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SOURCES OF INCOME INEQUALITY AND POVERTY IN RURAL PAKISTAN

Richard H. Adams, Jr.
Jane J. He

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Richard H. Adams, Jr.
Jane J. He

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CONTENTS

TABLES

ILLUSTRATION

FOREWORD

Throughout the developing world, policymakers are interested in devising new strategies for improving income distribution and reducing poverty. In large part, the choice of such strategies depends on an improved understanding of the sources of income inequality. Why do certain types of incomes go to different sets of people? And what roles do variables such as education and migration play in improving income distribution and in lifting people out of poverty?

This work attempts to answer these questions for rural Pakistan by analyzing a three-year panel data set collected in collaboration with four research institutes in Pakistan. This extensive series of household interviews enables the authors to examine many dynamic income-related issues that cannot be adequately addressed using cross-sectional data. By analyzing the contribution of more than 30 different sources of income to income inequality, and by examining how various family characteristics—such as education and migration—affect the movement of households into and out of poverty, the authors are able to shed new light on a variety of income-related issues.

The report is part of a wide-ranging series of IFPRI studies focused on Pakistan. The first IFPRI study based on this three-year panel data set is *Poverty, Household Food Security, and Nutrition in Rural Pakistan,* Research Report 96. Other studies are planned in the areas of rural credit, human capital accumulation, and water management.

Earlier IFPRI collaborative work in Pakistan included macroeconomic studies such as *Effects of Exchange Rate and Trade Policies on Agriculture in Pakistan,* Research Report 84, and *The Demand for Public Storage of Wheat in Pakistan,* Research Report 77. All of these studies were part of a Food Security Management Project jointly undertaken by IFPRI, the government of Pakistan, and the U.S. Agency for International Development (USAID) Mission in Pakistan.

Per Pinstrup-Andersen
Director General

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This study, which is based on a three-year data collection effort in rural Pakistan, involved many institutions and individuals. The U.S. Agency for International Development (USAID) Mission in Pakistan provided key financial support. Actual data collection proceeded in collaboration with four major economic research institutes in Pakistan: the Applied Economic Research Centre (University of Karachi), the Punjab Economic Research Institute (Lahore), the University of Baluchistan (Quetta), and the Center for Applied Economic Studies (University of Peshawar). We are especially grateful to the survey teams from these institutions as well as those from the IFPRI office in Islamabad for producing such a finely detailed three-year household data set.

In the early stages of analysis, advice from three IFPRI colleagues, Harold Alderman, Marito Garcia, and Sohail Malik, did much to focus our work. Aly Ercelawn, Sumiter Broca, Manzoor Gill, Richard Goldman, Ashfaque Khan, and Steve Vosti also provided useful insights. In the latter stages the comments of Keijiro Otsuka, Jane Hopkins, Chris Delgado, and two anonymous reviewers helped to significantly improve the contents of the study.

However, perhaps the most important acknowledgment should go to the inhabitants of the 727 surveyed households in four districts in rural Pakistan. Without the assistance and cooperation of these households, this study would never have seen the light of day.

1

SUMMARY

A number of studies in recent years have tried to pinpoint the contribution of different sources of income to income inequality in the developing world. Such empirical studies are potentially useful to Third World policymakers because they help to identify the nature and character of income inequality within a society. Equipped with this information, government officials can devise specific policy measures to help improve the distribution of rural and urban incomes.

This report seeks to add to this body of knowledge by breaking down the sources of income inequality in rural Pakistan into its constituent parts. It is based on a three-year panel survey of 727 households in three provinces in rural Pakistan. This survey included 12 rounds of household interviews during the period 1986/87–1988/89 and collected detailed data on income received both in cash and in kind.

Income inequality in the areas surveyed is moderate: the Gini coefficient (a measure of income inequality) for three-year average total per capita household income is 0.381. However, more than 37 percent of the survey households own no land, and the Gini coefficient of landownership is very high—0.769.

Total income is broken into five sources of income: nonfarm, agricultural, transfer, livestock, and rental. Although all of the households are rural, nonfarm income—from unskilled labor, self-employment, and government employment—is the single most important income source. Depending on the year, nonfarm income accounts for between 30 and 34 percent of total per capita household income. Moreover, nonfarm income is especially important to the poor, defined in this study as those households in the lowest income quintile. Poor households receive almost 50 percent of their income from nonfarm sources; they receive less than 10 percent of their income from agriculture. In contrast, households in the top income quintile receive more than 36 percent of their total per capita income from agriculture.

