption, and (ii) the necessity of (or indeed attractive returns associated with) self-financing, which might decrease the correlation between current income and consumption, particularly if future liquidity

constraints are anticipated, and the household is not presently so constrained. Table 4-1 shows the percentage of saving and dissaving households by income and expenditure quintile and region (Abidjan, other urban, rural). According to this table, "poor" households (in terms of low expenditure levels) in Abidjan and to some extent other urban areas are more likely to dissave than poor households in rural areas, likely due to liquidity or credit constraints -- credit is generally more difficult to obtain in rural areas, particularly to finance consumption expenditures, than in urban areas. In addition, "rich" households (again, in terms of high expenditure levels) are more likely to save in urban areas than their rural counterparts. This is likely caused by relative levels of wealth (there is greater income disparity in urban areas) and income stability (a significant share of urban income is drawn from wages, so the motive to self-invest is less apparent). It is important to note, however, that examining savings and dissavings behavior per se does not provide definitive evidence regarding the existence of liquidity constraints in the population -- households are liquidity constrained only if they would like to borrow and cannot. The higher proportion of dissavers in urban areas (particularly Abidjan) merely suggests that it may be easier to dissave in urban areas than in rural areas. A formal test for liquidity constraints across regions is described in Chapter 6.

Table 4-1

Percentage Savers and Dissavers by Income Quintile and Region

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
EXPENDITURE QUINTILES						
Abidjan						
Savers	31.8	25.8	19.4	37.9	47.0	32.3
Equal	6.1	9.1	9.0	6.1	4.5	6.9
Dissavers	62.1	65.1	71.6	56.1	48.5	60.8
Other Urban Areas						
Savers	37.9	37.9	40.3	51.5	37.9	32.3
Equal	4.5	9.1	9.0	4.5	4.5	6.9
Dissavers	57.6	53.0	50.7	44.0	57.6	60.8
Rural Areas						
Savers	41.0	30.3	29.8	36.0	28.8	33.2
Equal	3.4	4.5	8.4	7.3	5.1	5.7
Dissavers	55.6	65.2	61.8	56.7	66.1	61.1
INCOME QUINTILES						
Abidjan						
Savers	3.0	10.6	23.9	47.0	77.3	32.3
Equal	1.5	4.5	11.9	12.1	4.5	6.9
Dissavers	95.5	84.9	64.2	40.9	18.2	68.0
Other Urban Areas						
Savers	3.0	18.2	43.3	63.6	77.3	41.1
Equal	1.5	9.1	10.4	6.1	4.5	6.3
Dissavers	95.5	72.7	46.3	30.3	18.2	52.6
Rural Areas						
Savers	6.7	17.4	26.4	46.1	69.5	33.2
Equal	0.6	3.4	8.4	10.7	5.6	5.7
Dissavers	92.7	79.2	65.2	43.2	24.9	61.1

Source: CILSS tabulations.

Table 4-2 shows savings rates by per capita income and expenditure deciles. Table 4-3 presents similar information by quintile for each of the three regions in the Côte d'Ivoire. Note that savings rates are defined on the basis of group averages rather than the average of individual rates, that is,

$$SAVE_d = (\sum_i INCOME_{i,d} - \sum_i EXPENDITURES_{i,d})/\sum_i INCOME_{i,d} \quad (4.1)$$

where: SAVE is the average savings rate,

i denotes households, and

d denotes deciles.

According to Table 4-2, households in the bottom 70 percent of the income distribution dissave on average. According to the CILSS, the overall savings rate in the population is 1 percent of annual income. In all likelihood, the aggregate savings estimate is unrealistically low, for reasons discussed earlier in the text. However, the fact that the lower 70 percent of the income distribution report negative savings rates is consistent with numerous other studies of private savings behavior based on survey data. For a long time, these results were interpreted to mean that the poor (generally defined in terms of current income) did not contribute to capital formation in developing economies. It is clear, however, that current income is not a good measure of long-term well-being. If we look instead at savings rates by per capita consumption deciles, we find significantly less correlation between wealth and level of household savings. According to Table 4-2, savers are grouped in the

Table 4-2

Per Capita and Total Residual Savings Ratios [1/], by Income and Consumption Deciles

	Per Capita Income	Per Capita Consumption
Decile 1	-3.54	0.21
Decile 2	-0.87	0.12
Decile 3	-0.72	0.12
Decile 4	-0.42	-0.04
Decile 5	-0.49	-0.08
Decile 6	-0.09	0.01
Decile 7	-0.11	-0.12
Decile 8	0.03	-0.07
Decile 9	0.19	-0.10
Decile 10	0.38	0.14
Total	0.01	0.01

[1/] Defined as (Current Income - Consumption)/Current Income.

Source: CILSS tabulations.

lower 30 percent as well as the upper 10 percent of the expenditure distribution. The evident high propensity to save of the poor (defined in terms of consumption levels) is a curious phenomena. It suggests that there may be a number of households with a lesser "taste" for consumption (or, alternatively, a stronger preference for saving); they evidently prefer to consume at reletively low levels and save a significant share of total income. However, one must be cautious in placing too much emphasis on results that may be an artifice of the data or primarily caused by measurement error.

In order to explore regional variations in savings rates, estimates were made for each of the three regions by per capita income and expenditure quintiles. These are presented in Table 4-3. Note that while savings by income quintiles is fairly constant across regions, expenditure-based savings rates vary rather substantially across regions. In particular, the rate of household savings generally increases with increasing levels of expenditures in Abidjan (although not so dramatically as with increasing levels of income), while the rate of household savings actually seems to fall with increasing levels of consumption in rural areas. There are a number of possible reasons for observed differences in savings rates, ranging from measurement problems to real differences in economic behavior. In terms of measurement problems: If the value of consumption of home produced goods is understated, then measured levels of consumption for farm households may be biased downwards, artificially inflating levels of savings in the lowest quintiles. However, comparisons of consumption estimates from the

Table 4-3

Residual Savings Ratios, by Quintile and Region

	Income Quintiles	Consumption Quintiles
Abidjan		
Quintile 1	-1.87	-0.11
Quintile 2	-0.71	-0.15
Quintile 3	-0.16	-0.19
Quintile 4	0.04	0.16
Quintile 5	0.37	0.12
Other Urban Areas		
Quintile 1	-1.18	0.12
Quintile 2	-0.52	-0.02
Quintile 3	-0.08	-0.03
Quintile 4	0.10	0.10
Quintile 5	0.32	-0.15
Rural Areas		
Quintile 1	-2.02	0.15
Quintile 2	-0.50	0.16
Quintile 3	-0.23	-0.02
Quintile 4	0.04	0.00
Quintile 5	0.40	-0.09

Source: CILSS tabulations.

CILSS with external sources indicate that CILSS estimates compare quite favorably with other estimates for the survey year.

Mathematically, we would expect savings rates to fall with consumption levels, which suggests that the relationship between savings and consumption in Abidjan is more puzzling than that of households living outside Abidjan. Some of the difference might be caused by differences in souces of income and the structure of production between Abidjan and other areas; the marginal propensity to consume out of total income is significantly higher in Abidjan (where over half of total income is derived from wage activities) than in outside of Abidjan, primarily due to the necessity for many rural households to invest in own-production activities. Differences in credit availability and interest rates may also decrease the rate of savings exhibited by households at the lower end of the consumption distribution. Households at the upper end of the consumption distribution tend to live in Abidjan, are the wealthiest households in the Côte d'Ivoire, and likely save for reasons of own and outside investment.

Demographic Factors and Savings

Empirical research on savings and consumption behavior are often based on the permanent income or lifecycle hypothesis. While different in approach, the two generate very similar sets of hypothesis and empirical models. We use a general lifecycle approach to examine additional characteristics of savings behavior in the Côte d'Ivoire. Stated

simplistically, the life-cycle hypothesis predicts that savings will follow a hump-shaped pattern over the life-cycle of a household. In early years, earnings are low relative to future expected levels and asset accumulation tends to be fairly minimal. At the household ages, earnings increase to some maximum (empirical evidence has shown that earnings peak between 45 and 55 years old) and begin to fall as the working adult(s) in the household reach retirement age. Throughout this period, savings rates are hypothesized to increase as the household accumulates assets to finance consumption following retirement. In later years, savings rates fall off steeply and for many households become negative as the household lives off assets accumulated over the lifetime rather than income-generating economic activities.

An implicit assumption of the life-cycle hypothesis is that households are essentially nuclear -- that there is a generation of adult workers who work for a period of time, accumulate assets, and later stop working and live off the proceeds of past savings. Nuclear households are the exception rather than the rule in many LDCs. In the Côte d'Ivoire, for example, less than one-third of all households surveyed include no more than a head, spouse(s), and their natural or adopted children. These are classified as nuclear households. The remainder are laterally extended (other relatives in parents or children's generation reside in the household), horizontally extended (persons from other generations than parents or children reside in the household, for example, grandparents or grandchildren), or "fully" extended (both horizontal and lateral extensions). The Côte d'Ivoire has a significant number of fully extended

households and the relationships between people residing together are complex and varied. Because of the complexity in household structure and living patterns, as well as the existence of sometimes strong economic links between sub-Saharan African households (Rempel and Lobdell, 1978, Oucho and Mukras, 1983, Kaufman, 1982, Weisner, 1976), we may not find clear evidence of life-cycle savings effects in the Côte d'Ivoire.

The best information we have to determine the vintage, if you will, of Ivorian households is the age of the household head. Table 4-4 shows estimated savings rates by age of head head, for the country as a whole and stratified by region. For the total country, households headed by young individuals are clear dissavers (as the lifecycle theory might lead us to expect). However, savings rates do not seem to be clearly correlated with age in other age groups. The results are somewhat different when dissaggregated by regions. In Abidjan, "young" households are significant dissavers, "old" households are significant savers, and the remainder show no clear pattern. Note that the high savings rates evidenced by households in Abidjan headed by someone over 65 may be caused by the titular nature of headship; out of courtesy to age and authority, the eldest person in the household is often granted the title of head (and indeed, control over many of the households resources), regardless of his or her participation in economic activities. Savings patterns in urban areas outside Abidjan are likewise undefinitive, except that "old" households are clear dissavers. In contrast to those of other regions, rural households show a savings pattern that is most suggestive of hypothesized lifecycle effects -- savings rates of households headed by

Table 4-4

Residual Savings Ratios, by Age of Head, Wage Income Availability, and Male Labor Availability

	Abidjan	Other Urban	Rural	Total Country
Age of Head				
≤ 24 years	-0.37	0.13	-0.09	-0.12
25-34 years	0.05	0.07	-0.03	0.04
35-44 years	0.00	-0.09	0.01	-0.02
45-54 years	-0.04	0.05	0.03	0.01
55-64 years	-0.02	0.02	0.05	0.03
≥ 65 years	0.39	-0.42	-0.04	0.02
Income Availability				
Receive wage income?	0.06	0.07	0.06	0.06
No wage income	-0.17	-0.14	0.01	-0.05
Labor Availability				
No male in hh 15-64 years	-0.50	-0.12	-0.15	-0.23
Male(s) in household	0.04	0.00	0.03	0.03

Source: CILSS tabulations.

young individuals are lowest, rise gradually to reach a maximum for households headed by an individual aged 55 to 64 years, and then once again fall to become negative.

Table 4-5 shows residual savings ratios for nuclear and extended households by the age of the household head. On a priori grounds, we expect nuclear households to have higher saving rates. Reasons for this include: (i) better income reporting due to the smaller number of potential income sources, and (ii) risk adverse spending behavior -- extended families are often characterized by very diverse labor portfolios that allow them to compensate for transitory shortfalls in income for one member with another member's earnings. Evidence suggests, however, that the expected savings pattern does not hold true in the Côte d'Ivoire; according to our tabulations, nuclear households are consistent dissavers across all age levels, while households with more extended memberships are consistent savers. While it is not clear at this point why this might be, it does seem that age of the head may not be a particularly good proxy for household vintage or phase in family life cycle. Alternatively, households in the Côte d'Ivoire may simply not organize their resources according to the lifecycle hypothesis for a variety of reasons having to do with imperfect markets, liquidity considerations, or social custom in combination with economic factors.

The discussion up to this point is based on univariate rather than multivariate analysis; certain of the apparent effects (for example, high dissaving rates of nuclear households) may disappear when other

Table 4-5

Residual Savings Ratios, by Household Structure

Age of Head	Nuclear Households	Extended Households
≤24 years	-.47	.07
25-34 years	-.02	.06
35-44 years	-.16	.03
45-54 years	-.10	.05
55-64 years	-.07	.05
≥65 years	-.01	.03
Total	-.10	.04

Source: CILSS tabulations.

exogenous factors are controlled for. For example, if heads of nuclear households tend to be older than heads of extended households, then what appears to be a characteristic of nuclear households is in fact a characteristic of "older" households. In such cases, the high levels of dissaving evidenced by nuclear households will fall when the age of the head is controlled for. Multivariate analysis of household savings behavior is described later in the chapter. As a brief preview, the positive relationship between having a nuclear structure and dissaving does indeed disappear when other factors are controlled for.

Table 4-4 also shows savings rates by source of income (wage recipient versus non-wage recipient households) and male labor availability (the presence of at least one male person in the household aged 15 to 64 years). According to our tabulations, households receiving income from employment save significantly more than households receiving only self-employment income. This may in part be caused by differential errors in measurement; income from farm and non-farm self-employment is typically underestimated in household surveys, regardless of the care taken in measurement efforts and data tabulations. However, with few exceptions, the wealthiest households in the CILSS derived most or all of their income from employment activities, so that the apparent difference in savings rates could in part reflect real differences associated with levels of wealth.

Much has been said in recent years concerning the plight of women-headed households in LDCs, and the disproportionate number of these

households at the lower end of the income distribution. Headship is a difficult concept to define, however, and, as mentioned earlier, may be as much titular as effective (in terms of economic contribution to the household unit). Accordingly, we used a slightly different concept of effective headship rather than self-reported headship in examining the economic behavior of women-headed households. All households having no male between the ages of 15 and 64 were considered to be effectively woman-headed so far as productive activities and income generation are concerned. In total, some 12 percent of all households in the Côte d'Ivoire are effectively women-headed (or male labor scarce). According to Table 4-4, they dissave on average at a very high rate (23 percent of total income) in comparison to other households, who evidence positive savings rates of 3 percent of total income on average. Dissavings of male labor scarce households are highest in Abidjan, and reletively equal in other regions.

What explains this phenomena, and what does it suggest concerning the economic well-being of male labor scarce households in the Côte d'Ivoire? As no household can dissave consistantly over time, these households must either be temporally suffering the absence of male labor, or, receiving unreported income from outside sources. While both factors may be affecting reported income levels, the latter may be more important. An important policy finding falls out of this simple analysis; while households that are effectively woman-headed may well be suffering lower levels of welfare than their male-headed counterparts, using income rather than consumption as a measure of welfare paints an even blacker

picture of their quality of life than might actually be the case (although a large share of these households are in the bottom third of the welfare distribution as well as the bottom third of the income distribution). Efforts should be made to determine real sources of income for these households, the stability of the household structure, and the stability of existing (but largely unknown) sources of income.

Income, Consumption, and Savings Rates

This section briefly presents selected income and expenditure characteristics of Ivorian households by savings category. For purposes of this analysis, we use six categories: (i) savers (households with savings rates greater than 2.5 percent of total income); (ii) neither savers nor dissavers (savings rates between 2.5 percent and -7.5); (iii) "light" dissavers (savings rates between -7.5 percent and -50 percent); (iv) "moderate" dissavers (savings rates between -50 and -100 percent); (v) "heavy" dissavers (savings rates between -100 and -200 percent); and (vii) "heaviest" dissavers (savings rates less than -200 percent). Note that 35 percent of households spent less than they earned in the survey year (were in category 1), 6 percent neither saved nor dissaved, 22 percent were light dissavers, 14 percent moderate dissavers, 13 percent heavy dissavers, and the remaining 10 percent are in the heaviest dissaving category.

Table 4-6 shows the average proportion of total expenditures spent for food by savings category and region. If the permanent income

Table 4-6

Food Shares, by Savings Group and Region in the Côte d'Ivoire

	No. of Cases	Food Shares (percent of total expenditures)
Abidjan		
Savings Rate >2.5%	109	35.2
-7.5 to 2.5	23	37.9
-50 to -7.5	67	39.6
-100 to -50	46	41.1
-200 to -100	47	46.7
<-200	41	43.2
Total	333	39.7
Other Urban		
Savings Rate >2.5%	137	39.9
-7.5 to 2.5	21	37.7
-50 to -7.5	66	42.1
-100 to -50	33	41.2
-200 to -100	45	45.1
<-200	30	48.5
Total	332	41.7
Rural: Overall		
Savings Rate >2.5%	301	60.2
-7.5 to 2.5	51	66.7
-50 to -7.5	215	67.3
-100 to -50	144	62.4
-200 to -100	113	60.1
<-200	71	58.6
Total	895	62.5

hypothesis holds and no households are constrained satisfying consumption needs by credit or liquidity constraints, then food shares should not change systematically over the savings rate distribution. Interestingly, food shares actually increase by some 10 percentage points in Abidjan as the rate of dissaving increases, and increase by some 8 percentage points in other urban areas. No discernible pattern is evidenced by rural households.

What does the negative correlation between food shares and savings rates in urban areas imply? The poor generally spend the bulk of their income on food; as incomes rise, the food share falls. Thus a higher proportion of income spent of food in general indicates a lower level of overall welfare. The fact that food shares rise will levels of dissaving suggests that the heaviest dissavers may be worse off than households at the upper end of the savings distribution -- that in fact "permanent" income levels are not realized by all households.

There are several other possible explanations for the correlation between food shares and dissavings. First, the lower end of the savings distribution may essentially consist of two types of households -- those who are there due to transitory shortfalls in income and those who are in some sense always there; a group of the hard-core poor, if you will, who subsist through guile and the occasional generosity of family and friends. The latter group will devote most available resources to food consumption, while the former group's consumption behavior will not change dramatically in comparison to consumption behavior in times of income

excess. The combined effect between the two groups might well cause the patterns in Table 4-6.

There is another possible explanation for the relationship between food consumption patterns and savings behavior in Ivorian cities: In times of income excess, households may be more likely to purchase certain kinds of consumer goods (e.g., extra clothing, entertainment, cosmetics and beauty aids), thereby reducing the share of food costs in total expenditures. In times of income scarcity, however, they may be less likely to purchase these goods, thereby raising food shares. In short, the results in Table 4-6 might be in part caused by a transitory income effect.

Why don't rural households seem to evidence the same savings/food share correlations as urban households? Again, there are a number of possible explanations. For example, rural households may be much poorer than urban households and have stronger reasons to save for self-financing (the vast majority of rural income is drawn from farm and non-farm self-employment activities). Transitory excesses of income may be earmarked for the farm or family business rather than frittered away on "luxury" goods (i.e., less immediate necessities). Further, many rural households obtain most of their earnings from tree crops such as coffee and cocoa, which typically have three to five year gestation periods before newly planted trees begin to bear fruit for market. In such case, relatively large variations in income may be more typical (and thereby more easily

coped with by dint of appropriate planning) of the structure of production in rural areas than the structure of production in urban areas.

Concerning the hard-core dissavers: If such a group exists, they are far more likely to live in urban areas where opportunities for casual employment are greater, land ownership (or lack thereof) is not a critical determinate of income, and cultural norms may not be so rigid and likely to exclude newcomers as in rural areas.

Table 4-7 shows selected components of income shares by savings rate category and region. These results do not indicate a strong relationship between earned income shares and savings rates, except for savers and very heavy dissavers, both of whom draw a relatively large proportion of total earnings from family enterprises. Unfortunately, we suspect that this more likely indicates problems in measuring family enterprise income than a strong correlation between levels of saving and the share of income drawn from non-farm self-employment activities. Note also that households reporting the highest savings rates in Abidjan recieve a rather large share of income from family enterprises (some 26 percent of the total). Both effects (the positive and negetive correlations) may be real rather than an artifice of the data; wealthy households may be making significant profits from the businesses they operate, while poor households may be struggling to acquire income from very marginal enterprises. Unfortunately, it is not possible to judge the strength of these findings given present data constraints.

Table 4-7

Composition of Income By Saving Groups and Region in the Côte d'Ivoire

	No. of Cases	Wage Income	Farm Income	Family Ent. Income	Private Transfers	Rents & Dividends	Pensions, Soc. Sec.
Abidjan							
Savings Rate >2.5%	109	.50	.02	.26	.02	.11	.02
-7.5 to 2.5	23	.53	.02	.22	.01	.10	.04
-50 to -7.5	67	.52	-.01	.14	.03	.12	.06
-100 to -50	46	.57	.00	.20	.06	.03	.05
-200 to -100	47	.63	.01	.18	.02	.04	.03
<-200	41	.38	.00	.38	.06	.02	.06
Other Urban Areas							
Savings Rate >2.5%	137	.51	.07	.26	.01	.05	.02
-7.5 to 2.5	21	.55	.14	.13	.01	.08	.01
-50 to -7.5	66	.44	.16	.13	.01	.04	.05
-100 to -50	33	.33	.11	.24	.01	.10	.03
-200 to -100	45	.27	.18	.17	.02	.06	.04
<-200	30	.19	.17	.26	.03	.01	.01
Rural Areas							
Savings Rate >2.5%	301	.09	.68	.18	.00	.02	.00
-7.5 to 2.5	51	.05	.82	.10	.01	.00	.00
-50 to -7.5	215	.02	.89	.05	.01	.01	.00
-100 to -50	144	.03	.86	.05	.01	.01	.00
-200 to -100	113	.04	.82	.09	.02	.01	.00
<-200	71	.04	.70	.12	.04	.01	.00

In contrast to households in Abidjan, households living in other urban areas show a strong negative correlation between the share of income from wages and savings rates. As savings rates fall, the share of income acquired from farm and non-farm self-employment activities increases dramatically. This is at least in part caused by the high variability of self-employment income, and in part (possibly) by measurement error. However, similar to Abidjan, households with the highest savings levels receive a significant share of income (26 percent) from (formal) self-employment activities.

The results for rural areas are consistent with those for urban areas in that savers receive a larger share of self-employment income than dissavers. An additional observation seems appropriate for rural areas, viz., households with positive savings rates tend to have greater diversification in earnings sources than dissavers, who are likely to depend on farm and marginal non-farm self-employment activities. Curiously, the pattern of heavy dissavers receiving relatively large shares of total income from family enterprises is consistant across regions. Upon reflection, it is not surprising that the relationship between consumption and income would be most tenuous for households that maintain businesses (both farm and non-farm) as profits must go to maintain existing business capital and finance expansion as well as simply to maintain the household.

Regarding other sources of income such as private transfer payments, rents and dividends, and public transfer payments: heavy

dissavers receive a higher share of income from private (and in Abidjan, public) transfers than other groups. In addition, households with positive savings rates in Abidjan tend to receive a substantially greater share of rental income than do households in the heavier dissaving categories.

4.2 A General Model of Savings Behavior

This section describes the empirical results derived from a general model of savings behavior. The dependant variable in the model is a qualitative measure of savings behavior based on the level of savings or dissavings reported by the household. A wide variety of exogenous variables are used to characterize households in specific savings (or dissavings) groups within each region of the Côte d'Ivoire and for the country as a whole. The models are estimated using maximum likelihood techniques, and are formulated as multinomial logit (MNL) models. Multinomial logit was chosen as the most tractable form when the dependent variable is polytomous (multiple outcomes) rather than dicotomous (binary outcomes).

Derivation of the Model [1/]

This section presents a very brief derivation of the MNL model. It follows McFadden's general derivation of the so-called conditional logit model. For a more extensive discussion, consult any of the general texts cited in footnote (1).

In general, we assume that there is a relationship between some underlying or latent response variable and a number of observed exogenous variables, e.g.,

$$y_i = f(x_1, x_2, \ldots, x_n) \tag{4.2}$$

where: y_i is the underlying response variable for individual i, and

$x_1, x_2, \ldots, x_n$ are exogenous variables.

Note that exogenous variables may be measured with respect to the individual; however, for simplicity of exposition, individual specific subscripts are not retained.

[1/] There is a small but growing literature on qualitative or discrete choice models. Good general sources include seminal works of McFadden (1973, 1976), Domencich and McFadden (1975), Ben-Akiva and Lerman (1985), Train (1986), Hensher and Johnson (1981), and a recent text by Maddala (1983).

We do not typically observe the response variable. For example, it could be (although it is not required to be) the level of indirect utility or satisfaction that an individual obtains from a particular situation. When confronted with a variety of situations (or outcomes) denoted j (j=1,...,J), the individual is hypothesized to choose the one that suits him or her best, or maximizes y_i. While we can observe the outcome of the decision, call it $Y_{i,j}$, we cannot observe the level of satisfaction that the individual associates with that outcome, y_i. The outcome is necessarily introduced as a qualitative variable, which itself becomes some function of the exogenous variables.

$$Y_{i,j} = f(x_1, x_2, \ldots, x_n) \tag{4.3}$$

Further, let us assume that

$$Y_{i,j} = \begin{cases} 1 \text{ if } y_i = \max(y_{i,1}, y_{i,2}, \ldots, y_{i,J}) \\ 0 \text{ otherwise.} \end{cases} \tag{4.4}$$

The indirect utility associated with each outcome is assumed to have a known portion and a random portion, and the known portion can be expressed as some parameterized function of the exogenous variables.

$$Y_{i,j} = \beta_j X + \varepsilon_j \tag{4.5}$$

The probability that an individual chooses a particular outcome is a function of the probability that the utility associated with that outcome is greater than the utility associated with any other outcome, e.g.,

$$Pr(Y_{i,j}=1|X) = Pr(\beta_j X+\varepsilon_j > \beta_k X+\varepsilon_k, \text{ for all } k\varepsilon J) \tag{4.6}$$

or,

$$Pr(\varepsilon_k-\varepsilon_j < \beta_j X - \beta_k X \text{ , for all } k\varepsilon J) \tag{4.7}$$

If we assume the ε's are independent and identically distributed (i.i.d.) Gumbel and the indirect utility function is linear in parameters, then the model is multinomial logit. The probability that individual i chooses outcome j out of the set J is defined as

$$Pr(Y_{i,j}=1|X) = \frac{e^{(\beta_j X)}}{\sum_{k\varepsilon J} e^{(\beta_k X)}} \tag{4.8}$$

If the ε's were assumed to be i.i.d. normal, the model would be multinomial probit. However, the multinomial probit is computationally more complex and the expression for the probability that a particular outcome is chosen cannot be derived in closed form. For simplicity, we use the MNL form.

Although the above derivation follows McFadden's conditional logit, it is not necessary to assume random utilities (or indeed utilities at all) to obtain the same estimating equation (see Maddala, 1983). It is only necessary to assume a linear-in-parameters probability function having a known and an unknown or random portion. The assumption of random utilities, or, the assumption of a very general function which

discriminates between the characteristics of individuals based based on the outcomes they have chosen is left to the discretion of the reader.

Model Estimation

For purposes of this exercise, we divide the sample into four groups based on estimated savings rates: (i) savers (households with savings rates greater than 2.5 percent of total income); (ii) neither savers nor dissavers (savings rates between 2.5 percent and -7.5 percent of income); (iii) light-to-moderate dissavers (savings rates between -7.5 percent and -50.0 percent of income); and (iv) heavy dissavers (savings rates less than -50.0 percent of income). Because we suspect that savings rates may be measured with some error, we do not use the estimated savings as a continuous variable on the left-hand side of the equation, but instead use estimated savings rates to construct qualitative savings categories. Thus the dependent variable is qualitative and categorical, and takes on a value of one for the savings category (i) - (iv) that the household falls into, and zero otherwise. Using this variable, a MNL model is estimated to characterize economic and demograpic characteristics of households in each of the categories. If the estimation results make sense and discriminating functions are fairly robust, it suggests that measurement errors in savings may not be as serious a problem in the CILSS (nor in this research) as we might have initially thought.

Table 4-8 shows the proportion of households in each of the four savings categories by region and for the country as a whole. According to

Table 4-8

Distribution of Savers and Dissavers in the Côte d'Ivoire, by Region and Country Totals

	Percent in Category			
	Abidjan	Other Urban	Rural	Total Country
Savers (Savings Rate > 2.5%)	32.4	41.2	33.2	34.7
Neither (Savings Rate -7.5 to 2.5%)	6.9	6.3	5.7	6.1
Light-to-Moderate Dissavers (Savings Rate -50 to -7.5%)	20.2	19.9	24.2	22.4
Heavy Dissavers (Savings Rate < -50%)	40.5	32.6	36.9	36.8
Total Households	100.0	100.0	100.0	100.0

this table, the proportion of savers is highest in urban areas outside Abidjan (41.2 percent), and roughly equal in Abidjan (32.4 percent) and rural areas (33.2 percent). The proportion of heavy dissavers is clearly highest in Abidjan (40.5 percent) and lowest in other urban areas (32.6 percent). The high rate of dissaving in Abidjan may indicate that households residing in the capital city have better access to sources of credit and savings institutions than households residing outside the city.

For purposes of estimation, the second group (neither savers nor dissavers) is dropped from the sample. These households constitute a relatively small share of population (6.1 percent), and it is not clear whether they should be categorized as savers or as dissavers -- potential for mis-classification due to measurement error is high. However, we hope that the majority of households classified as savers (group 1) are indeed savers, and the majority classified as dissavers (groups 3 and 4) are indeed dissavers.

A wide range of variables are included in the savings models. These are described in Table 4-9. Means of those variables not previously used in the permanent income models in Chapter 3 (see Table 3-5) are presented in Table 4-10.

Perhaps the most interesting variable used in the models is a measure of the shortfall (or surplus) in current income vis-a-vis consumption needs of the household -- in effect, the difference between permanent (or expected) income and current income. The larger this

Table 4-9

Variables Used in Savings Models

Variable/Variable Type	Description
Income Shortfalls	
1. Current income shortfalls	ℓn(expected income) - ℓn(current income)
2. Shortfalls due to illness	no. days lost due to illness in last 4 weeks (all hh members)
Potential Measurement Errors	
1. Family enterprise income	does hh receive money from non-farm family enterprises?
2. Private transfer income	does hh receive transfer income?
3. Private transfer expenditures	does hh remit income?
Value of Physical Assets and Cash Savings	
1. Agriculture Assets	value of agriculture assets (mill. CFA)
2. Family Enterprise Assets	value of business assets (mill. CFA)
3. Cash Savings	value of cash savings (mill. CFA)
Education	
1. Max. males education	years of education of best educated adult male
2. Max. females education	years of education of best educated adult female
Demographic Variables	
1. Nuclear household	is hh nuclear (head, spouse(s), children of either or both)?
2. Male scare household	hh has no males 15-64 years old?
3. No. female children	no. females 0-14 years old
4. No. male children	no. males 0-14 years old
5. No. adult females	no. females 15 or greater years old
6. No. adult males	no. males 15 or greater years old
7. Age of household head	age in years of head of household
Regional Intercepts	
1. Abidjan residents	does hh reside in Abidjan?
2. Other urban area residents	does hh reside in other urban areas?

Table 4-10

Selected Variable Means for Savers/Dissavers Indicator Function, by Region and Country Totals

	Abidjan	Other Urban	Rural	Total Country
Expected Income - Current Income (CFA)	-572,583	-336,497	-193,925	-305,161
No. of working days lost due to illness in last 4 weeks (total hh members)	10.9	14.8	20.5	17.2
Percent nuclear households	33.5	29.6	36.3	34.3
Percent hh with no prime working-aged males (14-60 yrs)	6.9	9.4	12.5	10.6
Percent hh receiving private transfers	22.1	24.2	23.6	23.4
Percent hh sending private transfers	68.3	52.9	38.8	48.1
Age of hh head	41.7	44.5	50.3	47.3

Source: CILSS tabulations.

difference, that is, the greater the shortfall in current income, the more likely it should be that a household is dissaving (assuming problems with measurement error are not severe). Several definitions of the variable were used in early specifications of the models. The one that seems to work best (and is retained here) is the difference between the natural log (ℓn) of estimated permanent income and the natural log of reported current income. (Note that permanent income has been estimated from the permanent income models described in Chapter 3.)

A measure of the total days of work lost over the past 4 weeks due to illnesses of all household members is also included in the models. We expect the number of sickdays to be positively correlated with levels of dissaving -- the more illness in the household, the greater the likelihood of unusually low levels of earnings, or income shortfalls. In effect, illness is hypothesized to contribute to income shortfalls.

The previous variables introduce income shortfall effects into the models. Other variables are used to control for the effects of possible measurement error. In particular, a dummy variable for family enterprise income (equal to 1 if the household receives income from a family-operated enterprise and 0 otherwise) is introduced to control for the possible underestimation of family enterprise income. If this income is typically underestimated, we expect a positive correlation between the level of dissaving and family enterprise earnings. We also hope that the variable will control for measurement problems in estimating income shortfall effects.

It is often difficult to obtain good estimates of unearned income, particularly private remittances and transfers. Income from these "informal" sources has been found to be substantial and thereby important in a number of sub-Saharan African countries, particularly for households experiencing shortfalls in earned income. If transfer income is underestimated (assuming that the incidence is not underreported) in the CILSS, we expect a positive correlation between the likelihood of dissaving and the availability of income transfers. This positive correlation might also reflect a different aspect of the household economy: If transfer networks function as informal credit markets, households experiencing income shortfalls might be better able to dissave if they have access to informal credit sources than if they do not. A dummy variable is used in the models as an additional proxy for access to informal credit (equal to 1 if the household makes a transfer payment and 0 otherwise), on the assumption that the simple fact of belonging to a transfer network (indicated by receiving or remitting transfers) represents access to informal credit markets, which would increase the probability of dissaving when income shortfalls occur. Note also that participants in transfer networks are likely to have less easily identified household budgets and income sources (household membership may not be well defined) and thus are more likely dissavers (assuming that it is easier to identify expenditures than income) than households not participating in transfer networks.

Measures of the value of physical assets (family enterprise and farm) and total cash savings are also included in the models. In general, we expect assets to be negatively correlated with levels of dissaving; households with high levels of business and farm assets likely receive more income than households owning less assets, all other things being equal. Cash savings serve as a proxy for liquid asset holdings; given demographic and economic factors, a household which spends more than it earns in a particular year is likely to have a smaller stock of liquid assets at the end of that year than a household spending less than it earns.

Education variables are introduced to control for differences in so-called human assets. For reasons similar to those for physical assets, we expect education to be negatively correlated with dissavings -- the higher the level of education, the lower the probability of dissaving. There is an additional reason to expect the negative correlation: Recall that better educated individuals are more likely to work for wages or operate large enterprises in the Côte d'Ivoire. As wage income is generally less variable than income from other sources, we expect that households wherein individuals have higher levels of education (and are more likely to receive wages) will suffer less frequently from income shortfalls and are thereby less likely to be dissavers (particularly "heavy" dissavers).

A series of demographic variables are used to control for differences in household size and structure, as well as lifecycle

effects. Earlier bivariate tabulations show that nuclear households have higher dissaving rates than non-nuclear households. We find this surprising; one generally expects nuclear households to be more risk adverse and have fewer working members than extended households, thereby tending to decrease the likelihood of dissaving at any particular point in time. At the very least, we would expect both nuclear and extended households to have the same propensities to save For purpose of model estimation, a dummy variable for nuclear households (equal to 1 if the household is nuclear, and 0 otherwise) is introduced to determine whether the nuclear effect on savings remains when other factors are controlled for. In addition, a dummy variable is included for households without prime working-aged male members (1 if the household has no male members between the ages of 15 and 64, and 0 otherwise); on a priori grounds, we expect these households to be dissavers.

Household size and composition effects enter the models through four variables -- the number of female children, the number of male children, the number of adult females, and the number of adult males in the household. We have no a priori expectations regarding signs or magnitudes of coefficients for these variables. In contrast, we include the age of the household head in the models to attempt to control for lifecycle effects. To the extent that it does (and to the extent that some form of the lifecycle hypothesis holds in the Côte d'Ivoire), the age of the head and the probability of dissaving should be positively correlated.

Empirical Results

Model results are presented in Table 4-11, by region and for the country as a whole. The most notable finding in Table 4-11 is the strong and very significant 2/ correlation between our measure of income shortfalls (the difference in the logs of permanent and current income) and the probability of a household falling into one of the two dissavings categories. Further, the income shortfall effect is significantly greater for heavy dissavers than for light-to-moderate dissavers, which is exactly what we would expect if some form of the permanent income hypothesis holds in the Côte d'Ivoire. These results indicate that households appeal to some longer run concept of income when making consumption decisions.

Many of the other coefficients behave as expected -- ill health (as measured by the number of work days lost due to illness) increases the probability of dissaving in rural areas (although not noticably in urban areas) and asset levels and education tend to be negetively correlated with dissavings levels. The results are different across regions. In Abidjan, for example, education coefficients are generally significant at the 95 percent level, as are coefficients on business assets and cash savings for the group of heavy dissavers. The number of years of schooling for females has a particularly strong, negative effect on

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2/ Note that the standard error is underestimated for this variable as the measure is obtained from the permanent income equations. No correction has been derived as yet to correct the standard error for the predicted value from a regression model when used in a logit equation.

Table 4-11

Savers/Dissavers Indicator Function [1], by Region and Country Totals
(parameters estimated with respect to savers base)

	Abidjan				Other Urban Areas				Rural Areas				Total Country			
	Light Dissavers		Heavy Dissavers		Light Dissavers		Heavy Dissavers		Light Dissavers		Heavy Dissavers		Light Dissavers		Heavy Dissavers	
Variables																
Household Resides in Abidjan?	-		-		-		-		-		-		.739	(3.0)	1.428	(4.9)
Household Resides in Other Urban Areas?	-		-		-		-		-		-		.182	(0.9)	.333	(1.6)
$\log_e$ Expected Income - $\log_e$ Current Income	1.045	(3.1)	2.641	(7.1)	2.023	(5.6)	3.561	(8.3)	.674	(4.6)	1.866	(11.3)	.894	(7.4)	2.151	(16.0)
No. of working days lost due to illness in last 4 weeks (all household members)	-.013	(1.0)	.015	(1.2)	-.007	(0.7)	-.006	(0.6)	.011	(2.4)	.011	(2.4)	.006	(1.6)	.009	(2.5)
Receive Income from Non-farm Family Enterprise	-1.511	(3.4)	-1.342	(3.1)	-1.442	(3.6)	-1.474	(3.5)	-1.125	(4.9)	-1.036	(4.7)	-1.064	(6.4)	-.885	(5.4)
Receive private transfer payments?	.534	(1.2)	.540	(1.1)	.529	(1.4)	.174	(0.4)	-.249	(1.0)	-.113	(0.5)	.079	(0.5)	.080	(0.5)
Make private transfer payments?	.053	(0.1)	.458	(1.1)	.101	(0.3)	.919	(2.2)	.133	(0.6)	.222	(1.1)	.013	(0.1)	.213	(1.4)
Total Value of Agriculture Assets (000 000 CFA)	.154	(1.2)	.097	(0.7)	-.015	(0.5)	-.025	(0.6)	-.013	(1.2)	-.010	(1.0)	-.020	(2.1)	-.013	(0.5)
Total Value of Business Assets (000 000 CFA)	-.125	(1.7)	-.550	(2.7)	-.064	(0.7)	-.300	(1.5)	-.191	(0.5)	.016	(0.3)	-.055	(1.3)	-.219	(2.3)
Total Cash Savings (000 000 CFA)	-.118	(0.7)	-4.339	(3.8)	-.171	(0.6)	.033	(0.4)	-2.366	(2.9)	-1.308	(2.3)	-.193	(0.4)	-.108	(0.9)
Max. yrs education, male hh member	-.079	(2.0)	-.047	(1.1)	-.076	(1.9)	-.146	(3.1)	-.078	(1.8)	-.057	(1.4)	-.073	(3.6)	-.096	(4.6)
Max. yrs education, female hh member	-.069	(1.7)	-.170	(3.4)	-.081	(1.5)	-.241	(3.0)	.024	(0.3)	.053	(0.8)	-.051	(2.0)	-.136	(4.7)
Household is nuclear?	.189	(0.4)	.569	(1.2)	.451	(1.0)	-.210	(0.4)	-.045	(0.2)	.063	(0.3)	.059	(0.3)	.095	(0.5)
Household has no prime working-aged males?	.007	(0.0)	.718	(0.8)	.571	(0.8)	1.272	(1.5)	-.137	(0.4)	.527	(1.5)	-.126	(0.4)	.483	(1.7)
No. females 0-14 yrs old	.318	(2.2)	.407	(2.7)	-.001	(0.0)	.159	(1.5)	-.084	(1.3)	.017	(0.3)	-.036	(0.8)	.080	(1.7)
No. males 0-14 yrs old	-.077	(0.5)	-.168	(1.1)	.024	(0.2)	.222	(1.9)	.020	(0.3)	-.092	(1.5)	.022	(0.5)	-.024	(0.5)
No. females 15+ yrs old	.087	(0.5)	.141	(0.7)	.314	(2.4)	-.077	(0.5)	-.019	(0.2)	-.042	(0.5)	.056	(1.0)	-.041	(0.7)
No. males 15+ yrs old	-.089	(0.6)	-.238	(1.5)	.015	(0.1)	.016	(0.1)	-.019	(0.2)	-.165	(1.6)	-.035	(0.5)	-.101	(1.4)
Age of household head	.060	(3.0)	.052	(2.5)	.002	(0.1)	.047	(2.6)	-.002	(0.3)	-.006	(0.8)	.007	(1.0)	.008	(1.3)
Intercept	-1.486	(1.5)	-.534	(0.5)	-.130	(0.1)	-1.603	(1.6)	.700	(1.5)	1.194	(2.6)	-.021	(0.1)	.096	(0.3)
Log-likelihood (zero slopes)	-326.9				-328.0				-908.1				-1568.3			
Log-likelihood at convergence	-215.9				-223.3				-749.8				-1265.7			
Chi-squared statistic	221.81				209.39				316.60				605.17			

Notes:

[1] t-statistics are in parentheses.

Categories of Dependent Variable

$$\text{Savings rate} = \frac{\text{current income} - \text{expenditures}}{\text{current income}}$$

(1) Savers are defined as all households reporting a savings rate greater than 2.5 percent.
(2) Light dissavers are defined as all households reporting a savings rate less than -7.5 percent and greater than -50 percent.
(3) Heavy dissavers are defined as all households reporting a savings rate less than -50 percent (e.g., households spending at least half again as much as they earn).

dissavings levels in urban areas. In contrast, education has a less significant discriminating effect in rural areas, as is also the case for the value of business and farm capital. Increased levels of cash savings do, however, significantly decrease the probability of dissaving in rural areas.

Several other results deserve brief mention: First, income transfers seldom have much effect in discriminating between savers and dissavers, with the exception of transfers out (!) on the probability of being in the heavy dissaver category. This suggests that it is difficult to identify discrete domestic budgetary units in the Côte d'Ivoire, and that a great deal of informal resource exchanges occur. Second, all things being equal, households receiving non-farm family enterprise income are far less likely to be dissaving than households not receiving family enterprise income. Third, nuclear households are no more likely to be dissaving than non-nuclear households when other demographic and economic factors are controlled for. "Male-scarce" households are, however, somewhat more likely to be dissaving than others, particularly in areas outside of Abidjan. Finally, the probability of dissaving tends to increase with the age of the household head in urban areas, while there is no significant effect for households residing in the countryside. In short, there is some evidence of lifecycle effects occuring in urban areas.

In general, all of the models have good discriminatory power, as evidenced by chi-squared statistics and the values of the likelihood

function at convergence. This, in combination with the intuitively appealing signs and magnitudes of model coefficients lead us to believe that a significant share of households in the Côte d'Ivoire are in fact spending more than they earn in the survey year -- that calculated levels of dissaving are at least indicative of actual levels in the country. It further appears that many dissavers are experiencing transitory shortfalls in income, which suggests that households dissaving this year may not be dissaving next year. Availability of the CILSS panel data will allow us to examine this issue more directly over the upcoming months. Finally, although our results are consistant with there being a group of hard-core poor who always consume more in value terms than the little they earn, there is no way of testing for the existence of such a group within the confines of data availability and model specification. We made an effort in the CILSS to measure all sources of earned and unearned income; to the extent that we were successful (and many of the results described in this research suggest that we were more successful than is generally the case), we would not expect to find households who are typically spending more than they "earn" (when "earn" is defined so as to include both earned and unearned income). What would be useful to examine, however, are the living conditions of household who primarily depend on unearned income to satisfy consumption needs. These households may well form a group of hard-core poor who have little control over resources and virtually no way to increase welfare levels.

5. CONSUMPTION AND SAVINGS BEHAVIOR

The traditional or Keynesian consumption function is based on two key assumptions: (i) current income is the relevant concept in examining savings and consumption behavior, and (ii) the share of current income devoted to consumption (or, the average propensity to consume) declines with increasing levels of income. The consumption models described in the first section of this chapter reflect these assumptions. More recently, a host of competing theories have arisen, which are generally subsumed under the rubric of permanent income-lifecycle theories (Friedman, 1957, Modigliani and Brumberg, 1954). This more recent work shifts the relevant income concept from current to so-called permanent income, and assumes a strict proportionality between permanent income and permanent consumption. The new theories have spawned a host of tests and counter tests of empirical validity, most generally supporting the first assumption -- that permanent income is a stronger determinate of consumption than current income -- and not supporting the hypothesis of strict proportionality between permanent income and permanent consumption. (Note that the strict form of Friedman's permanent income theory predicts a MPC equal to one for the permanent component of income, and a MPC of zero for the transitory component). Consumption models based on permanent or expected income are presented in the latter half of the chapter. These are preceeded by a brief discussion of the permanent income hypothesis.

Clearly, the notion that consumers have a sense of long term income expectations when determining today's consumption levels has intuitive appeal; for many individuals, income admits of a high degree of temporal variability, and, in a period of relative scarcity (for example, when coffee or cocoa has been planted recently), the knowledge that income levels will shortly rise (the trees begin to bear fruit three to four year after initial planting) is sufficient to maintain consumption at levels above those dictated strictly by current income. However, permanent income is clearly difficult to measure from the analyst's perspective, and perhaps equally difficult to predict for the individual. Measurement problems differ depending on whether one approaches the problem using aggregate time series data or cross-sectional survey data; in the former case, permanent income is typically measured using some form of lag structure in income and (possibly) consumption. However, recent work in the rational expectations school has shortened the relevant lag period to a single year (see, for example, Hall, 1978) and shifted the focus from permanent/transitory to anticipated/unanticipated income (for a good review of recent work in this genre, see Blinder and Deaton, 1985).

Deriving a measure of permanent income based on cross-sectional data is more complex and can only be done satisfactorily using multi-period panel data (Bhalla, 1979, Hall and Mishkin, 1982, Leviatan, 1963), group averages with the groups defined along dimensions correlated with permanent income but not with transitory income (Eisner, 1958, Modigliani and Ando, 1960, and Mayer, 1966), or using an alternative simultaneous equations approach to modelling the structural consumption and income

equations (Musgrove, 1974, 1979, Attfield, 1976). This latter approach was judged to be beyond the scope of the present work. As the group means technique is not very satisfactory, and we do not as yet have panel data from the Côte d'Ivoire, we used yet another technique which, under fairly unrestrictive conditions, will yield consistent estimates of marginal propensities to save out of permanent income (Muellbauer, 1983, Attfield, 1980, 1981, Musgrove, 1978). Permanent income derivations were described in Chapter 3. Even if these conditions are not met, the direction of the bias is such that the estimated MPS will set a lower bound on the actual MPS, and as such may indicate something about the relevance of the permanent income hypothesis in the Côte d'Ivoire, and differences between the MPS out of current and permanent income.

Alternative measures of savings are used in the third and final section of the chapter to derive aggregate savings propensities out of permanent and transitory incomes. The aggregate savings measure is the estimated change in the stock of farm and business assets over the twelve month survey period. Note that the survey was not designed to capture full changes in stocks, so the alternative aggregate savings estimate is at best a partial measure of household savings activities. Cash savings is derived from Section 15 of the CILSS questionnaire, and represents the stock of (cash) liquid assets owned by the household at the time the survey was administered.

5.1 Keynesian Consumption Functions

Table 5-1 shows consumption function estimates based on current income for the total CILSS sample (1564 households). These use a variety of conventional functional forms: (i) simple linear, (ii) simple linear using per capita 1/ measures of income and consumption, (iii) semi-log (log transformation of income) using per capita measures of income and consumption, (iv) log-log model using per capita measures of income and consumption, (v) quadratic, and (vi) quadratic using per capita income and consumption measures. Annex Table 5.1 shows variable means for income and included demographic variables, by region and for the sample as a whole. In general, the quadratic specifications seem to have the best explanatory power, and yield sensible results, although the simple linear and log-log models also work well for many segments of the population.

Counts of the number of female and male children and adults were included in the equations to control for household size in the standard models and size-related scale effects in the per capita models. The coefficients of the demographic variables reflect the fixed cost of maintaining each household member, given marginal propensities to consume

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1/ In all cases where per capita measures are used, household size, the denominator, is constructed as the weighted average of the number of people in the household times the number of months each was present over the past 12 months. Thus, a two person household in which both members were present for 12 months over the past year is given a weighted size of 2.0 while a similarly sized household in which one member was present for 6 months and the other for the full 12 months is given a weighted size of 1.5.