The study identifies the contribution of each of the five sources of income to overall income inequality. It finds that two income sources—nonfarm and livestock—tend to decrease inequality. In other words, with everything else held constant, additional increments of nonfarm or livestock income will reduce overall income inequality. However, additional increments of the other three income sources—agricultural, transfer, and rental—will increase overall inequality.

The share of overall inequality contributed by each income source is also measured. Agricultural income makes the largest contribution and livestock income the smallest. Depending on the year, agricultural income accounts for between 35 and 45 percent of overall income inequality, while livestock income accounts for between 1 and 11 percent. The main reason for this difference is land: landownership is distributed unevenly both in this study area and in rural Pakistan as a whole. While agricultural income is strongly correlated with land, livestock income and land are poorly correlated.

These results suggest that the direct, immediate effects of agricultural growth have gone mainly to those households that own land, which are the richer households.

To be sure, this finding does not negate results from other studies, which indicate that additional rounds of agricultural growth can and often do benefit the poor. If future agricultural growth in Pakistan occurs in a way that increases the demand for labor more than the demand for land, then agricultural growth could have a positive effect on income distribution. Nevertheless, the results in this report show that agricultural wages represent on average less than 6 percent of total per capita agricultural income. Therefore, future policies in Pakistan need to be designed to help the rural poor to increase their income from sources outside of agriculture, such as nonfarm and livestock income.

To present a more detailed view of the effects of various types of income on inequality, the study disaggregates each of the five income sources. For example, nonfarm income is broken down into five sources and agricultural income into nine sources. In total, the study breaks down income into 35 separate sources.

While nonfarm income as a whole has a favorable effect on income distribution, this is not true for all of the individual sources of nonfarm income. In particular, nonfarm income from government employment is found to increase inequality because many government jobs require education, which only the richer households can afford.

The breakdown of agricultural income shows that cash crops and food crops affect inequality differently. While income from a leading cash crop (sugarcane) has a large and negative effect on income distribution, income from the main food crops (wheat and rice) has an equalizing effect. Much of this difference is due to government pricing policies that make sugarcane profitable. This suggests that in order to improve income distribution in Pakistan, either sugarcane pricing policies should be revised or sugarcane production should be de-emphasized, since this crop is monopolized by rich farmers.

The bulk of rental income in this study comes from land rent and tends to go to higher-income households. While households in the top income quintile receive more than 20 percent of their total per capita income from rental income, households in the lowest quintile receive only 5 percent of their income from this source.

Most transfer income in this study comes from remittances, either from internal migrants working in urban areas in Pakistan or from external migrants working abroad. Internal and external remittances have very different effects on equity, however. Whereas internal remittances are small and help to decrease inequality, external remittances are large and increase inequality. To improve the distributional effects of remittances, policymakers should consider measures designed to help poor households send migrants abroad.

The decomposition of livestock income reveals that income derived from owning a male buffalo or bullock has a negative effect on income distribution. However, income from owning female animals, such as indigenous types of cows, has an equalizing effect. For the poor, income from local cows accounts for almost 60 percent of total per capita livestock income. Taking steps to upgrade the productivity of local cows through crossbreeding and veterinary programs could improve rural equity.

The incomes of the poor are found to fluctuate considerably. When ranked by total per capita income, only one-third of the 145 households in the lowest quintile in the first year of the study were still in that quintile in both of the successive years. This means that most poverty in this area is temporary, with households moving in and out of poverty. A moderate share of the income fluctuations of the poor can be explained by changes in their physical assets and the size and composition of their household labor force.

2

RESEARCH ISSUES, METHODOLOGY, AND STUDY DESIGN

Ever since the appearance of Kuznets's seminal works (1955; 1963) on the relationship between economic development and income inequality, there has been much interest in the sources of income inequality in the developing world. In the past 15 years the development of new methodologies for decomposing the sources of income inequality has infused this subject with new data and insights. A number of empirical studies in developing countries, using various techniques, have pinpointed the contribution of different sources of income to total income inequality.[1] These studies decompose income inequality by economic sector (urban versus rural, for example), income source (income from labor versus capital versus land), and family characteristics (including educational and occupational attributes of workers).

Such empirical studies are potentially useful to policymakers because they help to identify the structure of income inequality within a society. Equipped with this information, government officials can devise specific policy measures to help improve the distribution of rural and urban incomes.