Table 5-1

Household Consumption Functions, Total Country

	Income	Income-Squared	Number of Children		Number of Adults		Intercept	R^2
			Female	Male	Female	Male		
(1) Linear model	.445	-	-	-	-	-	871741	.511
	(40.2)						(28.0)	
	.418	-	50068	-5703	26586	83370	617083	.528
	(37.2)		(3.0)	(0.4)	(1.4)	(3.9)	(13.2)	
(2) Per capita linear model	.679	-	-	-	-	-	101993	.416
	(33.3)						(7.8)	
	.658	-	-8331	-11314	-11216	-15608	197993	.426
	(31.7)		(1.1)	(1.5)	(1.3)	(1.6)	(8.5)	
(3) Per capita semi-log model	222714	-	-	-	-	-	-2343623	.176
	(18.2)							
	208009	-	-11757	-11438	-20774	-24731	-2035058	.197
	(16.7)		(1.3)	(1.3)	(2.1)	(2.1)		
(4) Per capita log-log model	.583	-	-	-	-	-	5.19	.539
	(42.6)						(31.9)	
	.542	-	-.025	-.057	-.048	-.015	5.97	.592
	(40.9)		(2.6)	(5.9)	(4.4)	(1.2)	(36.7)	
(5) Quadratic model	.677	-1.527 E-08	-	-	-	-	613680	.576
	(36.9)	(15.5)					(18.4)	
	.648	-1.452 E-08	43633	-12336	18712	64594	438424	.586
	(34.5)	(14.8)	(2.8)	(0.8)	(1.1)	(3.2)	(9.6)	
(6) Per capita quadratic model	.874	-3.652 E-08	-	-	-	-	62175	.431
	(23.5)	(6.2)					(4.3)	
	.842	-3.374 E-08	-6595	-7969	-9947	-17271	151044	.438
	(22.2)	(5.7)	(0.8)	(1.1)	(1.2)	(1.8)	(6.2)	

Note: t-statistics are in parentheses.
Source: CILSS tabulations.

out of current income. A Fisher F-test performed on the linear, per capita linear, and quadratic specifications indicates that including the demographic variables significantly improves the explanatory of all three models at a one percent level of significance. 2/ Accordingly, demographic variables are retained in all current income-based consumption models described in this section.

Table 5-2 presents consumption function estimates for each major region (Abidjan, other urban, and rural) in the Côte d'Ivoire, and Table 5-3 enumerates estimated marginal propensities to save (computed as 1-MPC) at three income levels -- the mean income for the lowest, middle, and highest income quintiles -- for each region and the country as a whole. These estimates are based on current income coefficients in Tables 5-1 and 5-2. Note that linear and log-log specifications require propensities to save to be invariant across income levels, while the semi-log and quadratic specifications allow for changes in savings propensities with income.

In general, results were fairly consistent between per capita and total consumption/income specifications, although some regional variation exists. Per capita estimates tend to explain less of the variation in

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2/ The F-statistic has 4, 1546 (or 1547 for the quadratic specification) degrees of freedom, which yields critical values of 2.37 (5 percent significance level) and 3.32 (1 percent significance level). The estimated test statistic for the linear specification is 11.67, for the per capita linear specification is 4.09, and for the quadratic specification is 9.30.

Table 5-2

Household Consumption Functions, by Region

	Income	Income-Squared	Number of Children		Number of Adults		Intercept	R^2
			Female	Male	Female	Male		
Abidjan (N=334)								
(1) Linear model	.343	-	167841	23935	143158	36853	1152854	.562
	(17.0)		(3.2)	(0.5)	(2.7)	(0.6)	(8.2)	
(2) Per capita linear model	.851	-	-10941	-26817	-26708	-54621	339753	.408
	(13.3)		(0.3)	(0.7)	(0.8)	(1.5)	(3.3)	
(3) Per capita semi-log model	349571	-	-19332	-42409	-69115	-59481	-3473344	.210
	(7.2)		(0.5)	(1.0)	(1.8)	(1.4)	(5.4)	
(4) Per capita log-log model	.417		-.027	-.089	-.057	-.053	-.080	.636
	(17.8)		(1.4)	(4.3)	(3.0)	(2.3)	(4.0)	
(5) Quadratic model	.663	-1.52 E-Ø8	190761	14778	104217	29693	686573	.660
	(17.6)	(9.7)	(4.1)	(0.3)	(2.2)	(0.6)	(5.2)	
(6) Per capita quadratic model	.250	1.61 E-Ø7	-22720	-39496	-21332	-55347	555248	.444
	(1.7)	(4.6)	(0.7)	(1.1)	(0.6)	(1.6)	(5.0)	
Other Urban Areas (N-332)								
(1) Linear model	.441	-	58296	43717	53177	95461	563284	.530
	(15.3)		(2.0)	(1.5)	(1.7)	(2.7)	(5.9)	
(2) Per capita linear model	.484	-	-18174	-13615	-22457	-12086	313398	.688
	(24.0)		(1.8)	(1.4)	(2.0)	(1.0)	(9.2)	
(3) Per capita semi-log model	289329	-	-15063	-6881	-36671	-21622	-3002107	.412
	(12.3)		(1.1)	(0.5)	(2.4)	(1.3)	(10.0)	
(4) Per capita log-log model	.534	-	-.040	-.037	-.059	-.014	6.18	.643
	(19.4)		(2.4)	(2.3)	(3.3)	(0.7)	(17.6)	
(5) Quadratic model	.702	-3.54 E-Ø8	44782	47329	42867	79852	369254	.552
	(10.0)	(4.1)	(1.5)	(1.7)	(1.4)	(2.3)	(3.5)	
(6) Per capita quadratic model	.871	-4.81 E-Ø8	-10669	-5882	-16169	-10399	162680	.747
	(18.1)	(8.7)	(8.7)	(0.7)	(1.6)	(1.0)	(4.6)	

Table 5-2 (continued)

Household Consumption Functions, by Region

	Income	Income-Squared	Number of Children		Number of Adults		Intercept	R^2
			Female	Male	Female	Male		
Rural Areas (N=898)								
(1) Linear model	.277	-	27010	40506	41995	39798	422839	.422
	(17.6)		(2.0)	(3.0)	(2.6)	(1.9)	(11.0)	
(2) Per capita linear model	.275	-	-7176	-8422	-6469	-2691	166549	.133
	(9.2)		(1.6)	(2.0)	(1.2)	(0.4)	(12.3)	
(3) Per capita semi-log model	312604	-	37466	39725	55373	39340	-3501081	.361
	(14.0)		(2.6)	(2.8)	(3.3)	(1.8)	(12.2)	
(4) Per capita log-log model	.401	-	-.034	-.045	-.031	-.022	7.37	.423
	(21.2)		(2.8)	(3.9)	(2.2)	(1.2)	(33.3)	
(5) Quadratic model	.486	-2.15 E-Ø8	23881	38321	46010	29398	294675	.460
	(15.8)	(7.9)	(1.8)	(3.0)	(2.9)	(1.5)	(7.3)	
(6) Per capita quadratic model	.507	-1.11 E-Ø7	-6929	-7767	-5077	-3829	137244	.155
	(9.0)	(4.9)	(1.6)	(1.8)	(1.0)	(0.6)	(9.3)	

Notes:

1. t-statistics are in parentheses under relevant coefficient.
2. Per capita specification includes income and consumption divided by the number of people in the household weighted by the number of months they were resident over the past 12 months.

Source: CILSS tabulations.

consumption with respect to income than household level estimates. As frequently found in similar studies, the cost of adding additional household members increases at a decreasing rate, that is, there are positive economies of scale with respect to household size over consumption. Thus the average consumption per capita falls with increasing household size as the coefficients on demographic variables in per capita specifications are negative.

The demographic coefficients in the country-wide consumption models in Table 5-2 suggest a rather curious bias towards the consumption of female children and a (perhaps less curious) bias towards the consumption of adult males over male children or adult females. In essence, given income, the fixed cost of consumption for female children is significant and positive, while the fixed cost of consumption for male children is insignificant and negative on average. The fixed cost of consumption for adult males is some two-and-one-half to three times the cost of consumption for adult females. The findings vis-a-vis female children contradicts both the folk wisdom in the field and various empirical studies regarding the cost of child-rearing; one typically finds a bias towards male children in allocating consumption within the household. However, estimation by regional subgroups (Table 5-2) shows that female children "cost more" only in Abidjan; expenditures in other urban areas are roughly equal (depending on how the model is specified), and expenditures in rural areas are actually higher for male children. The country-wide findings of a spending bias towards female children are borne out by other analyses of the CILSS data (van der Gaag, n.d.), which

suggest the results are real rather than an artifice of a particular estimation technique. The apparent willingness of households to pay more for female children deserves further study, but is beyond the scope of the present work. We suspect that this revealed preference for female children likely reflects household demographic structure, and the often fluid composition of West African households.

According to Table 5-3, marginal propensities to save out of current income range from a high of around .75 in rural areas, to a low of around .15 in urban areas, depending on the model specification.

Returning to the results presented in Table 5-2, the simple linear models require that a constant proportion of incremental income is saved regardless of the total level. With some exceptions, linear savings models fit the data quite well, yielding relatively high explanatory power and fairly precise estimates of income parameters (estimated t-statistics ranged from 40.2 for the total sample to 15.3 in other urban areas). The per capita specification of the simple model gives different results from the aggregate household specification only in Abidjan, where current income is most widely distributed and the population quite heterogeneous.

The per capita log-log specification generally provides better results than linear models; there are clearly non-linearities in the relationship between income and consumption. However, the log-log models assume a constant MPS across income levels. This assumption is relaxed in

Table 5-3

Estimated Marginal Propensities to Save Out of Current Income, by Region and Selected Income Levels

	Linear Model	Per Capita Linear Model	Per Capita Semi-Log Model	Per Capita Log-Log Model	Quadratic Model	Per Capita Quadratic Model
Abidjan						
Quintile 1: CFA 640,343	.657	.149	.454	.583	.356	.543
Quintile 3: CFA 2,237,140	.657	.149	.844	.583	.404	.030
Quintile 5: CFA 7,069,707	.657	.149	.951	.583	.549	-1.526
Other Urban Areas						
Quintile 1: CFA 605,216	.559	.516	.522	.466	.340	.187
Quintile 3: CFA 1,906,523	.559	.516	.848	.466	.432	.312
Quintile 5: CFA 3,725,169	.559	.516	.922	.466	.559	.487
Rural Areas						
Quintile 1: CFA 226,583	.773	.725	-.376	.599	.523	.543
Quintile 3: CFA 720,897	.773	.725	.566	.599	.544	.653
Quintile 5: CFA 2,402,921	.773	.725	.870	.599	.615	1.026
Total Country						
Quintile 1: CFA 291,525	.582	.342	.286	.458	.360	.177
Quintile 3: CFA 1,142,872	.582	.342	.815	.458	.384	.233
Quintile 5: CFA 4,081,392	.582	.342	.995	.458	.466	.427

Source: CILSS tabulations.

the semi-log models, which provide very sensible results, predicting a high sensitivity of savings to current income levels and quite high savings rates for the wealthiest households. Unforturnately, goodness of fit measures are lower for semi-log specifications than for other specifications, suggesting an inability to fit extremes in current income levels.

The quadratic models provide a more general functional form by introducing a second income term (income-squared) to allow for differences in marginal propensities to consume across income levels. In general, they evidence higher explanatory power than simple linear specifications [3/] and yield intuitively sensible results. With one exception (the per capita specification in Abidjan), marginal propensities to save were found to increase with rising levels of income, as one might expect.

An important measure of the appropriateness of the quadratic specification is the point at which the model predicts that all income is saved, that is, the point at which the MPS becomes greater than or equal to one. Difficulties arise when income levels increase past this point, as the model then predicts (clearly unrealistic) savings propensities of greater than one. It is encouraging to find that, with the exception of

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[3/] F-statistics have critical values of 3.86 and 6.76 for the 5 percent and one percent significance levels, respectively. Estimated test statistics are 91.09 for households in Abidjan, 14.49 for other urban households, and 61.72 for rural households. Clearly we cannot reject the hypothesis of significant improvements in explanatory power for any of the three regions.

per capita specifications for rural areas and for Abidjan, marginal propensities to save out of current income are still well below one when evaluated at mean income levels for the highest quintile in each of the regions. In fact, the MPS would be one in Abidjan at an annual income level of CFA 30.9 million per annum, in other urban areas at CFA 14.6 million per annum, and in rural areas at CFA 23.1 million per annum. As these values are well beyond the range of income reported in the sample for all but one or two households, the quadratic consumption specifications provide sensible results at sample extremes. Note that the models predict very similar savings rates for Abidjan and other urban areas (households in the lowest quintile save on average one-third of total income out of the marginal "dollar", while household in the highest quintile save on average some 55 percent of income at the margin), and slightly higher savings rates for households in rural areas (52 percent of income at the margin is saved in the lowest quintile, as compared to 62 percent in the highest quintile).

Consumption and Sources of Income

Our prior expectation is that the correlation between consumption and current income will be lowest for households deriving most or all of income from self-employment activities. The results presented in Table 5-3 show this to be the case; regardless of specification, marginal savings rates are higher in rural areas, where some 88 percent of all earned income is drawn from farm and non-farm self-employment. The hypothesis that propensities to save out of current income are affected by

the source from which income is derived (or, alternatively, the underlying production process which generates income and the liquidity and investment requirements of that process) can be tested more directly, however. Table 5-4 shows basic consumption functions estimated for four mutually exclusive (and collectively exhaustive in terms of earned income sources) groups of households: (i) those receiving earned income only from employment outside the household; (ii) those receiving earned income only from agriculture activities; (iii) those receiving earned income from non-farm self-employment, agriculture activities, but not from employment; and (iv) those receiving income from employment and at least one form of self-employment. Households who do not receive earned income are excluded from the table. Annex Table 5.2 presents variable means for the estimates presented in Table 5-4, and Table 5-5 presents marginal propensities to save derived from these estimates, evalutated at the income mean and median for the group.

At first glance, marginal propensities to save do not seem to differ a great deal across income source sectors, and there is no consistent support for the hypothesis that income from self-employment more likely to be saved than income from wage activities. For example, using the quadratic specification of the consumption function, households receiving income from employment only or employment plus other sources have a MPS of .380 and .326, respectively, at the median income level, while households receiving only income from agriculture have a MPS of .397 at the median income level. In contrast, households receiving non-farm self-employment income, possibly in conjunction with farm income, have a

Table 5-4

Household Consumption Functions, by Source of Income

	Income	Income-Squared	Number of Children		Number of Adults		Intercept	R^2
			Female	Male	Female	Male		
Wage Income Only (N=260)								
(1) Linear model	.424	-	194850	31218	125814	60766	916629	.583
	(15.9)		(3.3)	(0.5)	(2.1)	(1.0)	(6.3)	
(2) Per capita linear model	.473	-	-22791	-41145	-33363	-22912	490415	.740
	(22.6)		(1.4)	(2.5)	(2.0)	(1.4)	(10.9)	
(3) Per capita semi-log model	350821	-	-25373	-33184	-63524	-22848	-3648586	.521
	(12.7)		(1.1)	(1.5)	(2.8)	(1.0)	(9.8)	
(4) Per capita log-log model	.468	-	-.038	-.072	-.062	-.054	7.37	.677
	(17.1)		(1.7)	(3.2)	(2.7)	(2.3)	(19.9)	
(5) Quadratic model	.711	-2.349 E-Ø8	195455	16304	111162	41026	546641	.620
	(11.3)	(5.0)	(3.5)	(0.3)	(1.9)	(0.7)	(3.5)	
(6) Per capita quadratic model	.691	-3.062 E-Ø8	-13215	-29134	-30234	-21801	351263	.773
	(16.8)	(6.0)	(0.9)	(1.8)	(1.8)	(1.4)	(7.3)	
Farm Income Only (N=618)								
(1) Linear model	.347	-	23510	22665	57787	34465	388148	.454
	(17.4)		(1.6)	(1.5)	(3.0)	(1.5)	(8.3)	
(2) Per capita linear model	.310	-	-9174	-10739	-7966	-1813	173299	.097
	(5.6)		(1.6)	(1.8)	(1.1)	(0.2)	(8.7)	
(3) Per capita semi-log model	369270	-	30147	23992	57848	32080	-4193151	.364
	(13.1)		(1.9)	(1.4)	(2.7)	(1.3)	(11.8)	
(4) Per capita log-log model	.430		-.037	-.056	-.031	-.030	7.09	.477
	(18.8)		(2.9)	(4.1)	(1.9)	(1.6)	(26.6)	
(5) Quadratic model	.634	-2.763 E-Ø9	18966	22640	40354	12077	287301	.517
	(17.0)	(8.9)	(1.3)	(1.6)	(2.2)	(0.6)	(6.3)	
(6) Per capita quadratic model	.563	-1.863 E-Ø8	-8138	-9783	-7638	-2003	145041	.110
	(5.7)	(3.1)	(1.4)	(1.7)	(1.0)	(0.2)	(6.6)	

Table 5-4 (continued)

Household Consumption Functions, by Source of Income

	Income	Income-Squared	Number of Children		Number of Adults		Intercept	R^2
			Female	Male	Female	Male		
Non-Farm Self-Employment Income only, Farm + Non-Farm Income (N=408)								
(1) Linear model	.317	-	61189	4462	28620	101231	576420	.431
	(12.4)		(2.2)	(0.2)	(1.0)	(2.5)	(7.6)	
(2) Per capita linear model	.456	-	-5648	-10983	-7659	-9613	201655	.481
	(17.5)		(0.8)	(1.6)	(1.0)	(0.9)	(9.3)	
(3) Per capita semi-log model	452112	-	73385	8046	54473	83471	-5195363	.370
	(10.0)		(2.5)	(0.3)	(1.7)	(2.0)	(8.7)	
(4) Per capita log-log model	.432		-.024	-.050	-.038	.020	7.14	.442
	(14.6)		(1.2)	(3.2)	(1.8)	(0.7)	(19.9)	
(5) Quadratic model	.445	-1.374 E-09	63340	7744	30251	96191	457923	.439
	(7.4)	(2.4)	(2.2)	(0.3)	(1.0)	(2.4)	(5.1)	
(6) Per capita quadratic model	.380	1.724 E+08	-6099	-12231	-7772	-8588	217553	.484
	(7.2)	(1.7)	(0.8)	(1.7)	(1.0)	(0.8)	(9.2)	
Wage & Self Employment Income (N=251)								
(1) Linear model	.314	-	73326	-1365	124346	113483	643857	.543
	(14.0)		(1.5)	(0.0)	(2.4)	(2.1)	(4.2)	
(2) Per capita linear model	.431	-	-13020	-14291	-5032	-8597	235400	.553
	(16.0)		(2.0)	(2.3)	(0.7)	(1.2)	(10.4)	
(3) Per capita semi-log model	1127866	-	21569	-56688	104662	82155	-14243393	.522
	(13.3)		(0.4)	(1.2)	(2.0)	(1.5)	(12.5)	
(4) Per capita log-log model	.454		.242	-.227	-.256	.039	8.04	.603
	(3.9)		(0.5)	(0.8)	(1.2)	(0.2)	(5.3)	
(5) Quadratic model	.720	-1.566 E-08	54026	-51829	100894	59244	308268	.653
	(14.3)	(8.7)	(1.3)	(1.3)	(2.3)	(1.2)	(2.2)	
(6) Per capita quadratic model	.582	-4.763 E-08	-12845	-12712	-5425	-8505	201508	.569
	(10.1)	(2.9)	(2.0)	(2.1)	(0.8)	(1.2)	(8.0)	

Source: CILSS tabulations.

Table 5-5

Estimated Marginal Propensities to Save Out of Current Income, by Source of Income and Selected Income Levels

	Linear Model	Per Capita Linear Model	Per Capita Semi-Log Model	Per Capita Log-Log Model	Quadratic Model	Per Capita Quadratic Model
Wage Income Only						
Mean Income CFA 2,902,273	.576	.527	.879	.532	.423	.487
Median Income CFA 1,987,087	.576	.527	.823	.532	.382	.428
Agriculture Income Only						
Mean Income CFA 892,290	.653	.690	.586	.570	.415	.470
Median Income CFA 586,066	.653	.690	.350	.570	.397	.458
Non-Farm Self-Employment Income, With or Without Farm Income						
Mean Income CFA 1,498,418	.683	.544	.698	.568	.559	.672
Median Income CFA 959,839	.683	.544	.529	.568	.558	.653
Wage and Self-Employment Income						
Mean Income CFA 2,264,278	.686	.569	.501	.546	.351	.634
Median Income CFA 1,459,736	.686	.569	.227	.546	.326	.557

Source: CILSS tabulations.

MPS of .558 at the median level of income. This suggests that farmers may not save as intensively out of current income as we had anticipated. However, it is important to discriminate between income effects on savings and behavioral aspects; ignoring possible price differentials, median income for agriculture households is one-third to one-quarter that of households with members in the wage labor force, and a little more than half that of households receiving some non-farm self-employment income. In short, farmers are a great deal poorer than households in other income sectors, so it is not surprising that their savings at the margin are around the same as their wealthier counterparts in other sectors. In reality, this means that they are consuming much less overall than households in other sectors and still managing to save the same share of earnings at the margin. Clearly, however, private savings generated per household are less in the agriculture sector than other sectors of the economy.

Households receiving non-farm self-employment income evidence high savings rates in comparison to other sectors, in spite of relatively lower levels of mean and median incomes in comparison to the wage sector. This is as anticipated. Many of these households reside in rural areas, which explains the high rural marginal propensities to save cited in Table 5-4; clearly the bulk of savings (both at the margin and in aggregate) are not drawn from agriculture.

Consumption Propensities by Source of Income

Models of MPS by source of income within households are presented in Table 5-6 (see Houthakker, 1960, or Koskela and Viren, 1984, for similar estimates). The table presents a simple linear model and a quadratic model of consumption using the full sample, but allowing parameters to vary across income categories. Previous specifications constrained the coefficients to be the same across income categories within each income source sector. Not surprisingly, coefficients are very different across categories; the MPC out of income having a relatively low transitory component (wages, public transfers such as social security and pension payments) is higher than the MPC out of income with a higher expected transitory component (income from self-employment and farming, rents and dividends). For example, using a mean income level of CFA 1.5 million per annum, the marginal propensity to consume wages is .55 (.65 in the quadratic specification) and the marginal propensity to consume public transfers is .63 (.39 in the quadratic specification). In contrast, the marginal propensity to consume either farm income or non-farm family business income is around .26 (.36 and .38, respectively, in the quadratic specifications) and rents and dividends some .32 (.78 in the quadratic specification). In addition, the MPC out of private transfers was quite high (.73 and 1.07 in the linear and quadratic specifications, respectively), reflecting the welfare orientation of interhousehold support networks (Kaufman, 1982). It is interesting (and indeed encouraging) to note that most of the coefficients have low standard errors and are thus very precisely estimated; t-statistics range from 4.8

Table 5-6

Propensities to Consume Out of Different Types of Income

Source of Income	Linear Model	Quadratic Model		MPC (sample means)
		Linear term	Squared term	
Wages	0.550 (29.4)	0.744 (21.1)	-3.26 E-08 (7.1)	0.65
Agriculture	0.266 (11.7)	0.397 (9.9)	-1.24 E-08 (3.3)	0.36
Non-farm businesses	0.261 (11.5)	0.415 (11.6)	-1.22 E-08 (4.8)	0.58
Rents and Dividends	0.323 (6.1)	1.226 (13.1)	-1.48 E-07 (10.3)	0.76
Social Security, Pensions	0.625 (4.8)	0.558 (2.1)	-5.906 E-08 (0.5)	0.31
Private transfers	0.731 (5.2)	2.232 (7.9)	-3.88 E-07 (5.6)	1.05
Other (includes imputed rents and durables)	1.03 (15.3)	1.590 (13.2)	-1.26 E-07 (5.3)	1.21
R^2	.576	.653		

Note: t-statistics are in parentheses.

Source: CILSS tabulations.

for public transfer income to 29.4 for wage income in the linear specification, and are similarly robust in the quadratic specification.

There are some obvious problems with the income differentiated model in Table 5-6; the MPC out of "other" income was greater than one in both the linear and quadratic specifications, and the MPC from private transfers was greater than one in the quadratic specification when evaluated at the mean of current income. The latter suggests that private transfer income is underestimated in the CILSS sample. The former is caused in part by the inclusion of durables and imputed rents on both sides of the equation, that is, in both consumption and income measures. Both measures fall into the "other" category, and both implicitly have a coefficient of one in the equation.

To summarize the results of this section, the consumption functions we estimated based on current income evidenced good explanatory power and intuitively sensible results. Marginal propensities to save are highest for the wealthy and the self-employed, and lowest in general for the poor, regardless of the source of their income. Farm households evidence savings capacity that is roughly equal to wage earning households at the margin, despite large differences in current income levels. There is some empirical evidence to support the hypothesis that the marginal propensity to save out of current income is higher for households whose incomes have a large transitory component than for households having a smaller transitory component. However, this will be tested more rigorously in the next section, where estimates are made of permanent and

transitory income, and the basic consumption functions are re-estimated using these measures in place of current income.

5.2 Savings Propensities and Permanent Income

This section describes consumption functions estimated using permanent income estimates in place of current income. For purposes of expositional clarity, the discussion of empirical results is preceeded by a brief derivation of the permanent income hypothesis. Permanent income estimates are derived from the models presented in Chapter 3.

The Permanent Income Model [4/]

If y is annual income and q is annual consumption expenditures, then the following equations describe the permanent income model:

$$y = y^p + y^t \qquad (5.1)$$

$$q = q^p + q^t \qquad (5.2)$$

$$E(y^t)=0 \quad E(q^t)=0$$

$$E(y^p y^t)=0 \quad E(q^p q^t)=0$$

$$E(y^t q^t)=0$$

where: y^p and y^t, q^p and q^t are permanent and transitory income and consumption, respectively.

[4/] This section draws on Bhalla (1976, 1979), Musgrove (1974, 1976), and Muellbauer (1983).

In general, the transitory components of income and consumption are treated as the residual, or measurement error in a model relating current income to permanent income. The expected value of the residuals is assumed equal to zero across households, and the correlation between residuals as well as the correlation between permanent and residual components are likewise assumed to be zero.

According to the permanent income theory, permanent income and consumption are systematically related to each other by some fixed factor k, so that

$$q^P = ky^P \qquad (5.3)$$

The fixed factor depends on a variety of things such as individual tastes, interest rates, and composition of assets, but is independent of the level of permanent income, and is therefore invariant across the range of permanent income. This implies a unitary elasticity between permanent income and consumption, which in natural logs is expressed as

$$Q^P = k + Y^P \qquad (5.4)$$

where: Q is ln(q), and

Y is ln(y).

In estimation, an additional parameter μ is typically estimated to allow for for an elasticity of less than one:

$$Q^p = k + \mu Y^p \qquad (5.5)$$

Both forms (5.3 and 5.5) of the permanent income model are typically used; however, note that the two models make different assumptions concerning the impact of errors in the measurement of income components (for a discussion of this see Bhalla, 1979). The differences are not critical to the findings presented here.

For purposes of estimation, we assume a stochastic relationship between permanent income, which is itself unobservable, and some observable set of variables denoted X, so that

$$y^p = \beta X + \varepsilon \qquad (5.6)$$

where $E(\varepsilon y^t)=0$ and $E(\varepsilon q^t)=0$, that is, the error term ε is uncorrelated with either the transitory component of income or of consumption. This implies that

$$y = y^p + y^t = (\beta X + \varepsilon) + y^t \qquad (5.7)$$

so that q can be defined as

$$q = q^p + q^t = \alpha + k(\beta X + \varepsilon) + q^t \qquad (5.8)$$

for the linear model, and

$$Q = Q^p + Q^t = k + \mu(\beta X + \varepsilon) + Q^t \qquad (5.9)$$

for the log specification.

If the error term is uncorrelated with the explanatory variables (X's) in (5.7), then μ (or k in the linear case) can be estimated by obtaining fitted values $\hat{Y} = \beta X$ from (5.7) and then using these values as an estimate of permanent income in (5.8) or (5.9). In addition, the residuals from (5.7), $Y - \hat{Y}$, can be used as an estimate of the transitory component of income (if we believe that the MPC out of transitory income is greater than zero). Thus, the estimating equation becomes

$$q = \alpha + k_p(\hat{y}) + k_t(y - \hat{y}) + q^t \qquad (5.10)$$

However, there is a problem of identification in equation (5.7). Practically speaking, it is not possible to separate out the effects of ε from the total residual in the equation, that is, we obtain only $(\varepsilon + y^t)$ This means that measurement error in the permanent income equation cannot be separated from residual or transitory income effects. If ε is positively correlated with those variables in X that are positively correlated with income, β will be biased upwards, and estimates of k (or μ) accordingly biased downwards.

The problem could be solved in a number of ways. For example, multiple observations of the same individual over a sufficiently long period of time would allow us to isolate individual effects (Leviatan, 1963; Bhalla, 1979), or the structural model could be identified as in Musgrove (1974, 1979) and Attfield (1976, 1980, 1981). More recently, Muellbauer proved that μ can be estimated consistently, regardless of possible violations of the independence assumption, by using standard 2SLS (or instrumental variables) regression techniques. However, if there is some degree of dependence between the x's and ε, estimates of the β's will not be consistent.

In keeping with Muellbauer (1982), estimation is done in a two step process; first, (5.7) is estimated and fitted values used to construct instruments for permanent and transitory incomes. Note that transitory income is simply assumed to be the residual between actual and permanent income for present purposes. This is clearly incorrect, but is the best we can do under present circumstances. Accordingly, transitory income results must be viewed with caution. These variables are then used in estimating (5.8), (5.9) and (5.10). The two step estimation procedure yields correct standard errors for the coefficient on transitory income, but underestimates standard errors for the coefficient on permanent income. (Pagen, 1984, Deaton, 1985). Correct standard errors are estimated for the log specification using a single-pass 2SLS approach, but similar corrections were not performed for the linear and quadratic specifications. Note that both the two-step and single-pass yield consistent and unbiased estimates of consumption propensities; the only

difference lies in estimates of the standard errors. Previous work has shown that corrected errors differ very little from uncorrected errors in cross-sectional analysis of this sort.

Savings Propensities and Permanent Income

Regional and sectoral household production functions were used to construct measures of permanent and transitory income, which were themselves used to re-estimate household consumption functions. Performing the analysis in two separate OLS steps gives the same results as using single-pass 2SLS techniques; the first approach allows more flexibility in the specification of the consumption function. This section describes the resulting consumption function estimates.

For purposes of comparison, Table 5-7 shows simple linear, quadratic, and log-log consumption functions estimated on current income for the total sample, each region, and the four production-based categories. Note that household size variables are excluded from these models for reasons of expositional simplicity. Table 5-8 presents similar models with current income replaced by fitted values ($\hat{y} = \hat{\beta}x$ representing permanent income) and residual values ($y-\hat{y}$ representing transitory income) from the household production functions. Separate estimates are described for the total sample and for households stratified by the three major regions in the country. Table 5-9 presents similar models, but households are stratified by production categories. The

Table 5-7

Côte d'Ivoire: Base Household Consumption Functions; By Region, Income Source Category, and Total Country

	Income	Income-Squared	R^2
Total Country			
(1) Linear specification	.435 (39.4)	-	.499
(2) Quadratic specification	.665 (36.1)	-1.48 E-08 (15.0)	.563
(3) Log specification			
Abidjan			
(1) Linear specification	.370 (18.4)	-	.505
(2) Quadratic specification	.692 (18.1)	-1.55 E-08 (9.5)	.611
(3) Log specification	.292 (14.4)	-	.384
Other Urban Areas			
(1) Linear specification	.480 (16.0)	-	.437
(2) Quadratic specification	.743 (10.5)	-3.70 E-08 (4.1)	.463
(3) Log specification	.536 (21.8)	-	.591
Rural Areas			
(1) Linear specification	.335 (22.5)	-	.362
(2) Quadratic specification	.548 (17.8)	-2.22 E-08 (7.8)	.403
(3) Log specification	.317 (20.5)	-	.320
Wage Income Only			
(1) Linear specification	.460 (16.7)	-	.518
(2) Quadratic specification	.780 (11.9)	-2.66 E-08 (5.3)	.567
(3) Log specification	.485 (17.9)	-	.555
Farm Income Only			
(1) Linear specification	.396 (20.6)	-	.409
(2) Quadratic specification	.693 (19.9)	-3.03 E-08 (9.9)	.490
(3) Log specification	.484 (23.2)	-	.467
Other Self-Employment Income Only			
(1) Linear specification	.345 (14.2)	-	.332
(2) Quadratic specification	.526 (8.8)	-1.98 E-08 (3.3)	.350
(3) Log specification	.450 (16.7)	-	.411
Wage and Self-Employment Income			
(1) Linear specification	.343 (13.7)	-	.478
(2) Quadratic specification	.735 (14.9)	-1.58 E-08 (8.7)	.600
(3) Log specification	.661 (21.7)	-	.655

Source: CILSS tabulations.

Table 5-8

Côte d'Ivoire: Household Consumption Function with Estimated Permanent and Transitory Income; By Region and Total Country

	Estimated Permanent Income [1]	Permanent Income-Sq.	Estimated Transitory Income	Transitory Income-Sq.	Intercept	R^2
Abidjan						
(1) Linear specification	.482 (13.6)	-	-	-	1676454	.358
	.468 (15.3)	-	.294 (11.0)	-	1543133	.530
(2) Quadratic specification	.829 (9.7)	-2.99 E-08 (4.4)	-	-	1224382	.394
	.848 (12.1)	-2.97 E-08 (5.4)	.484 (11.6)	-1.29 E-08 (5.7)	11474	.603
(3) Log specification [2]	.491 (12.6)	-	-	-	7.621	.326
Other Urban Areas						
(1) Linear specification	.666 (14.7)	-	-	-	868471	.397
	.700 (17.2)	-	.320 (9.1)	-	709729	.518
(2) Quadratic specification	.989 (9.9)	-5.34 E-08 (3.6)	-	-	562926	.420
	.887 (9.8)	-2.28 E-08 (1.6)	.385 (8.0)	-3.11 E-08 (2.5)	538863	.534
(3) Log specification	.680 (17.4)	-	-	-	4.679	.479
Rural Areas						
(1) Linear specification	.216 (14.7)	-	-	-	827961	.194
	.383 (24.1)	-	.291 (17.7)	-	634996	.400
(2) Quadratic specification	.551 (17.0)	-9.17 E-09 (11.4)	-	-	580737	.297
	.575 (20.1)	-8.56 E-09 (4.2)	.413 (15.0)	-2.44 E-08 (16.1)	486059	.464
(3) Log specification	.512 (18.3)	-	-	-	6.769	.274
Total Country						
(1) Linear specification	.563 (30.5)	-	-	-	918449	.374
	.554 (36.8)	-	.331 (23.3)	-	774252	.536
(2) Quadratic specification	.849 (24.2)	-2.87 E-08 (10.3)	-	-	647768	.414
	.852 (28.6)	-2.37 E-08 (9.9)	.419 (22.1)	-1.03 E-08 (7.2)	505766	.581
(3) Log specification	.629 (28.0)	-	-	-	5.353	.335

[1] The production models provide an estimate of E[lny]. To obtain an estimate of E[y], it is necessary to use the following transformation:

$$\text{if } y \sim \ln N(\,), s_y^2), \text{ then } E[e^y] = e^{\,) + 1/2 s_y^2} = e^{\,)} * e^{1/2 s_y^2}$$

[2] Parameters estimated with 2SLS to obtain correct measures of standard errors.

Source: CILSS tabulations.

Table 5-9

Côte d'Ivoire: Household Consumption Functions with Estimated Permanent and Transitory Income; By Production Category

	Estimated Permanent Income	Permanent Income-Sq.	Estimated Transitory Income	Transitory Income-Sq.	Intercept	R^2
Wage Income Only						
(1) Linear specification	.474 (12.1)	-	-	-	1586685	.362
	.500 (14.7)	-	.397 (9.4)	-	1372000	.526
(2) Quadratic specification	.903 (10.1)	-3.96 E-08 (5.3)	-	-	963017	.423
	.806 (9.9)	-2.89 E-08 (4.3)	.358 (6.9)	2.09 E-09 (0.2)	940361	.558
(3) Log specification	.578 (15.4)	-	-	-	6.288	.480
Farm Income Only						
(1) Linear specification	.791 (22.8)	-	-	-	414886	.457
	.742 (22.6)	-	.214 (9.5)		412785	.526
(2) Quadratic specification	.656 (7.9)	3.46 E-08 (1.8)	-	-	478026	.460
	.692 (9.2)	2.55 E-08 (1.5)	.428 (12.2)	-3.02 E-08 (7.8)	416997	.570
(3) Log specification	.614 (18.4)	-	-	-	5.428	.357
Non-Farm Self-Employment Income Only, or Non-Farm and Farm Self-Employment Income						
(1) Linear specification	.609 (12.4)	-	-	-	753538	.276
	.561 (12.2)	-	.244 (8.1)	-	711236	.378
(2) Quadratic specification	.796 (8.6)	-2.37 E-08 (2.4)	-	-	600609	.286
	.762 (8.8)	-2.23 E-09 (2.4)	.428 (7.7)	-3.49 E-08 (4.0)	546689	.407
(3) Log specification	.622 (12.8)	-	-	-	5.383	.289
Wage and Self-Employment Income						
(1) Linear specification	.581 (13.6)	-	-	-	1007886	.427
	.511 (12.8)	-	.228 (7.2)	-	1033247	.526
(2) Quadratic specification	.911 (9.6)	-2.52 E-08 (3.9)	-	-	583838	.460
	1.105 (13.6)	-4.66 E-08 (8.1)	.466 (8.5)	-1.102 E-08 (3.7)	236579	.632
(3) Log specification	.746 (16.6)	-	-	-	3.693	.528

Source: CILSS tabulations.

results from Tables 5-8 and 5-9 are summarized in Table 5-10, which presents calculated marginal propensities to save out of current income and estimated permanent income. Coefficients from the quadratic consumption models are used in deriving the measures in Table 5-10, and savings propensities are evaluated at category or regionally-based sample means for current income and permanent income.

Several econometric issues should be noted regarding these estimates: First, the t-statistics on the permanent income coefficients for both the linear and quadratic models in Tables 5-8 and 5-9 are not strictly correct (Johnston, 1972, Pagan, 1984), although the OLS standard errors for transitory (or residual) income parameters are correct. The source of error lies in the fact that the income variable has been replaced by an instrument which has equal or less variance than the measured variable. This causes the standard errors for the instrumental variable to be underestimated if the model is estimated using a two step OLS approach, which upward biases reported t-values. 2SLS was used to generate correct standard errors for the log-log specification, but it is not feasible to use the same approach for the linear and quadratic models. 5/ In any case, changes in error estimates were fairly minimal, as is typically the case for correction techniques applied to instrumental variables estimates. While it would have been possible (although

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5/ Practical constraints are imposed by the fact that permanent income is estimated using a Cobb-Douglas production function (the natural log of total output is used on the left-hand side). The best linear estimator of Q (or any transformation of Q) is not necessarily a simple transformation of lnQ.

Table 5-10

Côte d'Ivoire: Marginal Propensitites to Save [1] Out of Current and Permanent Income; By Region, Income Source Category, and Total Country

	Marginal Propensity to Save		
	Current Income	Estimated Permanent Income	Estimated Transitory Income
Total Country			
Base Income: CFA 1,600,743	.382	.243	.557
Abidjan			
Base Income: CFA 1,600,743	.358	.267	.557
Mean Income: CFA 2,823,011 [2]	.396	.304	.531
CFA 2,231,813			
Other Urban Areas			
Base Income: CFA 1,600,743	.376	.182	.715
Mean Income: CFA 1,934,893	.400	.183	.635
CFA 1,608,834			
Rural Areas			
Base Income: CFA 1,600,743	.523	.478	.665
Mean Income: CFA 1,022,597	.497	.464	.596
CFA 833,672			
Wage Income Only			
Base Income: CFA 1,600,743	.305	.224	.641
Mean Income: CFA 2,902,273	.374	.297	.642
CFA 2,526,691			
Farm Income Only			
Base Income: CFA 1,600,743	.404	.233	.668
Mean Income: CFA 892,290	.361	.294	.583
CFA 718,194			
Other Self-Employment Income Only			
Base Income: CFA 1,600,743	.537	.280	.684 [3]
Mean Income: CFA 959,839	.512	.255	.599 [3]
CFA 1,082,892			
Wage and Self-Employment Income			
Base Income: CFA 1,600,743	.316	.170	.569 [3]
Mean Income: CFA 1,459,736	.311	.181	.542 [3]
CFA 1,821,278			

[1] Based on quadratic consumption models, evaluated at the sample mean income of CFA 1,600,743 and average income in category.

[2] Means for current and permanent income.

[3] Mean of estimated permanent income is above mean of current income. For expositional purposes, transitory income is assumed to be 40 percent of self-employment current income, and 25 percent of wage and self-employment current income.

Source: CILSS tabulations.

difficult) to calculate corrected standard errors for the latter equations, the parameter estimates were deemed sufficiently robust not to justify the extra effort, given the anticipated minimal gain. Note, however, that the bias in estimated standard errors for permanent income prevents us from performing formal statistical tests for parameter equality within or between equations. Note also that R^2 measures should not be compared between log-based and linear consumption estimates, as the log-transformation necessarily smooths out the effects of extreme residual values in the data; on a priori grounds, we expect log-based models to evidence higher R^2 measures, totally apart from the effects of specification.

The results of the permanent income corrected consumption estimates are encouraging; propensities to save out of the permanent income proxy are consistently lower than propensities to save out of current income. For example, according to Table 5-10, the estimated marginal propensity to save out of current income evaluated at the sample mean for households in Abidjan is .396, while the MPS out of permanent income (estimated at the mean of expected or permanent income) is .304. In contrast, the MPS in other urban areas is .400 and .183 out of current and permanent income, respectively. Rural estimates do not evidence as great a change as in other regions; the MPS out of current income is calculated at .497 and the MPS out of permanent income is .464. Note, however, that the point on the income distribution where we evaluate the MPS determines the final value; the lower the level of income, the greater the difference in measured savings propensities. Propensities to save by

production categories show a similar and more accentuated pattern than regional groupings; savings propensities drop from .374 to .297 (wage households), .361 to .294 (farm households), .512 to .255 (non-farm self-employment households), and .311 to .181 (wage + non-farm self-employment households). Thus, while our models do not yield savings propensities of zero for permanent income, there is nonetheless convincing evidence that households tend to save less out of permanent or expected income in the Côte d'Ivoire than out of current or measured income. In short, sources of income do matter in predicting savings behavior; households use a longer time frame than a year when making decisions regarding resource allocation; households appear to respond differently to short term changes in income than to more permanent changes.

It is useful to look at the actual consumption models in Tables 5-8 and 5-9 to examine the form of the relationship between income and savings, as well as transitory income effects. In general, the estimates provide convincing evidence of basic non-linearities in savings behavior vis-a-vis household income. At the lower end of the income distribution where the quadratic term has minimal impact, marginal propensities to consume out of expected income are very high -- they are in fact close to 1.0. This is particularly true for urban (Abidjan and other urban areas) households, and for households receiving at least some income from wage activities. The effect is less pronounced for households who operate a farm or other family enterprise; for them, non-linearities in savings propensities are less, and the MPS out of permanent income is relatively constant across the income distribution. This is particularly true for

farm households, where the MPC actually increases as income levels rise. This suggests that households who are dependent on their own resources to generate income (they are market producers as well as consumers) are more likely to be saving at least some of expected factor earnings, regardless of output levels. We anticipated such results in earlier parts of the study.

The log-log specification provides a different way of handling non-linearities in savings propensities. Comparisons with current income-based MPS show similar effects (by production category) as found using the more flexible quadratic specification; according to log-log estimates, households dependent on wages have an MPS out of current income of .515 and an MPS out of permanent income of .422. For farm households, the relevant values are .516 and .614; for self-employed households values are .550 and .378; and for wage and self-employed households the MPS out of current and permanent income are .339 and .254, respectively.

Residual (or transitory) income effects also look reasonably good; while we do not find a MPC out of transitory income of zero (as the strict form of the permanent income theory requires), they are, however, substantially lower than MPC's out of permanent income, and usually lower than MPC's out of current income. Table 5-10 includes a column for estimated MPS out of transitory income. These are consistently some two to three times as high as MPS out of permanent income.

To summarize our results: There is convincing evidence that households consume more at the margin out of expected income and save more out of unexpected or transitory income. Unfortunately, our estimates of permanent and transitory income are not ideal and may be contaminated by individual effects and other measurement error. However, our estimate of marginal propensities to save out of current and transitory income components should be consistent estimates of true values, given our assumptions and the estimation techniques employed. Use of panel data would improve the estimates substantially; unfortunately, the CILSS panel in the Côte d'Ivoire will not be available for some time. When the full data set becomes available it will be interesting to compare these estimates with panel estimates.

Until this point, we have basically ignored the role of liquidity constraints or borrowing constraints in determining consumption and savings behavior. Clearly the existence of such constraints will increase the correlation between current income and consumption, while decreasing the correlation between permanent income and consumption. This latter effect becomes obvious when one considers one of the basic tenets of the permanent income-life cycle hypothesis -- that households make consumption decisions based on expected life time earnings. This assumption presupposed that individuals can borrow and lend as much as they require to meet "permanent" consumption requirements at a market rate. To the extent that the assumption does not hold (for example, to the extent households are liquidity constrained), present consumption levels will be less than permanent income dictated levels. In effect, this would bias

our estimate of μ downwards, to the extent that some households are constrained in borrowing and lending behavior. Thus, liquidity constraints may provide a partial explanation of why estimated MPC out of permanent income are relatively low for certain groups in the population -- specifically farmers and some of the non-farm self-employed. The next chapter describes a formal test for liquidity constraints in each of the three major regions in the Côte d'Ivoire, and examines the role of liquidity in household welfare and savings behavior. First, however, we present some alternative savings models in the third and final section of Chapter 5.

5.3 Alternative Models of Savings Behavior

Throughout the thesis, we use the residual of annual income as a measure of private savings. It would be preferable to measure household savings directly as the change in stocks over the survey period; however, we do not have sufficiently detailed asset information in the CILSS to do so. We do obtain reasonably good measures of changes in the stock of so-called productive assets, however -- capital inputs into farm or non-farm household production activities. This section describes a simple "savings" model which has the change in the value of productive assets on the left hand side, and a variety of economic, demographic, and existing values of other asset measures on the left hand side.

In addition, models are described in the latter part of this section which explore the determinates of the stock of cash savings (the

most liquid form of household assets) in urban and rural areas. As with the stock adjustment model, a wide range of economic, demographic, and asset measures are used as explanatory variables.

Determinates of Changes in Productive Asset Stocks

According to the permanent income hypothesis, changes in the stock of productive assets should be more highly correlated with transitory incomes than with permanent incomes. If some households are liquidity constrained, the correlation between transitory income and stock adjustments may be exacerbated -- households will expand capital stocks primarily when they have sufficient "surplus" income to do so. If credit is generally unavailable, a household may have to save for a period of time to amass sufficient resources for a capital purchase. This suggests that, all other things being equal, a household which has recently increased its stock of productive assets will have less cash savings than a household which has not done so; in short, there will be a negative correlation between cash savings and the change in the value of the stock of productive assets. To test both hypotheses, a measure of permanent income, transitory income, and the value of cash savings are included in the stock adjustment model.

In addition, the model includes a variety of demographic variables which have been used throughout the thesis. Among these are the number of children and adults living in the household, stratified by gender, the age of the household head, nuclear and male labor-scarce dummy

variables, and regional intercepts. The value of stocks of selected personal assets are also used in the model, which include the cash value of recent durable purchases, the household net debt position, and the maximum years of education for adult men and adult women. All of these variables have been used previously, so descriptive statistics are not included here.

Table 5-11 presents stock adjustment estimates for the country as a whole. Note that parameter values are primarily driven by households living in Abidjan; models estimated for rural households and those living in other urban areas did not have much explanatory power. These regional results are not surprising when one realizes that the vast majority of household investment activities occur in Abidjan; few households outside the capital city reported changes in their stocks of productive assets.

According to Table 5-11, stock changes are quite significantly correlated with levels of transitory income, and not significantly correlated with levels of permanent income. Based on our estimates, a one CFA increase in transitory income results in a .237 CFA increase in the value of productive stocks. These results are gratifying, not only because of <u>a priori</u> expectations, but also because they provide some evidence that the residual-based transitory income measure is a reasonably good proxy for "actual" transitory income.

Table 5-11

Changes in Stocks of Productive Assets; Total Country

Variable [1/]	Parameters	
"Permanent" Income (CFA)	.0361	(1.0)
"Transitory" Income (CFA)	.2373	(10.1)
Max. education of males in hh (yrs)	4612.8	(0.4)
Max. education of females in hh (yrs)	-821.0	(0.1)
Value of Cash Savings (CFA)	-.0638	(1.3)
Value of durables purchased since January, 1984 (CFA)	-.0483	(0.6)
Net debt position (CFA)	.0810	(1.9)
Is household nuclear?	56589.5	(0.6)
Is household male labor-scarce?	-299013.0	(2.0)
Age of household head (yrs)	2865.5	(0.8)
No. female children, 0-14 yrs	28156.4	(1.1)
No. male children, 0-14 yrs	-23373.3	(0.9)
No. adult females, 15+ yrs	122805.9	(3.8)
No. adult males, 15+ yrs	-66098.0	(1.7)
Does household live in Abidjan?	-193577.7	(1.7)
Does household live in other urban areas?	-290596.1	(2.8)
Model Intercept	-113470.9	(0.6)
R^2	.089	
F-statistic	9.36	

1/ t-statistics in parentheses.

Source: CILSS tabulations.