This study seeks to add to this kind of knowledge by decomposing the sources of income inequality in rural Pakistan. First, it uses three-year panel data gathered in rural Pakistan to identify the contribution of five different sources of income—nonfarm, agricultural, transfer, livestock, and rental—to overall income inequality. This is useful because, to date, few decomposition studies have used time-series data in ungrouped (disaggregated) form to show the contribution of various income sources to rural inequality in a developing country.[2] Second, after identifying the contribution to inequality of the five different income sources, the study decomposes each of these income sources in order to analyze the impact of various types of income on inequality. For example, the study breaks down agricultural income into net income from nine sources (eight crops and agricultural wages) and then analyzes the effect of each of these sources on agricultural income distribution. As far as the authors know, no previous decomposition study has presented such a finely grained view of the effects of different types of income on rural inequality in the developing world.[3]

[1]Studies on Pakistan include Kruijk 1986 and 1987; Mohammad and Badar 1985; and Ercelawn 1984. Studies on other developing countries include Glewwe 1986; Nugent and Walther 1982; Pyatt, Chen, and Fei 1980; and Fields 1979.

[2]Among the decomposition studies cited in footnote 1, only Nugent and Walther 1982 use panel data in ungrouped (disaggregated) form to examine the sources of rural income inequality in a developing country (India).

[3]For example, Glewwe's (1986) decomposition analysis is based on only two income sources (labor and nonlabor), while that of Nugent and Walther (1982) is based on only three sources (agricultural, nonagricultural, and transfer).

Third, the results of the decomposition analysis are used to pinpoint the importance of different types of rural income for the poor. This is useful for policymakers who wish to address the twin problems of rural inequality and poverty. While inequality and poverty may not be synonymous, they are closely enough related so that a careful study of income inequality will also provide instructive insights into poverty.

Methodology

At the start of any income decomposition exercise, the question arises: what measure of inequality should be chosen for the study? Several different inequality measures have been proposed in the literature (Fields 1980; Kakwani 1980). According to Foster (1985) and others, the chosen measure should have five basic properties: (1) Pigou-Dalton transfer sensitivity, (2) symmetry, (3) mean independence, (4) population homogeneity, and (5) decomposability.

Pigou-Dalton transfer sensitivity holds if the measure of inequality increases whenever income is transferred from one person to someone richer. Symmetry holds if the measure of inequality remains unchanged when individuals switch places in the income order. Mean independence holds if a proportionate change in all incomes leaves the measure of inequality unchanged. Population homogeneity holds if increasing (or decreasing) the population size across all income levels has no effect on the measured level of inequality.

The property of decomposability allows inequality to be partitioned into either subpopulations or sources. Ideally, an inequality measure can be regarded as source decomposable if total inequality can be broken down into a weighted sum of inequality by various income sources (such as nonfarm and agricultural income). However, because activities that influence a particular source of income are likely to have an effect on other activities that compose total income, any inequality measure that is source decomposable must address the problem of covariance among the income sources.

There are several measures of inequality that meet the five preceding criteria. These measures include Theil's entropy index *T*, Theil's second measure *L*, the coefficient of variation, and the Gini coefficient.[4] The two Theil measures, however, are not decomposable when sources of income are overlapping. While the need for groups that do not overlap is not restrictive when inequality is decomposed over geographic regions, this restriction rules out using the two Theil measures in this study because many of the survey households receive income from several different sources.

Shorrocks (1982) has shown that the results of decomposing any inequality measure depend on the rule used in the decomposition procedure. In the absence of restrictions, for any inequality measure the inequality of total income can be allocated in many ways between the components of total income (Shorrocks 1982, 199). For this reason, it seems best to base the decomposition analysis here on the two remaining inequality measures: the coefficient of variation and the Gini coefficient.

[4]For an overview of these four inequality measures, see Anand 1983, 89–91.

The source decomposition based on the coefficient of variation can be developed following Shorrocks (1982) and Ercelawn (1984). Let total income y consist of income from k sources. The variance of total income, σ^2, can be written as the sum of variances of each source of income, σ_i^2, and of the covariances between sources of income, σ_{ij}:

$$\sigma^2 = \sum \sigma_i^2 + \sum_{i \neq j} \sigma_{ij}. \tag{1}$$

The contribution of the i^{th} source of income to total income variance consists of the i^{th} income variance and the part of the covariances allocated to the i^{th} source. According to Shorrocks, the "natural" decomposition of the variance assigns to the i^{th} source exactly one-half of all covariances involving the i^{th} income source. This leads to the expression

$$\sigma^2 = \sum \sigma_{iy}, \tag{2}$$

where the (absolute) contribution of the i^{th} source is measured by its covariance with total income y. This relationship can be rewritten so as to express the contribution in relative terms. As is apparent, the relative contributions remain the same whether inequality is measured by the variance or by the coefficient of variation. Since the variance does not meet the axiom of mean independence (that is, it does not change in proportion to changes in incomes), the coefficient of variation is adopted here. The decomposition corresponding to the coefficient of variation can be further elucidated by defining the following terms:

$$\sum w_i c_i = 1; \; w_i = \frac{\mu_i}{\mu}; \; c_i = \rho_i \frac{\sigma_i / \mu_i}{\sigma / \mu}, \tag{3}$$

where $w_i c_i$ is the so-called factor inequality weight of the i^{th} source in overall inequality; μ_i and μ are the mean income from the i^{th} source and from all sources, respectively; c_i is the relative concentration coefficient of the i^{th} source in overall inequality; and ρ_i is the correlation coefficient between the i^{th} source and total income.