The cash savings parameter is also of the correct sign, although not highly significant. According to the model, a one CFA increase in the value of productive stocks is associated with a .064 decrease in the value of cash savings. This result suggests that asset purchases may be influenced by credit constraints -- all things being equal, households run down cash savings in order to purchase productive assets.

We find a positive and significant correlation between the household's net debt position and stock changes -- households who have lent out more than they are owed are more likely to increase productive asset stocks, while households with outstanding debts are more likely to decrease productive asset stocks. Also, male labor-scarce households (those without working-aged male members) report an average of CFA 299,014 less in asset increases than households with working-aged male members. In short, these households may be divesting themselves of important productive assets simply in order to survive.

There is a curious correlation between the number of adult males and females in the household and changes in the stock of productive assets. According to our estimates, stocks increase with the number of adult women in the household, and decrease with the number of adult men. Recall that women are the primary operators of non-farm family businesses in the city; the positive correlation (each adult women increases productive stock adjustments by CFA 122,806) is likely the result of the self-employed/informal sector orientation of Ivorian women. The negative correlation for adult males (each adult male decreases productive stock

adjustments by CFA 66,098) is likely caused by the wage sector orientation (where physical capital does not play an important role) of Ivorian men.

Determinates of Changes in Levels of Cash Savings

The cash savings models include roughly the same set of variables as the previously described stock adjustment model. However, note that the dependent variable is a measure of the present stock of cash savings, in contrast to the change in stocks measure used above. Because of this, many of the parameters will reflect wealth effects -- wealthier households are simply expected to save more than less wealthy households, all things being equal -- as well as other factors.

The strong correlation between permanent income and cash savings found in Table 5-12 provides one example of this. For the country as a whole, a one CFA increase in permanent income is associated with a .278 CFA increase in cash savings, while a one CFA increase in transitory income carries with it only a .069 CFA increase in savings. In Abidjan, however, the relative effects between the two sources of income are much more similar than in the rest of the country -- a one CFA increase in income is associated with a .168 CFA and .127 CFA increase in cash savings for permanent and transitory income, respectively. This likely reflects the fact that savings institutions are much more readily available in the capital city, interest rates are likely higher, and househholds may not have good competing investment alternatives if they are primarily dependent on labor force activities to generate income.

Table 5-12

Permanent Income Determinants of Cash Savings in the Cote d'Ivoire, by Region and Total Country

Variable [1/]	Parameters							
	Abidjan		Other Urban		Rural		Total Country	
"Permanent" Income (CFA)	.1683	(5.8)	.4774	(4.9)	.3322	(17.5)	.2779	(13.6)
"Transitory" Income (CFA)	.1274	(6.9)	-.0107	(0.2)	.0665	(5.3)	.0693	(5.2)
Max. education of males in hh (yrs)	-12887.9	(1.3)	-58445.9	(2.9)	-5252.1	(0.9)	-17755.9	(2.8)
Max. education of females in hh (yrs)	9533.1	(0.9)	-49504.6	(1.9)	-18345.7	(1.8)	-27848.4	(3.4)
Ha. of land used	42106.6	(3.0)	1352.7	(0.1)	-6273.2	(2.3)	2599.8	(0.7)
Value of business assets (CFA)	-.00638	(0.6)	-.00055	(0.0)	-.00321	(0.5)	.00093	(0.1)
Estimated value of dwelling unit (CFA)	.00030	(0.0)	-.0528	(1.1)	-	-	-.0287	(1.7)
Value of durables purchased since January, 1984 (CFA)	-.0161	(0.3)	1.8851	(10.3)	.3351	(3.7)	.2945	(6.5)
Net debt position (CFA)	.0445	(1.8)	.2824	(3.1)	.1263	(2.5)	.0952	(4.1)
Is hh nuclear?	-118133.0	(1.1)	71026.4	(0.4)	7810.3	(0.2)	-7033.1	(0.1)
Is hh male labor-scarce?	-92513.0	(0.5)	225680.5	(0.8)	87002.2	(1.6)	144439.8	(1.8)
Age of household head (yrs)	4697.5	(1.1)	4462.7	(0.7)	380.4	(0.3)	-627.4	(0.3)
No. female children, 0-14 yrs	6275.5	(0.2)	-12277.1	(0.3)	9296.0	(1.0)	15682.8	(1.1)
No. male children, 0-14 yrs	-3277.3	(0.1)	-10690.4	(0.3)	-12190.0	(1.3)	-10055.4	(0.7)
No. adult females, 15+ yrs	-111611.3	(3.1)	-45042.1	(0.8)	-15081.0	(1.2)	-42224.8	(2.4)
No. adult males, 15+ yrs	-33203.4	(0.9)	122598.1	(2.1)	8793.5	(0.6)	70513.5	(3.4)
Does hh live in Abidjan?	-	-	-	-	-	-	-124650.0	(1.8)
Does hh live in other urban areas?	-	-	-	-	-	-	91997.2	(1.4)
Model Intercept	-54199.2	(0.3)	-542778.3	(1.7)	-115206.0	(1.7)	-127627.1	(1.4)
R^2	.336		.378		.519		.193	
F-value	9.88		11.92		62.86		184.9	

1/ t-statistics are in parentheses.

Source: CILSS tabulations.

In general, we expect to find a negative correlation between the value of other asset stocks and the stock of cash assets -- in fact, they represent competing uses of scarce household resources. However, liquidity constraints and investment complimentarities may reverse the direction of the correlation. For example, education is generally negatively correlated with the value of cash savings, given permanent income levels and other demographic factors. This likely is caused by lifecycle effects not captured by the age-of-household-head variable. Given permanent income levels, households with higher levels of education are typically younger than their less educated counterparts, and thereby have had less time to amass resources. In addition, households who have invested in education are likely to have lower stocks of other sorts of assets.

Regarding other assets: Land (as measured in ha.) is negatively correlated with the value of cash savings in rural areas (a somewhat surprising result), and positively correlated with cash savings in Abidjan. The value of recent durable purchases, which are themselves a relatively liquid form of assets, tend to be positively and fairly strongly correlated with cash savings for households residing in other urban areas, and negatively correlated for households in Abidjan and rural areas. The sign of the coefficient could be expected to go in either direction -- households likely to hold liquid assets may do so in the form of cash or easily sold durables whose values may be increasing in real terms. At the same time, some households may view durable purchases as a competing form of investment of scarce liquid resources. Housholds owed

money tend to have higher cash savings than households in debt; we interpret this primarily as reflecting wealth effects.

Demographic effects are not strong in the cash savings models. There is some tendancy for male labor-scarce households to have higher levels of cash savings than other households, particularly in rural areas, where these households have on average CFA 87,002 more saved than households with prime-aged male members. Note, however, that the correlations between the number of adult males and females and savings is just the opposite of the stock adjustment model -- each additional adult female member reduces the level of cash savings by some CFA 42,224 while each additional adult male member increases savings by CFA 70,516 for the country as a whole. The effect of adult females is clearly strongest in Abidjan, and relatively weak in other areas.

Table 5-13 describes models similar to those in Table 5-12, except that transitory income has been replaced by measures of total annual income by source, which include wages, business profits, farm profits, private transfers, rents and dividends, pensions, social security and other forms of forced savings, and other income. Thus, these models show the effect of another unit of wage income (for example) on cash savings, given permanent income levels.

Not surprisingly, the strongest effects are found for households residing in Abidjan. In the capital city, wage effects are nil, farm profits are strongly and significantly correlated with cash savings (CFA

Table 5-13

Current Income Determinants of Cash Savings in the Cote d'Ivoire, by Region and Total Country

Variable [1/]	Parameters							
	Abidjan		Other Urban		Rural		Total Country	
"Permanent" Income	.0355	(1.2)	.3757	(3.9)	.2570	(17.4)	.2165	(11.2)
Wage income (CFA)	-.0058	(0.2)	-.1729	(2.6)	.0773	(1.8)	-.0572	(2.4)
Agriculture income (CFA)	.5440	(8.8)	-.0991	(0.7)	.0738	(4.8)	.1112	(4.4)
Family enterprise income (CFA)	.1268	(5.5)	.0193	(0.2)	-.0613	(2.4)	.0573	(2.7)
Private transfer income (CFA)	.3425	(3.1)	-.4381	(0.3)	.4106	(0.6)	.1467	(1.2)
Rents and dividends (CFA)	.3489	(3.2)	1.3601	(5.6)	.9581	(6.8)	.5158	(7.9)
Pensions, social security, etc. (CFA)	.1766	(1.3)	.1300	(0.3)	-.1065	(0.3)	.0790	(0.6)
Other income (CFA)	.1810	(3.2)	.3417	(1.2)	.0443	(0.5)	.1271	(1.7)
Max. education of males in the hh (yrs)	3789.7	(0.4)	-40323.4	(1.9)	-6679.7	(1.1)	-4770.4	(0.7)
Max. education of females in the hh (yrs)	17663.9	(1.7)	-37028.3	(1.5)	-18037.7	(1.9)	-23592.8	(2.9)
Ha. of land used	6063.4	(0.4)	10990.6	(0.6)	-7395.5	(2.6)	-1224.6	(0.3)
Value of business assets (CFA)	-.0477	(2.2)	-.0517	(1.7)	-.0240	(3.1)	-.0425	(4.4)
Estimated value of dwelling unit (CFA)	-.0074	(0.4)	-.0688	(1.4)	-	-	-.0524	(3.0)
Value of durables purchased since January, 1984 (CFA)	.0222	(0.5)	1.8234	(10.4)	.2576	(2.8)	.3317	(7.4)
Net debt position (CFA)	.0130	(0.6)	.2947	(2.3)	.2662	(4.7)	.1033	(4.4)
Is hh nuclear?	-89827.8	(1.0)	-72557.3	(0.4)	10535.3	(0.3)	-21890.7	(0.4)
Is hh male labor-scarce?	-85296.7	(0.5)	161247.9	(0.6)	61096.0	(1.2)	157771.6	(2.0)
Age of household head	1700.2	(0.4)	-2312.7	(0.4)	407.9	(0.3)	-1328.6	(0.7)
No. female children, 0-14 yrs	22758.1	(0.8)	-23917.0	(0.6)	7761.2	(0.8)	10873.0	(0.8)
No. male children, 0-14 yrs	-6269.7	(0.2)	-23348.4	(0.6)	-15739.0	(1.7)	-8254.9	(0.6)
No. adult females, 15+ yrs	-95199.6	(2.8)	-39889.9	(0.7)	-12121.9	(1.0)	-47740.9	(2.8)
No. adult males, 15+ yrs	-24220.5	(0.7)	112837.8	(2.0)	5114.3	(0.3)	65587.4	(3.2)
Does hh live in Abidjan?	-	-	-	-	-	-	-82362.9	(1.2)
Does hh live in other urban areas?	-	-	-	-	-	-	175749.5	(2.8)
Model Intercept	83443.3	(0.4)	-33566.2	(0.1)	-88728.0	(1.4)	-89345.5	(0.9)
R^2	.465		.448		.554		.284	
F-value	12.15		11.35		51.34		25.21	

1/ t-statistics are in parentheses.

Source: CILSS tabulations.

profits are likewise significantly but less strongly correlated with cash savings (CFA .127 for every one CFA). As anticipated, there is little correlation between pensions and social security income and cash savings as most recipients of this type of income are retired and not highly motivated to save. Finally, the remaining categories of income all evidence positive and significant correlations with cash savings (.347 for rents and dividends, .342 for private transfer payments, and .180 for all other sources of unearned income).

Households living in other urban areas were found to have a strong correlation between permanent income and cash savings and a reletively weak correlation between transitory income and cash savings. Not surprisingly, only two of the new income measures were found to be significant -- wages are negatively correlated with the stock of savings (one CFA in wages reduces cash .544 in cash savings for every one CFA of farm income), and business savings by CFA .173), and rents and dividends are positively correlated (one CFA of rent and dividend income increases savings by an average CFA 1.360!).

For rural households, income correlations were often significant, but of a much smaller magnitude than in Abidjan. This reflects the lower overall levels of savings reported by rural households. For example, one CFA derived from agriculture increased cash savings by CFA .074, one CFA of income from wages increased cash savings by CFA .077 (curiously similar to the farm income savings rate), and one CFA of income from non-farm business activities actually decreased cash saving rates by CFA .061.

This latter result may reflect the fact that rural households who have diversified sources of self-emloyment income are more entrepenuerial and thereby more likely to invest cash surpluses rather than hold them in the form of cash. Note also that most rural households have limited access to formal savings institutions, and are more likely to keep cash under a mattress than to deposit it in a formal institution at attractive interest rates. Rural households have much greater access to informal savings institutions, however, which are called "tontine" savings clubs in the Côte d'Ivoire. In terms of unearned income, rents and dividends show a strong and significant correlation with the stock of cash savings maintained by the household; according to our estimates, some CFA .958 of savings result from every one CFA of income from rental capital and dividends. It is important to note that dividends are themselves likely derived from cash savings, so that the positive effect is not surprising.

Other parameters in the cash savings models described in Table 5-13 are fairly similar to those described in Table 5-12, although the negative correlation with selected asset values increase in some cases.

As a general comment on the models presented in this section; the results are (perhaps surprisingly) robust, and most coefficients have the expected signs and are of a reasonable magnitude. We feel that the results provide somewhat reassuring evidence that permanent and transitory income estimates are generally adequate, as well as shed light on some interesting aspects of savings behavior in the Côte d'Ivoire.

Annex Table 5.1

Variable Means for Consumption Functions, by Region

	Abidjan (N=334)	Other Urban (N=332)	Rural (N=898)	Total Country (N=1564)
Annual Income (CFA)	2,823,011	1,934,893	1,022,597	1,600,074
Per Capita Income (CFA)	538,375	370,652	148,027	278,646
Annual Expenditures (CFA)	2,772,481	1,958,942	1,012,610	1,588,088
Per Capita Expenditures (CFA)	589,536	361,387	158,311	293,509
Number of females 0-14 years [1/]	1.65	1.90	1.85	1.82
Number of males 0-14 years	1.43	1.94	2.04	1.89
Number of females 15+ years	1.92	2.24	2.30	2.21
Number of males 15+ years	1.86	2.03	1.75	1.84

[1/] Individual counts are weighted by the number of months the individual has been present in the household over the past year.

Source: CILSS tabulations.

Annex Table 5.2

Variable Means for Consumption Functions, by Source of Income

	Wage Income Only (N=260)	Agriculture Income Only (N=618)	Non-Farm Self-Employment Income, Farm & Non-Farm Income (N=408)	Wage and Farm or Non-Farm Non-Farm Self-Employment Income (N=1564)
Annual Income	2,902,273	892,290	1,498,418	2,264,278
Per Capita Income	679,561	127,188	243,750	270,230
Annual Expenditures	2,784,834	982,945	1,431,546	2,065,773
Per Capita Expenditures	626,342	154,085	244,440	270,747
Number of females 0-14 years [1/]	1.45	1.81	1.96	2.08
Number of males 0-14 years	1.42	1.98	2.00	2.07
Number of females 15+ years	1.64	2.29	2.41	2.34
Number of males 15+ years	1.71	1.81	1.77	2.21

[1/] Individual counts are weighted by the number of months the individual has been present in the household over the past 12 months.

Source: CILSS tabulations.

6. THE EFFECTS OF LIQUIDITY CONSTRAINTS ON CONSUMPTION BEHAVIOR

According to the permanent income-lifecycle hypothesis, consumers act as if they maximize a lifetime utility function, subject to a lifetime budget constraint. For this to occur, capital markets must operate perfectly; individuals must be able to borrow and invest as much as they wish at equivalent interest rates. Transitory shortfalls in income can be smoothed by dissaving, either in the form of borrowing or by liquidating present stocks of assets. If some individuals are constrained by imperfect capital markets, that is, if they are liquidity (or credit) constrained, then they may be forced to consume at levels comensurate with current income, and below desired consumption levels. In essence, liquidity constraints would act to increase the correlation between current income and consumption, but decrease the correlation between estimated permanent income and consumption. This latter effect caused by credit constraints limiting individual's ability to "realize" expected permenant income levels.

This chapter describes a relatively simple test for liquidity constraints in the Côte d'Ivoire. It begins with a brief discussion of the problem based on principles of intertemporal welfare optimization It then describes the methodology used to perform formal statistical tests. The final section in the chapter describes empirical results, and discusses the potential influence and severity of liquidity constraints on consumption behavior in different segments of the Ivorian population.

6.1 Theoretical Overview [1/]

Consider a situation in which the individual is attempting to optimize his or her lifetime level of welfare. The lifetime utility function of a representative consumer is given by

$$U = u(x_1, x_2, \ldots, x_T, A_{T+1}/P) \tag{6.1}$$

where: x_t is consumption at time (age) t,
A_{T+1} represents assets at the end of a consumers lifetime, which are bequested to others,
P is the lifetime price index across all goods.

Periods are linked by between period transfers of assets, which may be negative or positive. If an individual begins his/her life with an initial endowment A_o, assets at the end of each period are defined in terms of within period exogenous income, expenditures, and the asset endowment at the end of the previous period.

$$A_t = (1+r_t)A_{t-1} + Y_t - p_t x_t \tag{6.2}$$

where: r_t is the interest rate in period t,
Y_t is income in period t,
$p_t x_t$ is consumption expenditures in period t, and
all other variables are as previously defined.

[1/] This section draws on Deaton, 1980, and Deaton and Muellbauer, 1980.

The intertemporal budget constraint is given by

$$\sum_t d_t * p_t x_t + d_T * P(A_{T+1}/P) \qquad (6.3)$$

or

$$A_o + \sum_t d_t * Y_t \qquad (6.4)$$

where: d_t are discount factors determined by $d_t = 1/(1+r_1)(1+r_2) \ldots (1+r_t)$, and all other variables are as previously defined.

Thus, the intertemporal utility function (6.1) is maximized subject to the condition that total consumption is equal to the sum of consumption across periods plus bequests (6.3), which is itself equal to initial endowments plus the sum of the discounted stream of income across periods (6.4).

In this simple formulation, we assume that capital markets operate perfectly, that is, that the timing of consumption is completely independent of income, so long as total consumption does not exceed lifetime income plus inital endowments. For reasons cited earlier, this assumption may be unrealistic in many parts of the developing world.

Consider the role of the boundary conditions stated in (6.2). First, savers are characterized by the condition $Y_t > p_t x_t$, and dissavers by the condition $Y_t < p_t x_t$. Dissaving can occur in two ways: (i) liquidation of existing assets, or (ii) borrowing. Is there a binding

constraint on the extent of dissavings allowed in any particular period? We might assume that the stock of assets could never be negative, that is, that the value of assets in any year are sufficient to cover dissavings: $(1+r_t)A_{t-1} \geq Y_t - p_t x_t$. According to the model, the constraint on stocks is not necessary so long as the budget constraint is satisfied and lifetime consumption does not exceed initial endowments plus lifetime earnings. Practically speaking however, borrowing typically depends on collateral, and the availability of collateral requires that the present value of assets (both physical assets and human assets) in a paticular period be positive. Thus, the non-negativity of stocks constraint adds realism to the model. It is important to note that credit may only be available at high interest rates, or selectively, regardless of the availability of collateral -- in short, collateral does not quarantee funds.

What else might constrain consumption in a particular period? Assuming that current income is not sufficient to obtain desired consumption levels, and the intertemporal budget constraint is satisfied, the potential dissaver could liquidate assets in lieu of borrowing. Let us further assume that she/he possesses two distinct kinds of assets, one for which markets function well (A^L, or liquid assets) and another for which markets are limited or nonexistent (A^{NL}, or nonliquid assets). What are the conditions for liquidation financing of consumption? Clearly one can most profitably and easily dispose of liquid assets, particularly cash holdings and consumer goods. Sales of productive assets -- land, buildings, and equipment -- may have a long-term effect on future streams of income, and as such is clearly not desirable. In addition, sales of

costly capital stocks under duress seldom yields favorable returns. It is also important to note that capital transactions, particularly land market transactions, may be limited or even disallowed in rural areas of many developing countries due to sanctions imposed by government, local authorities, or social custom.

Disposal of so-called nonliquid assets -- for example, human capital or pension funds -- may only be possible at a considerable loss relative to their expected value at some later time or use value in productive activities. In the Côte d'Ivoire, human capital, pensions and social security, and rural land are the major types of nonliquid stocks maintained by households. Education in particular (considered as part of the stock of human capital) yields tremendously high returns in productive activities. Households who decide not to invest in education because of current or expected income shortfalls may be placing themselves at a serious future disadvantage. Rural land likewise yields high returns, and in many cases (some 65 percent of CILSS households) cannot be sold in the Côte d'Ivoire. Further, many Ivorian farmers grow tree crops, which have long gestation periods followed by longer periods of production. Improper maintenence or delayed replanting of the stock due to temporary cash shortages may cause substantially lower returns than under other investment regimes.

Let us consider the role of liquidity constraints within a particular time period more systematically. As before, assume that households have liquid and nonliquid assets at the start of a period, A_L

and A_{NL}, and receive an exogenous stream of income within the period, Y_t. Actual consumption is $x_t p_t$, while desired consumption (which is greater than or equal to actual consumption) is c^*. Liquid assets can be further stratified into those assets which directly contribute to production, $A_{P,L}$, and those which do not, $A_{NP,L}$. On this basis, we can identify six distinct savings/dissavings regimes:

For $Y_t \geq c^*$:

1. $Y_t > c^*$ (savers)
2. $Y_t = c^*$ (neither dissavers nor savers)

For $Y_t < c^*$: (dissavers)

3. $(c^* - Y_t) < A_{NP,L}$
4. $(c^* - Y_t) < (A_{NP,L} + A_{P,L})$, but $> A_{NP,L}$
5. $(c^* - Y_t) < (A_{NP,L} + A_{P,L} + A_{NL})$, but $> (A_{NP,L} + A_{P,L})$
6. $(c^* - Y_t) > (A_{NP,L} + A_{P,L} + A_{NL})$

In regime 1, the household consumes c^* and increases total asset holdings by the difference $Y_t - c^*$ during the period. In regime 2, the household likewise consumes c^*, but evidences no net change in asset holdings. Stocks of assets likely fall for households operating in regimes 3 through 6, depending on decisions regarding desired versus actual consumption levels.

Households operating in regime 3 must liquidate some non-productive liquid assets to achieve desired consumption levels. Households in regime 4 cannot subsidize consumption out of non-productive

assets alone, but must either sell or borrow against other assets -- likely productive assets will serve as better collateral than non-liquid assets. If borrowing is possible, then desired consumption levels can be meet. However, if credit is not available, then households will have to sell productive assets in order to achieve desired consumption levels. Assume c_{min} represents minimum feasible consumption levels. Households operating in this regime have a series of choices: if credit is available, then households who can borrow against $A_{P,L}$ will do so to achieve c^*. If credit is either unavailable or limited, households can either sell some of their productive assets or decrease consumption up until level c_{min}, at which point they must begin to disinvest in productive assets. The likelihood of consuming below desired levels is even greater for households operating in regime 5; the value of nonliquid assets is certain to be highly idiosyncratic, depending on the timing of attempted sales and market conditions. For example, a household which has use rights to a plot of rural land, but no sales rights may be able to rent the land for a short time, or allow other lineage members to use the land in return for various kinds of support. A household with relatives working in the city may be able to obtain temporary help from them on the basis of kinship. In any case, the level of consumption will almost certainly drop. The same is true of households operating in regime 6, where the present income shortfall outstrips even the present value of total household assets.

How is the simple intertemporal optimization solution changed by the existence of imperfect capital markets, which is implied by the

seperation between liquid and non-liquid assets? First, the lifetime stream of income from holding such assets will be greater than the income from sales, so permanent income will fall if liquidation is necessary. If the household later attempts to repurchase nonliquid assets, they may or may not be available on the market, the price at which they are available may bear little relation to the price at which the household was forced to sell them, transactions costs may be significant and asymetrical, and the household still confronts the problem of amassing considerable resources to make a capital purchase under highly constrained credit conditions -- the same conditions that forced them to sell in the first place.

Portfolio effects are important as well. For example, households throughout the developing world make large sacrifices in order to educate their children -- that is, in order to increase stocks of human capital. Our previous analyses suggest that the returns to formal education range from 4 to 5 percent (in real terms) a year in the agriculture sector to 10 to 12 percent a year in the wage sector. In addition, small-scale entrepreneurs likewise evidence high returns to investments in education; our results suggest that they may be as high as 12 percent per year of formal education completed. Further, returns to education increase with increasing levels of education -- for example, the returns to investment in secondary education are generally higher than similar returns for primary schooling. What does a household do when faced with the choice of disinvesting in illiquid physical assets or not investing in human capital? If capital markets are imperfect, then investments in education cannot be smoothly substituted for investments in physical assets; a

change in the asset portfolio may incur substantial transaction costs, and a loss in long-term wealth relative to the levels of wealth which would be expected if capital markets functioned better.