The decomposition of the Gini coefficient can be developed as follows. Pyatt, Chen, and Fei (1980) have shown that the Gini coefficient of total income, G, can be written as

$$G = \frac{2}{n\mu} \operatorname{cov}(y, r), \tag{4}$$

where n is the number of observations, y is the series of total incomes, and r is the series of corresponding ranks. On this basis the Gini coefficient of the i^{th} source of income, G_i, can be expressed as

$$G_i = \frac{2}{n\mu_i} \operatorname{cov}(y_i, r_i), \tag{5}$$

where y_i and r_i refer to the series of incomes from the i^{th} source and corresponding ranks, respectively. Since total income is the sum of source incomes, the covariance between total income and its rank can be written as the sum of covariances between each source income and rank of total income. Equations (4) and (5) can then be used to express the total income Gini as a function of the source Ginis:

$$G = \sum \frac{\mu_i}{\mu} R_i G_i, \tag{6}$$

where R is the correlation ratio expressed as

$$R_i = \frac{\operatorname{cov}(y_i, r)}{\operatorname{cov}(y_i, r_i)} = \frac{\text{covariance between source income amount and total income rank}}{\text{covariance between source income amount and source income rank}}. \tag{7}$$

The decomposition corresponding to the Gini coefficient can then be expressed by defining the following terms:

$$\sum w_i g_i = 1;\; w_i = \frac{\mu_i}{\mu};\; g_i = R_i \frac{G_i}{G}. \tag{8}$$

where $w_i g_i$ is the factor inequality weight of the i^{th} source in overall inequality, and g_i is the relative concentration coefficient of the i^{th} source in overall inequality.

Assuming that additional increments of an income source are distributed in the same manner as the original units, an income source can be defined as inequality-increasing or inequality-decreasing on the basis of whether additional shares of income from that source lead to an increase or decrease in overall income inequality. From the decomposition equations (3) and (8), it follows that the i^{th} income source is inequality-increasing or inequality-decreasing according to whether c_i (or g_i) is greater than or less than unity.[5]

[5]This analysis ignores feedback effects, that is, the effects that a change in any source income share might have on distribution within any source income. Of course, such an assumption might be quite unrealistic for large changes in any source income share.

3

DATA SET, INCOME SOURCES, AND DECOMPOSITION OF OVERALL INCOME INEQUALITY

Data Set

The data for this study were collected in a series of 12 interviews with 734 households over a three-year period in rural Pakistan.[6] The interviews began with the 1986 monsoon *(kharif)* planting season and ended with the 1989 winter *(rabi)* harvest. Six interviews were conducted with households in the first year (1986/87), and three interviews in each of the two subsequent years (1987/88 and 1988/89). In these interviews, data were collected from each household on a wide range of topics: income, expenditures, food consumption, nutrition and health status, education, employment, landownings, and rural credit.

While other analyses of this data set have concentrated on such topics as food security, education, and rural credit, the focus of this study is income.[7] The intensive panel approach of this data set lends itself quite well to a close, detailed analysis of the sources of rural household income over a short time period. By its very nature, however, this intensive approach rules out any broad national coverage. It should therefore be emphasized at the outset that this study was *never* designed to be representative of rural Pakistan as a whole. Rather its purpose was more limited: to analyze the determinants of rural poverty in selected rural districts.

Data collection took place in three provinces: Punjab, Sind, and North-West Frontier (Figure 1). Within each province the poorest district was selected on the basis of a production and infrastructure index elaborated by Pasha and Hasan (1982). The selected districts included Attock (Punjab Province), Badin (Sind Province), and Dir (North-West Frontier Province). Since rural poverty also exists in more prosperous areas, a fourth district, Faisalabad (Punjab Province), was also included in the survey.