Interestingly, there is evidence of uneven patterns of school attendance in the Côte d'Ivoire -- children frequently drop out of school for short periods of time, and later return to complete their education. This phenomenon may well be caused by liquidity constraints in conjunction with frequent transitory shifts in household income. Rather than liquidating productive assets, households may delay schooling until more resources become available. This suggests that the loss in future income caused by delayed education is less than the cost of obtaining funds for schooling in the present, either by borrowing at high interest rates (if credit is available) or liquidating stocks of assets.

Considerable theoretical work and some empirical work has been done in an attempt to identify the impact of possible liquidity constraints on savings and consumption behavior (Wiseman, 1975, Zellner, Huang, and Chow, 1965, Pissarides, 1978, Hall and Mishkin, 1982, Flavin, 1984, Hayashi, 1985), with only some degree of success. However, all of the cited empirical studies use data from industrialized countries, where one might expect financial systems to be best developed and imperfections in capital markets to have relatively little effect on household savings. Their findings suggest (essentially via a refutation of the permanent income hypothesis) that liquidity constraints may influence consumer behavior, but only to a small extent in absolute terms. We

suspect that liquidity considerations may well have a stronger influence on savings behavior in developing areas.

The next section describes an approach for testing whether some households within selected segments of the Ivorian population are liquidity constrained. The technique was developed by Hayashi (1985). His empirical work uses data from the U.S.

6.2 Methodology for Liquidity Constraints Tests

In Chapter 3, we specified the household's optimal consumption rule in a general sense -- permanent income was assumed to be generated by physical and human assets in combination with family labor inputs, and consumption (in Chapter 5) was assumed to be a function of permanent income, transitory income, and demographic factors (in this case, household size). No effort was made to address questions of the endogeneity of family labor inputs, primarily for reasons of data limitations. The measurement of permanent income and specification of an optimal consumption rule for the household is seriously complicated if future labor inputs are assumed to be stochastic. In this section, we introduce a more general reduced form model of consumption which does not specify a particular consumption rule for the household. We do so in part for computational simplicity, and in part to make the test for liquidity constraints more powerful; we want a test of consumer behavior and not a test of consumer behavior conditioned on specification. A failure in

terms of specification may not be distinguishable from a failure in terms of behavior.

As stated in the previous section, the household attempts to maximize its lifetime utility function subject to a lifetime budget constraint. This is only possible if there are no constraints on borrowing, that is, if the household can borrow or invest (lend) as much as it wants at a single interest rate. What if there are borrowing constraints in the present period? In such case, an additional constraint must be added, e.g., the household behaves as if it maximizes its lifetime utility function subject to a lifetime budget constraint and a borrowing constraint. Following Lucas (1980) and Hayashi (1985), let us assume that the borrowing constraint applies within each period so that consumption cannot exceed some exogenously given level k. Thus:

$$c_t \leq k \qquad (6.5)$$

where t denotes a time subscript for each period. If k is sufficiently large, the problem reduces to the standard permanent income-lifecycle hypothesis (see Lucas, 1980, for a formal statement of the model). Note that k is specific to the individual household, and not observed.

As before, let us assume that the desired level of consumption is c^* in the present period. [3/] Actual consumption would then be represented by

$$c_t = \min(c^*, k) \tag{6.6}$$

The basic question, then, is whether c_t is less than c^*, which implies that the household cannot borrow as much as it would like to meet desired consumption levels, or whether c_t is equal to c^*, which implies that available credit is equal to or greater than desired levels. To state the model formally,

$$c_t = \begin{cases} c^* \text{ if } k \geq c^*, \text{ and} \\ k \text{ otherwise.} \end{cases} \tag{6.7}$$

Unfortunately, we only observe c^* for households that are not liquidity constrained; for other households, we observe the maximum consumption which could be acheived under the household-specific borrowing constraint. However, there is no <u>a priori</u> way to know whether we are observing c^* or c_t because we do not know which households are liquidity constrained and which are not. Nonetheless, we can determine whether <u>some</u>

[3/] Note that c^* may be affected by future liquidity constraints insofar as these are reflected in a households decision rule concerning consumption, but it is not affected by present period borrowing constraints -- it reflects the amount the household would like to consume if the borrowing constraint is not binding (e.g., $c^* < k_t$). According to Hayashi, "c^* solves the fictitious intertemporal optimization problem where the future borrowing constraints are present, but the current borrowing constraint is not" (1985, p. 189).

households appear to be liquidity constrained using the following approach.

We observe current income and current consumption for all households. Some households are savers in the present period -- that is, they consume significantly less than current income flows -- and some households are dissavers or neither dissavers or savers -- they consume at levels comensurate with or greater than current income flows. Households consuming sufficiently less then current income are extremely unlikely to be liquidity constrained in the present period. This implies that k is not a binding constraint. How much is "sufficiently less"? While any rule of this type is arbitrary, we chose to partition the sample according to

$$k \geq .85(Y_t + .40(\text{Cash Savings})) \qquad (6.8)$$

Thus any household consuming less than 85 percent of the sum of current income plus 40 percent of reported cash savings was assumed not to be constrained in consumption behavior, that is, to be consuming at c^*. (Note that the .85 and the .40 multipliers simply provide an extra safety margin; for purposes of the planned statistical tests, it is important that only households which are not currently liquidity constrained be included in appropriate group). The remaining households may or may not be constrained in consumption behavior. If all of them are not, then we expect their consumption behavior to be statistically indistinguishable from the clearly unconstrained group's. If at least some households in

the group are liquidity constrained (but not necessarily all of them), then their consumption behavior will differ from the unconstrained group's behavior.

Table 6-1 shows how the sample selection rule in (6.8) paritions households in each of the three regions of the Côte d'Ivoire. For reasons which will become apparent later, the group determined by $c_t<k$ are referred to as non-limit observations, and the group determined by $c_t>k$ as limit observations. According to Table 6-1, some 28.8 percent (443 cases) of household in the CILSS sample are in the non-limit group, that is, are assumed to be not currently liquidity constrained. The shares are roughly similar across regions -- 28.3 percent of the sample population from residing in Abidjan, 34.6 percent in other urban areas, and 26.8 percent in rural areas. In all cases, there are sufficient observations in both limit and non-limit groups for application of the formal statistical test.

There are several ways to test for similarities across the two groups in the sample population. Perhaps the most simple is the standard Chow-test (1960). Regressions are estimated for the pooled sample and each subgroup. The maintained hypothesis is parameter equality across the subgroups. The test statistic is computed as

$$F(V_1,V_2) = \frac{(RSS_p - RSS_i)/(E-1)K}{RSS_i/(N-E*K)} \qquad (6.9)$$

where: RSS_p is the residual sum of squares of the pooled regression;

Table 6-1

Limit and Non-Limit Observations, By Region

	$c_t < k$ (Non-Limit Observations)		$c_t > k$ (Limit Observations)		Total	
	N	Percent	N	Percent	N	Percent
Abidjan	93	28.3	236	71.7	329	100.0
Other urban	114	34.6	216	65.5	330	100.0
Rural	236	26.8	644	73.2	880	100.0
Total Country	443	28.8	1096	71.2	1539	100.0

Source: CILSS tabulations.

RSS_i is the residual sum of squares of each subgroup regression;
N is the total number of cases;
K is the number of parameters;
E is the number of equations;
V_1 is degrees of freedom equal to (E-1)K;
V_2 is degress of freedom equal to (N-E*K).

The test requires homogeneity of the error variances among subgroups, which can be tested with a Bartlett-test. In interests of brevity, this latter test was not performed here. Note that if the homogeneity assumption does not hold, the Chow-test statistic is only an approximation to the true test value.

Chow-tests are carried out to test for parameter equality across savings sub-groups classifed by region (Abidjan, other urban, and rural). These are described in the next section. In performing these tests, we use the full permanent income specification described in Chapter 3 (e.g., we specify an optimal consumption rule for the household), and estimate the consumption function parameters by 2SLS for the log-log specification, which yields correct estimates of standard errors for the derived variable.

Hayashi (1985) suggests a somewhat more interesting test for liquidity constraints which provides consistent estimates of consumption function parameters that are not adulterated by borrowing constraints. Following Hayashi, let us assume a general consumption function that is a linear function of a set of independant variables:

$$c^* = \beta X + \varepsilon, \quad E(\varepsilon|X) = 0 \tag{6.10}$$

The independent variables might include a wide range of effects associated with consumption levels -- current income, physical assets, education, and demographic factors -- and transformations within the effects (squared and interaction terms). Again, recall that our intention here is to specify a very general and non-restrictive form of the consumption function.

Consider again our sample selection rule, defined previously as $k \geq .85(Y_t + .40(\text{Cash Savings}))$. Define $T = .85(Y_t + .40(\text{Cash Savings}))$ as the threshhold value which seperates households into a subsample within which c^* is observed ($c_t<T$) and a subsample within which c^* may or may not be observed ($c_t>T$). A truncated, limited dependant variable can be defined as

$$y = \begin{cases} c^* & \text{if } c_t<T \\ T & \text{otherwise} \end{cases} \tag{6.11}$$

Clearly this implies that

$$y = \begin{cases} \beta_1 X + \varepsilon_1 & \text{if } c_t<T, \text{ and} \\ U & \text{otherwise} \end{cases} \tag{6.12}$$

In standard terminology, households that satisfy the sample seperation rule ($c_t<T$) are called nonlimit households, while those that do not are called limit households.

We can obtain consistent (although not necessarily efficient) and asymptotically normal estimates of the β's if we estimate (6.12) using a Tobit procedure, even if some of the limit households are liquidity constrained. Under the alternative hypothesis, namely, that none of the households in the sample are liquidity constrained ($c_t=c^*$), we can obtain efficient and asymptotically normal estimates if we estimate the general consumption function by OLS across the entire sample population:

$$c_t = \beta_2 X + \varepsilon_2 \qquad (6.13)$$

The question, then, is whether the two procedures yield the same results. If the null hypothesis that none of the households are liquidity constrained is correct, then the results should be statistically indistinguishable. If, on the other hand, if we can reject the null hypothesis, at least some of the limit households must evidence different consumption behavior than the non-limit households. By reason of experimental design, we interpret these differences as evidence of current liquidity constraints affecting some segements of the Ivorian population.

A Hausman specification test (1978) is used to test for differences in consumption behavior between limit and nonlimit households. This requires estimation of a Wald-type statistic of the form:

$$H(d) = (\beta_{Tobit} - \beta_{OLS})(V_{Tobit} - V_{OLS})^{-1}(\beta_{Tobit} - \beta_{OLS}) \qquad (6.14)$$

where: d represents degrees of freedom;
β_{Tobit} and β_{OLS} are the parameter estimates from the Tobit and OLS procedures, respectively; and
V_{Tobit} and V_{OLS} are the sample size adjusted estimates of the respective asymptotic variance matrices;

The statisic is distributed chi-square with degrees of freedom (d) equal to the number of parameter constraints, that is, to the number of coefficients in the model.

A useful feature of the Tobit parameters is that they provide consistent estimates of true population values regardless of the existence of liquidity constrained households in the total population, so long as none of the nonlimit households are liquidity constrained. Tobit parameters can be used to construct consistent estimates of preferred consumption, $\hat{c}^*$, which can be measured as $\hat{\beta}_{Tobit}X$. The difference $(\hat{\beta}_{Tobit}X-c_t)$ or $\hat{c}^*$ represents the shortfall in consumption due to liquidity constraints.

The next section describes the empirical results of both the Chow-test and the Hausman specification test. As will be seen, there is evidence of substantial liquidity constraints in all three regions of the Côte d'Ivoire, as well as within several selected subgroups of the population.

6.3 Empirical Results of Liquidity Tests

The estimation sample is partitioned similarly for both the pooled sample Chow-test and the Tobit-based Hausman specification test. Table 6-2 shows means and standard deviations by region for the variables used to perform both tests. As many of the variables have appeared previously in the household production function and basic consumption function estimates, we present sample statistics for limit and non-limit groups only, and do not show aggregate sample statistics.

From Table 6-2 we see that households partitioned into the non-limit group tend to be substantially wealthier on average than those in the limit group, regardless of the wealth criterion used. This is particularly true for households residing in Abidjan, where limit households earn on average CFA 1,600,848 annually as compared to CFA 5,960,274 for non-limit households. As expected, the difference in annual expenditures is not as large (CFA 2,513,019 as compared to CFA 3,385,764). However, non-limit households have much higher levels of savings and total assets, and somewhat more secondary and tertiary schooling.

Differences between limit and non-limit households in other urban and rural areas parallel those in Abidjan, but exist to a much lesser degree. For example, in other urban areas, households in the limit group spend on average CFA 1,858,097 per year on consumer goods, in contrast to CFA 2,085,951 for the non-limit group. Income differences are large,

Table 6-2

Sample Statistics for Two Subsamples

	Limit Observations		Non-Limit Observations	
	Mean	Standard Deviation	Mean	Standard Deviation
Abidjan				
Annual expenditures (CFA)	2,513,019	1,674,935	3,387,764	2,253,740
Annual income (CFA)	1,600,848	1,357,279	5,960,247	5,591,160
Household savings (CFA)	108,809	291,653	753,557	1,655,930
Total assets (CFA)	1,292,553	3,250,301	7,792,367	35,006,150
Total household members				
Men, 15+ years	1.95	1.41	2.22	1.68
Women, 15+ years	2.03	1.59	2.17	1.81
Children, 0-14 years	3.31	2.56	3.18	3.07
Education (max yrs completed, 20+ years, spline function)				
0-6 years of education	4.55	2.49	4.88	2.33
7-13 years of education	2.54	2.63	4.22	2.90
14+ years of education	0.25	1.02	1.65	2.59
Total years of education	7.34	-	10.75	-
Other Urban Areas				
Annual expenditures (CFA)	1,858,097	1,229,510	2,085,951	1,283,376
Annual income (CFA)	1,276,757	1,106,522	3,226,521	1,967,864
Household savings (CFA)	162,837	357,150	689,836	2,570,067
Total assets (CFA)	1,909,072	4,213,539	4,006,119	11,552,718
Total household members				
Men, 15+ years	2.07	1.54	2.55	1.92
Women, 15+ years	2.45	2.07	2.51	1.79
Children, 0-14 years	4.04	3.34	4.38	3.28
Education (max yrs completed, 20+ years, spline function)				
0-6 years of education	3.42	2.89	4.17	2.72
7-13 years of education	1.65	2.41	2.67	2.76
14+ years of education	0.08	0.48	0.27	0.94
Total years of education	5.15	-	7.11	-
Rural Areas				
Annual expenditures (CFA)	985,917	719,378	1,076,877	1,006,860
Annual income (CFA)	642,943	518,341	2,140,791	2,399,200
Household savings (CFA)	54,900	146,383	325,859	1,164,280
Total assets (CFA)	5,082,641	9,944,323	11,437,937	47,524,300
Total household members				
Men, 15+ years	1.84	1.24	2.19	1.78
Women, 15+ years	2.34	1.61	2.83	2.76
Children, 0-14 years	3.91	2.96	4.97	4.90
Education (max yrs completed, 20+ years, spline function)				
0-6 years of education	1.53	2.45	2.16	2.73
7-13 years of education	0.24	0.91	0.66	1.67
14+ years of education	0.00	0.00	0.00	0.00
Total years of education	1.77	-	2.82	-

Source: CILSS tabulations.

however (CFA 1,276,757 as compared to CFA 3,226,521). Differences in sample means for assets and household savings appear large as well, but within group variability is large as well (as evidenced by large standard deviations), so they are not significantly different (in a statistical sense) from one another. In rural areas, consumption levels are similar for the two subsamples (CFA 985,917 for limit households and CFA 1,076,877 for non-limit households), while income levels are significantly different (CFA 642,943 compared to CFA 2,140,791, for limit and non-limit households, respectively), as are levels of household savings (CFA 54,900 compred to CFA 325,859, limit and non-limit households, respectively). However, neither levels of education nor asset holdings are significantly different between households in the two subgroups.

To briefly summarize the sample statistics in Table 6-2: Limit and non-limit households are relatively similar in rural and other urban areas (or at least not statistically dissimilar), except along the dimensions upon which the sample was subdivided (income and cash savings as a proxy for liquid assets). In contrast, the groups are rather more dissimilar in Abidjan, although between group differences in consumption levels are not significant. The degree of similarity between limit and non-limit subgroups is encouraging; we are more willing to believe differences in consumption patterns between groups are caused by liquidity constraints rather than some other (excluded) effects if the groups appear relatively similar along important economic dimensions.

Pooled Sample Comparisons

Households that are currently liquidity constrained are less able to consume at levels commensurate with permanent income (or alternatively, long-run expected income levels) than households that are not currently liquidity constrained. As a result, we expect that the correlation between permanent income and consumption to be lower for liquidity-constrained households than for non-constrained households. Further, if the permanent income hypothesis holds in its strict form, the marginal propensity to consume out of permanent income should be equal to one for non-constrained households. We found earlier that the MPC was significantly less than one for the total sample. The limit/non-limit classification allows us to discover whether inappropriate sample aggregation, namely, combining households that can realize permanent income levels with those that cannot, is in part responsible for the low value.

Table 6-3 shows log-log permanent income based consumption functions for each of the three regions and for the limit/non-limit groupings within each region. Models are estimated using 2SLS to obtain correct estimates of standard errors. Two sets of estimates are provided in Table 6-3, one using per captia income and consumption (to adjust for important demographic effects) and one using aggregate income and consumption. The measure of permanent income is derived from household production functions, as described in Chapter 3. Annex Table 6.1 shows

Table 6-3

Log-Log Consumption Models By Region, Limit/Non-Limit Categories, and Per Capita Adjustment (Within Group Permanent Income Estimates)

	Per Capita 1/					Aggregate Household 2/				
	Permanent Income		Intercept		R^2	Permanent Income		Intercept		R^2
Abidjan										
Limit observations	.548	(6.3)	6.202	(5.8)	.141	.530	(8.7)	7.216	(8.5)	.241
Non-limit observations	.976	(22.8)	-0.153	(0.3)	.852	.892	(19.9)	1.168	(1.7)	.815
Pooled sample	.518	(10.6)	6.425	(10.5)	.255	.491	(12.6)	7.621	(13.7)	.327
Other Urban Areas										
Limit observations	.825	(13.2)	2.601	(3.5)	.449	.739	(16.7)	4.082	(6.7)	.563
Non-limit observations	1.015	(17.6)	-0.646	(0.6)	.735	1.083	(14.3)	-1.676	(1.5)	.647
Pooled sample	.757	(14.9)	3.163	(5.1)	.403	.681	(17.4)	4.679	(8.5)	.479
Rural Areas										
Limit observations	.271	(4.1)	8.714	(11.9)	.025	.531	(14.9)	6.682	(14.5)	.254
Non-limit observations	.859	(16.0)	1.128	(1.7)	.523	.905	(20.8)	.753	(1.2)	.649
Pooled sample	.325	(7.1)	7.989	(15.2)	.053	.512	(18.3)	6.769	(18.2)	.274

Notes:

1/ F-statistics for Chow-test are 31.9, 63.2, and 34.1 for Abidjan, other urban areas, and rural areas, respectively.
2/ F-statistics for Chow-test are 19.5, 56.5, and 27.5 for Abidjan, other urban areas, and rural areas, respectively.

Source: CILSS tabulations.

the underlying aggregate (not based on per capita estimates) production functions by region for the limit and non-limit household groupings.

The results in Table 6-3 strongly support the hypothesis that liquidity constraints limit some households' ability to consume at levels commensurate with permanent income. Across all regions, the marginal propensity to consume out of permanent income for households we identify as not currently liquidity constrained is significantly higher than the MPC for households in the potentially constrained group. Further, the MPC for the non-constrained households is not significantly different than one for those residing in Abidjan and other urban areas (.976 and 1.015, respectively for per capita models, and .892 and 1.082, respectively, for aggregate models), and very close to one for households residing in rural areas (.859 and .905 for per capita and aggregate models, respectively). In addition, model intercepts are not significantly different from zero at the 95 percent confidence interval. The magnitude of the coefficients in combination with high explanatory power for non-limit group consumption functions lend rather strong support to a stricter form of the permanent income hypothesis.

In contrast, consumption functions for the limit households evidence comparably low MPC's out of permanent income, high intercepts, and low explanatory power. The differences are most noticable for households in Abidjan and rural areas; households in other urban areas evidence more similar consumption behavior between the sample subgroups.

For purposes of comparison, consumption estimates are included for the pooled sample in each region (which simply includes all households in the region). Note that the estimated MPC out of permanent income for the pooled model is roughly the same as that estimated for the potentially constrained group of households, and the R^2 indicates relatively poor explanatory power. Both factors are indicative of a non-homogeneous population in the pooled estimation sample (or, alternatively, inapproprate parameter constraints across different segments in the population).

Chow-tests were performed on both per capita and aggregate consumption models, by region, using the F-statistic described in the previous section. Calculated test statistics are given in the notes at the bottom of Table 6-3. The critical value for the test statistic is 3.0 at the 95 percent confidence interval; thus, based on Chow-test results, we reject the hypothesis of parameter equality between limit and non-limit households for both specifications in all three regions.

There are problems which could affect the permanent income estimates for limit households, and artificially (in terms of our maintained hypothesis) create the results shown in Table 6-3. Some limit households may be suffering temporarily low levels of income (recall that we specifically choose these households on the basis of low income and savings relative to consumption levels), which would downward bias our estimates of the household production function parameters. In effect, returns to input factors will appear lower than in a more typical year.

Further, it is our sense that reported income is more likely to be reported below the norm than above the norm, which means that the expected value of the error term will not necessarily be equal to zero in the production equation. The measurement error in permanent income will act to decrease the correlation between permanent income and consumption -- the very results found in Table 6-3.

How can we determine whether these results are real (in the sense of reflecting actual liquidity constraints in the economy) or an artifice of data reporting and model structure? While we know of no rigorous statistical technique to use in this case, the following approach may help to clarify our findings. In performing the pooled sample test, income was assumed to be endogenous and determined by a set of instruments for each subgroup in the sample. This can be formally stated as follows:

$$Y_1 = \alpha_1 Z_1 + \upsilon_1 \qquad (6.15)$$

$$Y_2 = \alpha_2 Z_2 + \upsilon_2$$

where: groups 1 and 2 are limit and non-limit households, respectively,
the Z's are the instruments or exogenous variables, and
Y_1 and Y_2 represent income for limit and non-limit groups, respectively.

If Y_1 does not represent "normal" returns to factor inputs denoted Z_1 (and further, are off by more than just a scale factor), then predicted income for limit households will underestimate typical factor incomes. In effect, the parameter vector α_1 will be downward biased.

If we assume that income estimates for the non-limit group are more likely to represent expected returns to input factors than income estimates for the limit group, a natural solution presents itself. If we also assume that factor returns should be the same between the subgroups (e.g., $\alpha=\alpha_1=\alpha_2$), then a better estimate of expected income from limit households' productive activites can be obtained by substituting α_2 for α_1 in constructing permanent income estimates. In essence, we hypothesis that production parameters are downward biased for limit observations, but are correct for non-limit observations. Accordingly, we replace the biased estimates (α_1's) with unbiased estimates (α_2's). Note that the replacement is only acceptable if factor markets are assumed to operate perfectly and factor incomes are either low (for some of the limit group) or normal (possibly for some of the limit group and by assumption for all of the non-limit group).

Table 6-4 presents re-estimates of log-log permanent income models in which permanent income is defined as $\hat{\alpha}_2 Z_1$ for limit households and $\hat{\alpha}_2 Z_2$ for non-limit households. 4/ Aggregate estimates only are presented (in contrast to aggregate and per capita estimates) in interests of brevity. The results are extremely interesting. For households in Abidjan, the MPC out of permanent income for limit observations is essentially unchanged by the redefinition of permanent income -- the

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4/ Note that standard errors are uncorrected in Table 6-4 as the models were estimated via a two-step process. Thus, reported t-statistics are higher than actual (i.e., corrected) values.

Table 6-4

Log-Log Consumption Models By Region, Limit/Non-Limit Categories

	Permanent Income [1/]		Intercept		R^2
Abidjan					
Limit observations	.508	(9.5)	7.025	(8.9)	.278
Non-limit observations	.892	(12.0)	1.410	(1.3)	.617
Other Urban Areas					
Limit observations	.989	(11.3)	-0.215	(0.2)	.372
Non-limit observations	1.083	(11.3)	-1.677	(1.2)	.535
Rural Areas					
Limit observations	.778	(15.2)	2.816	(4.0)	.260
Non-limit observations	.905	(12.6)	.754	(0.7)	.406

Note:

[1/] Permanent income estimates based on production parameters estimated for non-limit group of households.

Source: CILSS tabulations.

correlation between permanent income and consumption is still much stonger for non-limit observations than for limit households, which supports the hypothesis of liquidity constraints in the sample populaiton. However, the MPC out of permanent income increases dramatically in other urban areas; under the maintained hypothesis $\alpha=\alpha_1=\alpha_2$ there is no real evidence of liquity constrained behavior amongst households living in urban areas outside Abidjan. The MPC out of permanent income also increases over previous levels in rural areas; however, the value is still significantly less than one for limit observations and not significantly different than one for non-limit observations. In short, our results are still indicative of the existence of liquidity constraints in Abidjan and rural areas, but not in other urban areas. Further, there is clear indication that at least some (primarily those residing outside Abidjan) of the limit observations are managing to shift consumption patterns over time and obtain some (although not necessarily as much as desired) additional income to adjust for transitory income shortfalls.

Hausman Specification Test

As described in Section 6.2, a very general consumption model is estimated for each region using OLS and Tobit to obtain consistent estimates of consumption function parameters. A Hausman specification test is used to compare the results. This section describes the empirical estimation and test results.

The general form of the consumption model includes standard variables, squared variables, and various interaction terms. Standard variables include: (i) current income; (ii) liquid assets (defined as cash savings alone); (iii) other assets, including other personal assets, business assets, and farm assets; (iv) value of owned housing stock; (v) household size (number of men, women, and children); and (vi) years of education completed (spline variable, 0-6 years, 7-13 years, 14 or more years). Squared terms are included for (i) current income, (ii) liquid assets, and (iii) other assets. Interaction terms include (i) household size * current income, (ii) education * current income, (iii) household size * other assets. In total, the models have 23 parameters (including the intercept) for urban households, and 20 parameters for rural households. Variable means and standard deviations by region were reported previously in Table 6-2.

Tobit estimation requires that the error term be homoskedastic. Inspection of model residuals if we estimate a standard linear equation of the form

$$c_t = \beta X + \varepsilon$$

where: X represents the vector of exogenous variables described in the preceeding paragraph, and c_t is current consumption;

shows that the variance of the error term increases with increasing levels of income for all regions, a typical finding in this kind of work. In

addition, Breusch-Pagen statistics were computed for each region to check for heteroskedasticity; in all cases, evidence of significant heteroskedasticity was found. 5/ We performed two levels of corrections in an attempt to obtain homoskedastic residuals. First, the models were transformed by using the natural log of consumption in place of normal consumption on the left hand side. As a result of this transformation, Breusch-Pagen statistics dropped to 21.7, 67.0, and 33.7 for Abidjan, other urban areas, and rural areas, respectively. In addition, we divided all variables in the model by the square root of the log of income, on the assumption that the variance of the residuals is proportional to the natural log of current income. A plot of model residuals after the two-tiered correction indicates that the heteroskedasticity problem is corrected by these adjustments.

After corrections, the estimating equation for each region becomes

$$\log_e(c_t)/\log_e(Y_t) = \beta X/\log_e(Y_t) + \varepsilon \qquad (6.16)$$

5/ The statistic is distributed chi-squared with degrees of freedom equal to the number of model parameters minus one. The Breusch-Pagen statistics for the three subsamples (Abidjan, other urban, rural) are 232.0, 651.1, and 106.4, respectively. The critical value for the 95 percent confidence interval (df=23) is 33.92 and (df=20 for rural households) 31.41. The critical value for the 99 percent confidence interval is (df=23) 40.29 and (df=20) 37.57.

The empirical results of both Tobit and OLS estimations are presented in Tables 6-5 through 6-7 for Abidjan, other urban areas, and rural areas, respectively. Note that all economic variables are expressed in million CFA, that is, they are scaled by a factor of CFA 1,000,000 in the tables. Note also that reported parameters are transformed as described in (6.16), and cannot be compared directly to previous estimates.

Table 6-5 presents general consumption models for Abidjan: Table 6-5(a) describes OLS estimates on the entire sample, while Table 6-5(b) describes Tobit estimates using only 81 non-limit observations. By visual inspection, the two sets of parameters are different along a number of important dimensions. For example, consumption increases with increasing levels of liquid assets (as we expect) in both models, and decreases with increasing levels of non-liquid assets. However, there is a positive (and significant) correlation between housing assets and consumption in the OLS model, and (the expected) negative and significant correlation between housing assets and consumption in the Tobit model. In addition, the size of the income parameter (.181 as compared to .686) is dissimilar between the models, and income-based interaction effects are likewise generally different. Note also the notable differences between demographic (household size) coefficients in the models.

Table 6-5(a)

Abidjan: OLS Estimates (R^2 = .632) [1/]

	Base		Household Size						Education					
			Men		Women		Children		0-6 years		7-13 years		14+ years	
Base	-.076	(1.0)	-.040	(1.7)	.064	(2.8)	.068	(4.7)	.028	(1.7)	.013	(0.8)	.043	(1.4)
Annual income	.181	(3.9)	.000003	(0.0)	-.0025	(0.4)	-.0082	(1.9)	.0048	(0.5)	.0019	(0.3)	-.0073	(1.8)
Liquid assets [3/]	.050	(0.7)												
Other assets [4/]	-.013	(1.2)	.0096	(1.7)	-.0050	(1.3)	.0004	(0.2)						
Value of owned housing stock	.040	(3.1)												
Annual income **2	-.0039	(2.6)												
Liquid assets **2	-.0035	(0.4)												
Other assets **2	.00003	(0.0)												
Estimate of variance of error = .103 (25.6)														

Table 6-5(b)

Abidjan: TOBIT Estimates [1/], [2/]

Base	-1.344	(5.3)	.0042	(0.1)	.039	(0.8)	-.1137	(2.7)	.0072	(0.1)	.031	(0.7)	.086	(1.7)
Annual income	.686	(6.8)	-.0001	(0.1)	-.0130	(1.2)	.0081	(0.9)	-.019	(0.9)	-.029	(2.3)	-.0070	(1.0)
Liquid assets [3/]	.223	(1.9)												
Other assets [4/]	-.0260	(1.3)	.0024	(0.2)	-.0040	(0.6)	.0042	(0.9)						
Value of owned housing stock	-.697	(2.8)												
Annual income **2	-.0069	(2.5)												
Liquid assets **2	-.0235	(1.6)												
Other assets **2	-.00004	(0.3)												
Estimate of variance of error = .154 (2.1)														

Notes

[1/] t-statistics are in parentheses.
[2/] Sample size is 329 total, 81 non-limit households. Value of the likelihood function at convergence is -23.1.
[3/] Household cash savings.
[4/] Includes all other farm, business, and family assets.

Source: CILSS tabulations.

The computed Hausman specification test statistic [6/] is 410.2 for Abidjan, which leads us to again reject resoundingly the hypothesis that the models are the same. Insofar as differences can be attributed to liquidity constraints, there is evidence of liquidity constrained behavior in sample households in Abidjan.

Table 6-6 shows general reduced form consumption models for households residing in urban areas outside Abidjan. These models are similar to those estimated for Abidjan; income, savings, and other assets have roughly similar effects in both OLS and Tobit estimates, while the coefficient for housing assets is inexplicitly positive in the OLS model, and negative (and in this case insignificant) in the Tobit model. Demographic variables likewise evidence different effects between the two specifications, as do most of the education variables. The computed Hausman test statistic is 571.2, indicating significant differences between the models and suggesting (as in Abidjan) that other urban households are affected by current liquidity constraints in determining consumption patterns. Note that this finding contradicts the final results of the pooled sample comparisons in the previous section. However, we consider this approach the better of the two for identifying potential liquidity constraints in the sample population.

[6/] The statistic is computed using all parameters in the reduced form equation and the variance estimate of the error term.

Table 6-6(a)

Other Urban Areas: OLS Estimates (R^2 = .648) [1/]

	Base	Household Size			Education		
		Men	Women	Children	0-6 years	7-13 years	14+ years
Base	-.799 (10.4)	.0737 (2.2)	.0054 (0.2)	.0613 (3.9)	.041 (2.3)	.022 (0.9)	.129 (1.4
Annual income	.473 (8.8)	-.0247 (2.1)	.0099 (1.0)	-.0150 (2.4)	-.0097 (1.0)	.0017 (1.4)	-.042 (1.8)
Liquid assets [3/]	.087 (1.8)						
Other assets [4/]	.0054 (0.6)	-.0002 (0.0)	-.0029 (1.2)	.0012 (0.9)			
Value of owned housing stock	.058 (3.4)						
Annual income **2	-.026 (3.9)						
Liquid assets **2	-.0024 (1.0)						
Other assets **2	.000 (0.0)						
Estimate of variance of error = .115 (25.7)							

Table 6-6(b)

Other Urban Areas: TOBIT Estimates [1/], [2/]

Base	-1.162	(5.5)	-.0410	(0.7)	-.0491 (0.9)	-.0224 (0.8)	.0071 (0.2)	-.0144 (0.3)	-.246 (1.6)
Annual income	.683	(7.1)	.0328	(1.7)	.0106 (0.7)	.0052 (0.6)	-.0160 (1.0)	.0090 (0.7)	.0667 (1.9)
Liquid assets [3/]	.071	(1.2)							
Other assets [4/]	.007	(0.5)	-.0029	(0.3)	-.0050 (0.9)	.0014 (0.4)			
Value of owned housing stock	-.012	(0.5)							
Annual income **2	-.056	(5.4)							
Liquid assets **2	-.0013	(0.5)							
Other assets **2	.0004	(1.2)							
Estimate of variance of error = .129 (1.8)									

Notes

[1/] t-statistics are in parentheses.
[2/] Sample size is 330 total, 87 non-limit households. Value of the likelihood function at convergence is -2.3.
[3/] Household cash savings.
[4/] Includes all other farm, business, and family assets.

Source: CILSS tabulations.

Problems were encountered in computing the Hauseman test statistic for rural households; if the full rural sample is used, the variance matrix ($V_{Tobit} - V_{OLS}$) is singular. This does not occur if the estimation sample is truncated to include only households earning more than CFA 250,000 per year, which constitutes more than 80 percent of the rural sample. Table 6-7 presents reduced form consumption parameters for these households. The results are by and large consistent with previously described estimates. Note, however, that the coefficent on non-liquid assets is positive and significant in both the Tobit and OLS equations. Care must be taken in interpreting these results; because of demographic interactions, this does not mean that consumption levels necessarily increase with increasing levels of fixed assets. Consider the derivative of consumption with respect to family assets based on rural Tobit estimates:

$$\partial c_t/\partial(\text{Fixed Assets}) = .014*(\text{Fixed Assets}) + .000002*(\text{Fixed Assets})^2 - .0026*(\text{No. Women}) - .00008*(\text{No. Men}) - .0006*(\text{No. Children})$$

Thus, the model predicts that, all other things being equal, consumption will rise with increasing fixed asset levels only for relatively small households. As household size increases, consumption falls with asset levels at an increasing rate.

The Hauseman statistic for the 80 percent rural sample is 154.3. If the sample truncation point is increased to CFA 400,000 per annum, the statistic falls to 145.1. As in other regions, we thus reject

Table 6-7(a)

Rural Areas: OLS Estimates (R^2 = .433) [1/]

	Base		Household Size					Education			
			Men		Women		Children	0-6 years		7-13 years	14+ years
Base	-.865	(17.8)	.0276	(1.2)	.0393	(2.1)	.0289 (3.1)	.0268	(2.3)	-.0190 (0.7)	- -
Annual income	.343	(9.6)	.0159	(1.3)	-.0129	(1.6)	.0041 (1.2)	-.0063	(0.9)	.0025 (0.3)	- -
Liquid assets [3/]	.279	(3.0)									
Other assets [4/]	.019	(4.8)	-.0029	(2.0)	.0003	(0.3)	-.0006 (1.1)				
Value of owned housing stock	-	-									
Annual income **2	-.0219	(6.9)									
Liquid assets **2	-.0294	(2.5)									
Other assets **2	-.0000	(0.0)									
Estimate of variance of error = .135 (38.6)											

Table 6-7(b)

Rural Areas: TOBIT Estimates [1/], [2/]

Base	-1.523	(9.8)	.0263	(0.5)	.0085	(0.2)	.0012 (0.1)	-.0241	(0.9)	.0570 (1.1)
Annual income	.573	(9.3)	-.0085	(0.5)	.0012	(0.1)	.0103 (2.0)	.0938	(1.0)	-.0129 (0.9)
Liquid assets [3/]	.324	(2.6)								
Other assets [4/]	.014	(1.8)	-.0007	(0.3)	-.0026	(1.2)	-.0006 (0.7)			
Value of owned housing stock	-	-								
Annual income **2	-.0375	(7.3)								
Liquid assets **2	-.0300	(1.9)								
Other assets **2	.0000	(0.2)								
Estimate of variance of error = .163 (2.2)										

Notes

[1/] t-statistics are in parentheses.
[2/] Sample size is 746 total, 86 non-limit households. Value of the likelihood function at convergence is -46.8.
[3/] Household cash savings.
[4/] Includes all other farm, business, and family assets.

Source: CILSS tabulations.

the null hypothesis of parameter equality between the two samples, and thereby once again find evidence of liquidity constraints affecting current consumption behavior.

Specification tests were carried out on other selected subsamples, with similar results. For example, household were partitioned into those receiving wage income (509 cases) and those not receiving wage income, and the OLS and Tobit models re-estimated for wage households only (on the assumption that households receiving wages may yield more accurate estimates of income than households dependent on income from self-employment). The estimated Hauseman statistic is 526.3 for the wage group, which provides strong support to the hypothesis of liquidity constraints. Households were also partitioned into nuclear (526 cases) units and extended units; evidence of liquidity constaints was found for nuclear households -- the Hauseman statistic is 192.8 -- but problems with matrix singularity prevented us from computing the Hauseman statistic for non-nuclear households.

While more extensive testing within different segments of the population is possible, these results are sufficient to support the hypothesis of liquidity constraints acting to influence consumption patterns across a wide and heterogeneous band of the Ivorian population.

How severely do current liquidity constraints affect consumption patterns in the Côte d'Ivoire? As noted in a previous section, the Tobit parameters provide unbiased estimates of true consumption parameters in

the population regardless of the outcomes of the specification tests. Accordingly, we used these parameters to predict desired consumption levels, c^*, based on exogenous variables and the reduced form consumption coefficients. Based on this exercise, households residing in Abidjan are found to be consuming on average 4.6 percent less than they wish to (limit households alone are consuming 13.8 percent less than desired), households residing in other urban areas are consuming an average of 6.5 percent less than desired levels (12.8 percent for limit households alone), and rural households are consuming 5.6 percent less than desired levels (the figure for limit households is only slightly larger than for the total). Thus, while the quantitative effects are not so great as the outcomes of the statistical tests might have lead up to expect, they are still considerable for a substantial share of households in the Côte d'Ivoire.

To summarize the results of this chapter: We found convincing evidence that liquidity constraints influence consumption patterns in the Côte d'Ivoire, despite data limitations and potential problems with measurement error. However, this work should be viewed as a bare beginning to the identification and analysis of liquidity constraints in developing areas. What we have established is that consumption patterns may be significantly affected by liquidity considerations; not all households manage to "realize" their permanent income potential, which results in a loss in consumer welfare. These findings have broad ramifications, both in terms of modelling consumer bahavior and assessing the potential welfare impact of economic policy. On the modelling side, care must be taken in assessing savings and consumption propensities; a

low correlation between consumption and permanent income may reflect an inability to obtain credit and invest at the proper time and to the extent desired. Policy ramifications are somewhat broader; clearly greater availability of credit and more extensively developed capital markets will improve overall levels of welfare. Many household's responses to policy actions will be dictated by their access to credit and capital markets; austerity measures that do not greatly change long run or permanent income may have a much sharper impact on (generally poor) households for whom current income is a more accurate measure of permanent income (in the sense of influencing consumption behavior) than permanent income itself.

Annex Table 6.1

Household Production Functions By Region and Limit/Non-Limit Grouping

	Abidjan				Other Urban Areas				Rural Areas			
	Limit	(N=215)	Non-limit	(N=90)	Limit	(N=)	Non-limit	(N=)	Limit	(N=)	Non-limit	(N=)
Physical Assets												
Personal assets (CFA)	.054	(3.6)	.053	(4.1)	.095	(4.7)	.050	(2.9)	.038	(3.3)	.069	(5.2)
Non-farm business (CFA)	.0139	(0.1)	.0085	(0.9)	.0067	(0.7)	.029	(3.3)	.017	(1.6)	.042	(4.9)
Land holdings (Ha)	.157	(1.0)	.099	(0.8)	-.061	(0.9)	-.012	(0.2)	.573	(8.5)	.303	(4.8)
Time Inputs												
Adult male (hours/year)	.063	(2.4)	.066	(2.9)	.030	(1.3)	.015	(0.6)	.113	(5.1)	-.023	(0.7)
Adult female (hours/year)	.036	(1.6)	.014	(0.9)	.057	(3.4)	.004	(0.3)	.093	(4.8)	.025	(1.0)
Human Capital												
Experience (age-6-educ. of head)	.197	(1.2)	.321	(3.6)	.095	(0.8)	.067	(0.6)	-.063	(0.6)	-.016	(0.1)
Education												
Male 0-6 years	.027	(0.7)	-.009	(0.3)	.087	(3.3)	.080	(3.4)	.064	(2.7)	-.012	(0.5)
Male 7-13 years	.001	(0.0)	.149	(4.4)	.064	(1.8)	.032	(2.2)	.027	(0.5)	.079	(2.1)
Male 14+ years	.157	(1.4)	.030	(0.9)	.039	(0.3)	.063	(1.0)	-	-	-	-
Female 0-6 years	.083	(2.2)	.065	(2.1)	.045	(1.7)	.045	(2.0)	.027	(0.9)	.089	(3.2)
Female 7-13 years	.081	(1.3)	-.027	(0.8)	.024	(0.5)	-.004	(0.1)	.163	(1.1)	-.022	(0.3)
Female 14+ years	-.024	(0.2)	.039	(0.9)	.881	(1.0)	.234	(1.4)	-	-	-	-
Intercept	11.743	(19.2)	12.366	(28.4)	11.419	(23.1)	13.025	(31.7)	10.264	(21.9)	12.608	(26.3)
R^2	.235		.638		.411		.490		.318		.396	

Source: CILSS tabulations.

7. OVERVIEW OF RESEARCH FINDINGS

This chapter presents a broad overview of the findings of the research. These are described in roughly the order in which they occur in the body of the work.

Beginning with the descriptive work in Chapter 2, households who obtain income from wages are typically among the wealthiest in the Côte d'Ivoire, with the exception of a small number of very successful entrepreneurs. In contrast, farm households, particularly those who do not engage in income earning activities outside the household, are among the poorest. This is somewhat surprising, given the export-crop lead growth strategy pursued by Ivorian policy-makers since independence. As expected, however, cash crop farmers (primarily coffee and cocoa cultivators) are significantly better off than households growing only subsistence crops. Note that over two-thirds of farm households grow coffee or cocoa, and most of these grow basic food crops as well. An estimated 53 percent of the total value of food consumed in rural areas is home-produced rather than purchased, in contrast to 28 percent for the country as a whole.

Urban households appear notably better off than rural hosueholds, earning nearly twice as much on average as their rural counterparts. Unfortunately, urban/rural comparisons are hindered by a lack of dependable regional price indices. However, based on rough estimates,

urban households in the Côte d'Ivoire consume at least twice as much on average as rural households. In contrast to differences in absolute levels of welfare, the distribution of income and consumption are relatively similar between the regions. For example, the Gini coefficient on income in Abidjan is .536 as compared to .525 in rural areas. In contrast, the Gini coefficient on consumption expenditures is .354 for households residing in Abidjan and .379 for rural households. While consumption is more evenly distributed than income, neither measure indicates a very equitable distribution of resource flows in the country.

Stocks of assets are even more unevenly distributed than income or consumption, as documented in Chapter 3. Exceptions include primary and secondary schooling in urban areas (particularly in Abidjan), and land in rural areas. Education, or so-called human capital, appears to be the main type of asset held by urban households, while land is the predominant asset held by rural households. Note that the Côte d'Ivoire is not (yet) a land scarce country; under present policies, anyone can obtain land (albeit sometimes in inaccessible areas) at little or no cost. However, there is virtually no land market in most rural areas due to prevailing traditions regarding land acquisitions and transfers. There is, however, a very active rural labor market that operates under the guise of sharecropping contracts. Nearly 40 percent of farmers who cultivate cash crops report that sharecroppers work on their land. Note that sharecropping arrangements in the Côte d'Ivoire appear to be a means by which a landowner acquires labor rather than a laborer acquires land; the landowner by-and-large retains control over the land that is sharecropped,

and often spends considerable time working on the land with the sharecropper. The sharecropper is "paid" a fixed percentage of crop revenues, typically one-half or one-third of the total. Not surprisingly, we found few individuals who report working for wages (as opposed to a share of crop revenues) in the Côte d'Ivoire's agriculture sector.

While savings rate estimates described in Chapter 4 are low compared to other developing areas (possibly due in part to problems of income underestimation), national accounts estimates suggest that CILSS estimates are not greatly out of line with interpolations based on historical trends in private savings. Only 35 percent of respondents earned more than they spent in the survey year, while 59 percent were dissavers and 6 percent spent roughly what they earned. Note that over 90 percent of all households in the bottom 20 percent of the income distribution are dissaving, in contrast to only 19 percent in the upper 20 percent of the income distribution. Note that we found little correlation between savings rates and consumption levels, which lends credence to the hypothesis that consumption expenditures are highly correlated with permenant income levels.

The savings models described in the latter half of the chapter provide convincing evidence that the likelihood of being a dissaver is highly correlated with income shortfalls -- the greater the difference between permanent income and current (or reported income), the higher the probability of dissaving in the survey year. This is an expected and (in terms of evaluating data quality) encouraging result.

Based on consumption function estimates, marginal propensities to save are indeed found to be highest for households obtaining income from self-employment activities (both farm and non-farm), in support of our first major research hypothesis. We interpret this as a propensity to invest in own-production activities, possibly reflecting one way in which private savings respond to investment opportunities. In addition, permanent income effects are important in the consumption models described in the chapter; the marginal propensity to save out of permanent income is low on average (.2 to .3 for the country as a whole) in comparison to the MPS out of transitory income, which typically ranges from .5 to .6, depending on model specification and the level of income at which it is evaluated.

Finally, convincing evidence of liquidity constraints was found in all three regions of the country. Liquidity constrained households evidence different consumption behavior than non-constrained households. Further, the permanent income model is much more strongly substantiated for non-constrained household than for the (potentially) constrained group. Our rough estimates show that households in Abidjan consume on average 4.6 percent less because of liquidity constraints, while households in other urban areas consume 6.5 percent less than desired. Rural households consume on average 5.6 percent less than they would if there were no liquidity constraints. It is not surprising that the effects of liquidity constraints are less in Abidjan, where formal credit and savings institutions are more pervasive. Note that households

reporting low levels of income in the current year are most heavily affected by liquidity constraints; our estimates show that these households are consuming some 12 to 13 percent less than they would if credit were more readily available.

In summary, households in the Côte d'Ivoire are not extensive savers, likely due to expectations formed by past trends in goverment spending and public policy (for example, schooling and health care have been virtually free and are generally accessible), underdevelopment of factor markets in rural areas, particularly land and credit markets, and twenty years of impressive economic growth. At present, only small-scale entrepeneurs are making a significant contribution to the expansion of the capital stock, and much of this is in the service sector rather than the export sector. The country's primary exports, coffee and cocoa, are still cultivated in a traditional, labor-intensive fashion. Farmers are cautious in expanding land area under cultivation because coffee and cocoa prices have been somewhat unstable in recent years, and government controlled prices are historically well below world prices. However, the Côte d'Ivoire has undergone drastic changes since 1980, and the government is making a consolidated effort to "liberalize" the economy and encourage expansion of the private sector. For this to be successful, individuals will have to change savings and consumption patterns. Thus far, shifts have primarily occured in sectors where individuals preceive a reason to save and have viable investment alternatives. On this basis, it appears that the government will have to actively pursue policies that encourage the development of viable investment alternatives in order to increase

levels of private savings. In addition, it is critically important to improve household's access to sources of credit to increase private resource mobilization.

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ANNEX I

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ANNEX I

Imputed Rents for Urban Households

In line with previous work (see, for example, Lee and Trost, 1978, Maddala, 1984) selectivity corrected (Heckman, 1979) hedonic rent equations were estimated in order to impute rental values to owner-occupied housing. The approach is conceptually simple; households who own their dwelling unit receive an annual flow of services from the unit equal to what they would have had to pay to rent it -- in short, home owners are treated as if they rent their dwelling unit from themselves.

Rent imputations were made for home owners in urban areas (Abidjan and other urban) only. Rural households were excluded primarly for reasons of data availability; some 97 percent of rural households reside in units they own, and infomation on rural rental markets is too limited to allow any assessment of rent-to-value ratios in these areas. Further, many rural households are not permitted (due to family, ethnic, or other cultural sanctions) to sell land or buildings. The exclusion of rural households from rental assessments does not mean that rural households receive no housing service flows from owned dwelling units, but rather that we lack sufficient information to estimate said service flows with any degree of accuracy. In any case, exclusion of rural households from rent imputations will not affect savings estimates as rent imputations enter both income and consumption valuations.

Some 46 percent of households in urban areas outside Abidjan reside in a dwelling unit they own themselves, in comparison to only 23 percent of households living in Abidjan. On the assumption that regionally diverse housing markets may operate along different lines, seperate hedonic equations are estimated for (i) Abidjan and (ii) other urban areas in aggregate. While it be preferable to further dissagregate other urban estimates, sample size limitations made this impractical.

This Annex includes a brief description of the underlying sample selectivity model (knowledge of standard hedonic rent equations is assumed), estimates for Abidjan and other urban areas of a probit indicator function to predict probabilities of renting and owning, and selectivity-corrected hedonic rent estimates for each group of households.

Derivation of the Basic Model

We only observe rental payments for households presently in the rental market; the CILSS data does not include a measure of estimated rent for home owners, nor does it include the present market value of the dwelling unit. We will use the actual rents paid by renters to impute rents for households who own their dwelling units.

In doing so, we first estimate a hedonic rent function which relates rents paid to characteristics of the housing unit and neighborhood

for all renters. In general terms, the hedonic function can be represented as

$$R = f(Z_1,\ldots,Z_n \mid \text{household is a renter}) \qquad \text{(A1.1)}$$

where: R is the market rent, and

$Z_1,\ldots,Z_n$ are characteristics of the neighborhood or housing structure.

What we ultimately want is the expected rental value of owner-occupied dwelling units, that is,

$$E[R \mid (Z_1,\ldots,Z_n), \text{ household is an owner}].$$

We obtain this measure in the following way. First, assume all households are either renters or owners (squatters are ignored for the present). Define an indicator variable, δ, which takes on a value of one if the household rents its dwelling unit and 0 otherwise. If we assume that rents are some linear function of housing and neighborhood characteristics, then

$$R = \begin{cases} \text{unknown, if } \delta = 0 \\ \beta Z + \varepsilon_1 \text{ if } \delta = 1 \end{cases} \qquad \text{(A1.2)}$$

We specify a function to predict whether a household rents or owns its dwelling unit. The function includes characteristics of the households

and its members on the right-hand side, and the indicator variable, δ, on the left-hand side. It is likewise assumed to be linear in parameters.

$$\delta = \alpha X + \varepsilon_2 \qquad \text{(A1.3)}$$

where: δ is a 0,1 indicator variable, and
X is a vector of independent variables describing household and individual characteristics.

We wish to obtain an unbiased estimate of rents from equation (A1.2). We cannot simply estimate (A1.2) for renters and use the coefficents to impute rents for owners due to classic selectivity problems. Heckman (1979) has shown that an unbiased estimate of rents for the total population can be obtained using the following approach.

As before,

$R = \beta Z + \varepsilon_1$ given that $E[\varepsilon_1]=0$, $E[\varepsilon_1^2]=\sigma_{11}$

$\delta = \alpha X + \varepsilon_2$ given that $E[\varepsilon_2]=0$, $E[\varepsilon_2^2]=\sigma_{22}=1$

$f(\varepsilon_1,\varepsilon_2)$ is bivariate normal,

$F(\varepsilon_1,\varepsilon_2)$ is the corresponding cumulative density function,

$E[\varepsilon_1,\varepsilon_2] = \sigma_{12}$.

R is observed iff $\varepsilon_2 > -\alpha X$,

R is not observed if $\varepsilon_2 < -\alpha X$.

We know that the expected value of rents for the total population is (the following derivation is based on Van der Gaag, 1984):

$$E[R|Z] = \beta Z \qquad \text{(A1.4)}$$

However, the expected value of rents for households in the rental market (that
is, conditioned on the fact that the household is a renter rather than owner)
is

$$E[R|Z, \varepsilon_2 > -\alpha X] = \beta Z + \gamma(\lambda_1) \qquad \text{(A1.5)}$$

where λ_1 (typically called the Mills-ratio correction factor) is defined as

$$\lambda_1 = \frac{f(-\beta Z)}{1-F(-\beta Z)} \qquad \text{(A1.6)}$$

$$\gamma = \frac{\sigma_{12}}{\sigma_{22}^{\frac{1}{2}}} \qquad \text{(A1.7)}$$

and f(.) and F(.) are the normal denisty and cumulative functions, respectively.

Recall that we actually want to estimate the expected value of rents conditioned on the household being a home owner, that is, the

expected rental value of an owned dwelling unit. Given the above derivation, this is equivalent to

$$E[R|Z, \varepsilon_2<-\alpha X] \ . \qquad \text{(A1.8)}$$

We know that

$$E[R|Z] = E[R|Z, \varepsilon_2>-\alpha X]*E[\varepsilon_2>-\alpha X] + E[R|Z, \varepsilon_2<-\alpha X]*E[\varepsilon_2<-\alpha X] \qquad \text{(A1.9)}$$

From this it follows that

$$E[R|Z, \varepsilon_2<-\alpha X] = \beta Z + \gamma(\lambda_2) \qquad \text{(A1.10)}$$

$$\text{where} \quad \lambda_2 = \frac{-f(-\alpha X)}{F(-\alpha X)} \qquad \text{(A1.11)}$$

Using equation (A1.10), we can compute the expected value of rent, conditioned not only on housing and neighborhood characteristcs for home owners, but also on the likelihood of being an owner. The measure of imputed rent used in this study is just this -- the expected rent for the sample of owners rather than the full sample (as is more typically done in income and consumption assessments).

The model is estimated in two steps following Maddala (1984). First, estimates of $-\alpha X$ are obtained from a binary probit model

using δ (the decision to own or rent) as the dependant variable. These results are then used to estimate λ_1 , which is one of the exogenous variables in the hedonic rent equation. λ_2 is likewise estimated from the probit equation, and is used with the β's from the hedonic rent equation(s) to impute rents for home-owners, i.e.,

$$\text{Imputed Rent} = \hat{\beta}Z + \hat{\gamma}\,(\hat{\lambda}_2)$$

The next section describes the specification of and empirical results from the binary owner/renter probit equation and hedonic rent functions for CILSS sample households.

Empirical Results

The owner/renter probit model includes a wide array of variables specific to the household. Among these are: (i) employment variables; (ii) measures of housing subsidies; (iii) meaures of assets and income; (iv) demographic variables; (v) length of time in present location; and (vi) specific characteristics of the household head. Annex Table 1-1(a) shows means and standard deviations of these variables for households in Abidjan and in other urban areas. According to this table, some 11 percent of households in Abidjan and 12 percent in other urban areas receive some form of wage-related housing subsidy. Only 4 percent of dwelling units are used for business purposes in Abidjan as opposed to 11 percent in other urban areas. In addition, households in Abidjan have lived in the city (although not necessarily in the same dwelling unit) for

Annex Table I-1(a)

Means and Standard Deviations of Independent Variables: Indicator Function for Tenure Choice

	Abidjan		Other Urban Areas	
	Mean	Standard Deviation	Mean	Standard Deviation
Employee in household?	.74	-	.58	-
Public employee in household?	.30	-	.31	-
Does household receive housing subsidies?	.11	-	.12	-
Value of subsidies per month (CFA)	5,987	20,796	6,012	18,549
Is dwelling unit used for business?	.04	-	.11	-
Measures of assets and income				
- total expenditures 1/ (CFA/yr)	2,513,928	1,721,709	1,684,050	1,162,245
- present value of business assets (CFA)	664,660	4,378,490	276,114	1,211,956
- income from durables (CFA/yr)	40,897	89,584	33,464	36,382
- value of outstanding debts (CFA)	441,394	2,437,225	219,582	1,228,481
- present value of cash savings (CFA)	322,285	1,085,908	342,494	1,607,442
Years household lived in current place	17.63	11.73	13.14	13.89
Household size	7.37	4.54	8.85	5.79
Characteristics of the household head				
- female?	.12	-	.11	-
- not Ivorian?	.30	-	.20	-
- age	42.12	11.32	44.81	13.62
- years of education	5.95	5.99	4.29	5.23

Notes:

1/ Excludes imputed rents and durables.

Source: CILSS tabulations.

an average of 17.63 years, while households in other urban areas have live in the same place for an average of 13.14 years. Note also that 30 percent of households in Abidjan are not native to the country, as compared to 20 percent in other urban areas. This suggests that there are a significant proportion of non-indigenous people in the Côte d'Ivoire. Households are large in both areas; in Abidjan, households have on average 7.37 members, while in other urban areas they have 8.85 members.

The hedonic rent equations only include variables relating to the housing unit or neighborhood. In particular, these are (i) descriptions of the physical structure; (ii) availabiltiy of public services; and (iii) size of the unit. Annex Table 1-1(b) shows means and standard deviations for exogenous variables included in the hedonic rent equations. From this table, we see that dwelling units in urban areas outside Abidjan are substantially larger than those in Abidjan -- units in Abidjan are on average 54.95 square meters, as compared to 81.37 square meters in other urban areas. Note also that units in Abidjan are far less likely to be occupied by single families, but generally have higher levels of public services (particulary water and sanitation).

Annex Table 1-2 shows parameter estimates of probit owner/renter indcator functions for households in Abidjan and other urban areas. In general, the results are encouraging and reveal some interesting facets of Ivorian housing markets. In particular, for households in Abidjan, other things being equal the probability of renting increases with increasing levels of total expenditures, housing subsidies, and education, and

Annex Table I-1(b)

Means and Standard Deviations of Independent Variables: Hedonic Rent Equation

	Abidjan		Other Urban Areas	
	Mean	Standard Deviation	Mean	Standard Deviation
Area (meters^2)	54.95	57.53	81.37	67.31
Dwelling unit characteristics				
- walls of permanent materials?	.96	-	.80	-
- electric lighting?	.81	-	.75	-
- fuel supply gas or electricity?	.29	-	.13	-
- indoor water faucet?	.44	-	.21	-
- flush toilet?	.80	-	.24	-
- inside toilet facilities?	.45	-	.25	-
Structural characteristics				
- detached, single family home	.09	-	.28	-
- compound, single family occupied	.07	-	.34	-
Rent (CFA/month)	25,961	36,771	22,408	22,215

Source: CILSS tabulations.

Annex Table I-2

Indicator Functions for Choice of Housing Tenure, Renters' Versus Owners
(all coefficients estimated with respect to the rent alternative)

	Abidjan 1/		Other Urban Areas	
Employee in household?	-.286	(0.75)	.332	(1.30)
Public employee in household?	-	-	.968	(3.29)
Does household receive housing subsidies?	1.259	(1.76)		
Value of subsidies per month (CFA)	-.000011	(1.38)		
Is dwelling unit used for business?	.411	(0.75)	-.205	(0.07)
Measures of assets and income				
- total expenditures (000 CFA/yr)	.000468	(1.79)	.00116	(2.26)
- present value of business assets (000 CFA)	-.0000357	(0.79)	-	
- income from durables (000 CFA/yr)	-.00395	(1.37)	.0025	(0.50)
- value of outstanding debts (000 CFA/yr)	-.0000346	(0.64)	-	
- present value of cash savings (000 CFA)	.0000249	(0.23)	-	
Years household lived in current place	-.012	(1.49)	-.013	(1.21)
Household size	-		-.150	(4.91)
Characteristics of the household head				
- female?	-		-.328	(1.09)
- age	-		-.033	(1.86)
- not Ivorian?	-		1.198	(4.32)
- years of education	.031	(1.31)	-.556	(0.52)
Interaction variables				
- Employee * total expenditures (000 CFA)	.000129	(0.75)	-	
- Age of head * total expenditures (000 CFA)	-.0000154	(3.88)	-.0000173	(1.6)
- Age of head * education of head	-		.0017	(0.64)
Intercept	1.389	(3.77)	1.482	(1.85)
Model statistics				
Log-likelihood value				
- at zero	-172.3		-209.3	
- at convergence	-136.5		-103.4	
x^2 statistic	71.73		211.96	
Percent renters	76.0%		50.3%	
Number of cases	313		302	

Notes:

1/ Asymptotic t-statistics are in parentheses.

Source: CILSS tabulations.

decreases with increases in durable flows, outstanding debt, and length of residence. Interaction effects (total expenditures with employment status, age, and education of the household head) were generally not significant, with the exception of age*expenditures, which has a negative (and significant) sign. Combining of the two expenditure variables (total expenditures, age*total expenditures) tells us that the probability of renting increases as income rises, but at equal levels of income "older" households are more likely to own their dwelling unit than households with younger heads.

The models for other urban areas are generally similar to those for Abidjan, with one or two notable exceptions. For example, households with at least one public employee are more likely to rent a dwelling unit than those without an employee, In addition, large households are less likely to be renters than smaller households, as are female-headed households, and households with older heads. Not surprisingly, non-Ivorian households are significantly more likely to rent a dwelling unit than indigenous households. At least some of the effects found in urban areas outside Abidjan reflect the stronger rural orientation of these households -- other "urban" areas range from medium-sized cities to villages.

(Note that specifications are not identical between the two areas due to estimation problems with the second step of model estimation -- the hedonic rent functions. Some full(er) specifications caused problems in

the estimated ratio of error variances between the two equations in the model.)

Annex Table 1-3 shows hedonic rent estimates for households in Abidjan and other urban areas. The variable on the left-hand side is cash plus kind rental payments measured in CFA per month. A standard linear model is estimated for each subsample. In addition, a semi-log model -- the natural log of monthly rent is used as the dependent variable -- is estimated for Abidjan. This latter model was used to make rent imputations for households in Abidjan.

Comparisons can be made between the rent equations for Abidjan's households and those residing in other urban areas, although the models are not symetric so far as variable inclusion is concerned. Note that both models include a measure of the total area of the housing unit (and area squared, to control for nonlinearities), structural characteristics (single family versus non-single family units), some dwelling unit characteristics (materials used in the walls, source of fuel supplies), and "cluster"-specific dummy variables. Models differ in terms of dwelling characteristics -- for Abidjan, a source of lighting dummy is included, while dummy variables relating to water and sanitation were found significant for other urban areas.

According to Table 1-3, households in Abidjan are willing to pay an average of CFA 309.7 per square-meter per month, in comparison to CFA 337.2 per square-meter per month for urban households outside of

Annex Table I-3

Hedonic Rent Equations Corrected for Sample Selectivity

	Abidjan 1/ 2/				Other Urban Areas 3/	
	Log (rent)		Rent			
Area (meters^2)	.023	(7.93)	309.7	(2.9)	337.2	(8.93)
Area-squared	-.000049	(3.08)	.843	(1.5)	-.392	(7.37)
Dwelling unit characteristics						
- walls of permanent materials?	.416	(2.28)	12,863	(1.9)	861.3	(0.30)
- electric lighting?	.177	(1.79)	588.7	(1.2)	-	
- fuel supply gas or electricity?	.552	(5.67)	19,067	(5.4)	12,949.0	(4.61)
- indoor water faucet?	-		-		3,384.1	(1.22)
- flush toilet?	-		-		7,177.2	(1.87)
- inside toilet facilities?	-		-		6,954.7	(2.10)
Structural characteristics						
- detached single-family home	-.154	(0.94)	10,237	(1.7)	-7,541.0	(3.27)
- compound, single family occupied	.755	(2.53)	49,712	(4.6)	-2,721.5	(1.08)
Community intercepts: Abidjan						
- Bietry	.593	(2.43)	59,226	(6.5)	-	
- Autre Abobo	.282	(1.40)	13,499	(1.8)	-	
Community intercepts: other urban areas						
- Agnibilekrou	-				2,790.5	(0.61)
- Man	-				-2,231.2	(0.55)
- Bouake Air Force	-				8,565.5	(1.94)
Intercept	7.988	(38.92)	-17,465	(2.4)	-1,846.9	(0.57)
Lambda	.176	(1.05)	13,309	(2.2)	5,270.0	(2.40)
Model statistics						
R^2	.645		.696		.782	
F-statistic	41.43		51.9		38.16	
Number of cases	238		238		152	
Mean of dependent variable	9.636		25,961		22,408	

Notes:

1/ Dependent variable is the natural logarithm of monthly rent (cash + kind) and monthly rent (cash + kind).

2/ Asymptotic t-statistics are in parentheses.

3/ Dependent variable is monthly rent (cash + kind).

Source: CILSS tabulations.

Abidjan. Note that rents per unit area fall gradually with increasing size of the dwelling unit in other urban areas, while tending to rise with increasing size in Abidjan. Note also that the area-based variables evidence stronger effects in the log-linear model, which suggests that there are substantial non-linearities in the relationship between rents and the size of dwelling units.

In Abidjan, households are willing to pay some CFA 12,863 per month to obtain walls made of permanent materials (cement, brick, stone, wood, iron), CFA 588.7 per month for electricity, and CFA 19,067 to reside in a unit with gas or electric cooking facilities. In comparison, households in other urban areas are willing to pay only CFA 861.2 per month for walls made of permanent materials, CFA 12,949 for gas or electric cooking facilities, CFA 3,384 for an indoor water faucet, CFA 7,177 for a flush toilet, and CFA 6,955 for inside toilet facilities.

Also, households were willing to pay an additional CFA 10,237 per month to live in a single family detached home in Abidjan, and CFA 49,712 to live in a single family compound. In contrast, households in other urban areas were actually willing to pay less for single family units than multi-family units. However, the signs and magnitudes of the parameters must be interpreted in light of other variables included in the model -- we are, in effect, controlling for different factors in each of the regionally-based models, and these differences may impact the scale and direction of all coefficients.

It is interesting to note that the coefficient for the Mills-ratio correction factor is positive and significant in the linear models for both Abidjan and other urban areas, although not significant in the log-linear model. This means that there is significant correlation between the error term in the probit equation and the error term in the hedonic rent equation (recall that γ , the correction coefficient, is equal to $\sigma_{12}/\sigma_{22}^{\frac{1}{2}}$ from (A1.7)); in short, sample selectivity appears to cause problems in imputing rents to home owners in the Côte d'Ivoire, and should therefore be taken into account (for example, as we have done here) in the imputation procedure.

The explanatory power of the model in both regions is good -- for Abidjan, the estimated R^2 is .645 and .696 (semi-log and linear, respectively), while for other urban areas the R^2 is .782 (linear only).

ANNEX II

Annualized Value of Durables

In the CILSS, households were asked to identify the durables they own, when each was purchased, for what price, and the current value of each durable at the time the survey was administered. This information was used to impute an annualized flow of services obtained from the stock of durables owned by the household. This annex briefly describes stock of durables owned by Ivorian households, and how durable flow imputations were made.

Annex Table II-1 shows durable ownership by region for thirteen classes of durable stocks. According to these tabulations, urban households, be they in Abidjan or outside, are much more likely to own almost any kind of durable good than rural households. Bicycles form the one exception to this rule; some 44.5 percent of rural households report owning a bicycle at the time the survey was administered, as compared to only 22.6 percent of households living in cities outside Abidjan and 3.6 percent of households in Abidjan.

According to Annex Table II-1, the most frequently owned household durable is a radio/cassette player -- some 45.8 percent of households in the Côte d'Ivoire report owning at least one. 68 percent of households in Abidjan own a television set, 57.8 percent of households in other urban areas, and 8 percent of rural households, for a national total of 30.7 percent. About half of the urban households also reported owning

Annex Table II-1

Percentage Households Owning Durables, By Durable Category and Region

Durable	Abidjan	Other Urban Areas	Rural Areas	Total
Sewing machine	33.2	36.4	12.7	21.9
Gas stove	37.7	23.8	2.0	14.0
Refrigerator	53.6	50.0	4.7	24.3
Air conditioner	19.2	11.1	0.0	6.4
Fan	49.7	49.4	3.7	22.9
Radio	30.8	28.0	19.6	23.5
Radio/cassette player	55.7	64.2	36.4	45.8
Phonograph	6.3	6.6	3.2	4.5
Stereo equipment	20.9	13.9	0.5	7.6
Television set	68.0	57.8	8.0	30.9
Bicycle	3.6	22.6	44.5	30.7
Mobylette	1.5	21.4	18.5	15.3
Car or truck	22.2	14.8	2.2	9.0

Source: CILSS tabulations.

a fan and a refrigerator; country-wide totals are 22.9 and 24.3 percent, respectively (ownership is rare in rural areas). Sewing machines are fairly common throughout the Côte d'Ivoire; ownership levels are 33.2 percent, 36.4 percent, and 12.7 percent in Abidjan, other urban areas, and rural areas, respectively. Note that only 22.2 percent of households in Abidjan own an automobile or truck, as compared to 14.8 percent on other urban areas and 2.2 percent in rural areas. These levels of automobile ownership are typical for sub-Saharan African countries.

Annex Table II-2 shows an average estimated annual rate of depreciation for each class of durables included in the CILSS questionnaire. These typically range from around 9 percent (sewing machines and bicycles) to a high of 17 percent (fans, radios, air conditioners). The measure is derived as follows: Consider the relationship between the value of a commodity purchased at some time t_0 for price p_0 and the value today, represented by market price p_t. If the durable good was purchased t years ago,

$$p_t = p_0(1-\delta)^t \qquad \text{(A2.1)}$$

where: δ is the rate of depreciation, and all other variables are as previously defined.

Solving for δ, equation (A2.1) becomes:

$$\delta = 1 - e^{((\log_e p_t - \log_e p_0)/t)} \qquad \text{(A2.2)}$$

Annex Table II-2

Estimated Depreciation Rates by Type of Durable

Durable	Depreciation Rate
Sewing machine	.091
Gas stove	.153
Refrigerator	.132
Air conditioner	.173
Fan	.167
Radio	.161
Radio/cassette player	.146
Phonograph	.142
Stereo equipment	.122
Television set	.122
Bicycle	.092
Mobylette	.125
Car or truck	.117

Source: CILSS tabulations.

Note that both the purchase price (p_0) and the estimated price at the time of the interviews (p_t) is needed to estimate an average rate of depreciation for some particular commodity. Roughly 3 percent of households in the CILSS did not report either or both measures, and were excluded in estimating average depreciation rates (although these households were not excluded from service flow imputations). In addition, households obtaining durables by way of non-market mechanisms (for example, as gifts) were likewise excluded in estimating depreciation rates. These households were identified by a self-reported zero price at the time of purchase.

Following Diewert (1974), and Deaton (1980), the annual flow of services from a particular durable is defined as

$$V = p_t - p_{t+1} \frac{(1-\delta)}{(1+r)} \qquad \text{(A2.3)}$$

where: r is the real interest rate or opportunity cost of capital,
V is the annualized flow of services from durable stocks,
p_{t+1} is the price of the durable at the beginning of next year (that is, at the end of this year),
and all other variables are as previously defined.

For simplicity, we assume that all price changes ($p_t - p_{t+1}$) are caused by stock depreciation. By implication, then,

$$V = p_t\left(1 - \frac{(1-\delta)}{(1+r)}\right)$$

or,

$$V = p_t \frac{(r+\delta)}{(1+r)} \qquad (A2.4)$$

In short, the annualized flow of services from durable stocks is equal to the opportunity cost of capital plus the rate of depreciation times the current value of the stocks (or price today), all divided by one plus the opportunity cost of capital.

The major problem in measuring the annual flow of services from durables is that we do not know the opportunity cost of capital. In point of fact, interest rates likely vary across households in LDC's, with this variation being a function of economic conditions and how well various commodity markets operate. Published market rates may bear little relation to actual rates. For purposes of this study, we simply assumed a zero opportunity cost of capital in computing annualized durable flows. While this is a far from ideal solution, it seems the most practical given the objectives of the research, i.e., analyzing private savings behavior in the Côte d'Ivoire: Recall that durable flows enter both income and consumption estimates, and are netted out in assessing residual savings rates. Thus for the majority of the work described here, interest rate assumptions are irrelevant.

However, how much impact will the assumption of zero interest rates have on the welfare evaluations in Chapter 2? This depends on relative values of the interest rates and depreciation rates, that is, on the specific household and the type of commodity under consideration. For

example, if the depreciation rate is .08 (roughly the lowest found amongst the CILSS durable types) and the interest rate is .10, then annualized flows would be equal to .16 times the current value of the durable (in contrast to .08 times the current value if interest rates are assumed equal to zero). In contrast, if the depreciation rate is .15 (which represents a general upper bound on estimated depreciation rates in our sample) and the interest rate is .10, annualized flows would be .22 times the current value (in contrast to .15 times the current value). If the actual real rate of interest is lower, corresponding values are closer -- for example, if the interest rate is .05 and the depreciation rate .08, the annualized value is equal to .12 times the current value of the commoditiy (in comparison to .08 times the current value at zero interest rates); if the depreciation rate is .15, the annualized value is equal to .19 times the current value (in contrast to .15 times the current value if the opportunity cost of capital is assumed to be zero).

Are these differences large or small, that is, does the assumption of zero interest rates seriously compromise the results presented in Chapter 2? In a relative sense, they somewhat large -- durable flows can as much as double, depending on interest rate assumptions. However, in an absolute sense, the differences are not so large, as durable flows constitute only a small proportion of total income, so that even a doubling of the estimated values will have little impact on overall welfare levels. For this reason, and given the objectives of the research, the admittely ad hoc assumption of a zero

opportunity cost of capital in estimating the annualized flow of services from durables is deemed acceptable.

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