While the districts were chosen purposively, the villages and the households were selected using a stratified random sample. Within each district, two markets *(mandis)* were chosen at random. For each market, three lists of villages were constructed—those within 5 kilometers of the market, those within 10 kilometers,

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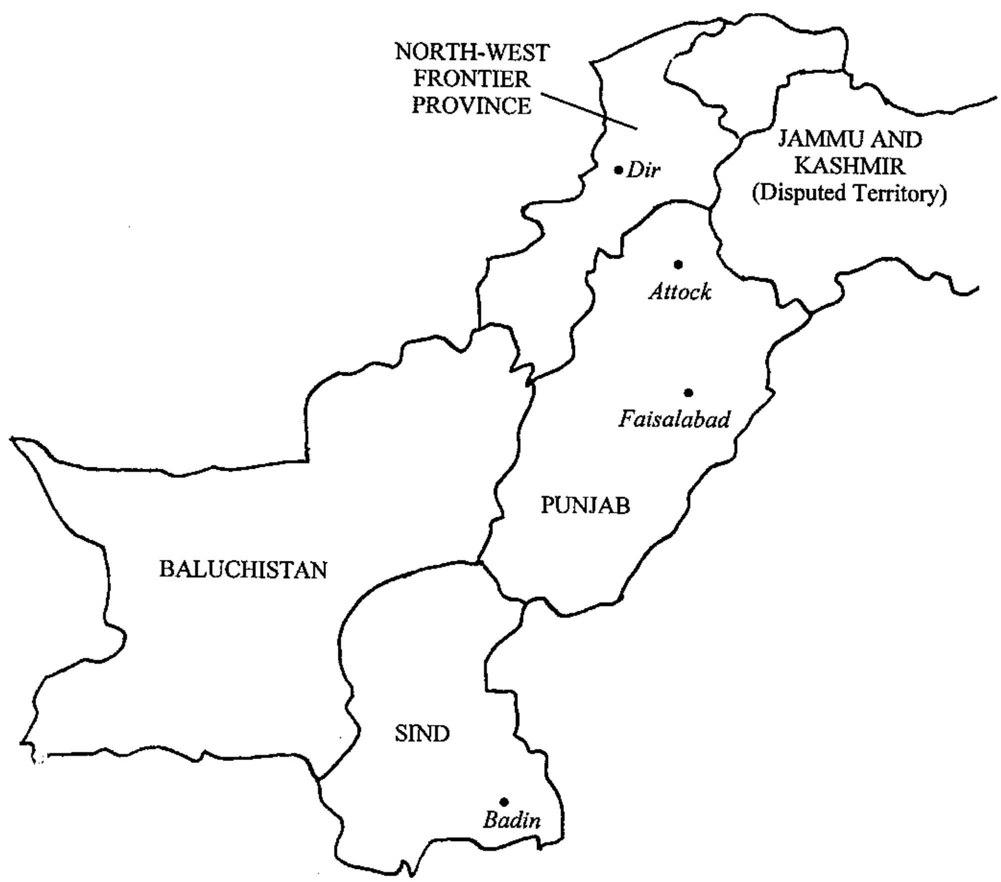
[6]This study was undertaken by the International Food Policy Research Institute (IFPRI), working in collaboration with Pakistani research institutes: the Applied Economic Research Centre (University of Karachi), the Punjab Economic Research Institute (Lahore), the University of Baluchistan (Quetta), and the Center for Applied Economic Studies (University of Peshawar).

[7]The following studies are based on this data set: on food security and nutrition, Alderman and Garcia 1993 and 1994; on education, Alderman et al. 1993; on rural credit, Malik 1993a; and on agricultural income, Adams and Alderman 1992.

Figure 1—Map of the provinces and districts included in the IFPRI panel survey of Pakistan



Note: Survey districts are in italics.

and those between 10 and 20 kilometers. Villages were then chosen randomly from these three lists. The selected villages were enumerated and households were selected randomly from the complete list of village families.

Interviews were conducted by a team of male and female interviewers who completed separate male and female questionnaires for each household. These questionnaires collected complete income data from each member of the household. In addition, in each round a village questionnaire gathered information on village infrastructure, current prices, and wage rates.

Of the total 734 households in the three-year survey, 7 households were excluded because of missing or incomplete data. This study is therefore based on data from 727 households.[8]

Measurement and Definition of Income

Any attempt to accurately measure household income in either developed or developing countries faces a myriad of problems. In single-interview surveys, response error usually leads to a large underrecording of income. In this survey the sheer number of interviews—12 for each household—as well as the high frequency of such interviews—approximately every three months for three years—helped reduce many sources of response error. The round-by-round collection of data on both expenditures and incomes also helped to identify those households that consistently underreported income.

The concept of income used in this study is fairly comprehensive, including income received in kind as well as in cash. A money value was imputed to receipts in kind, household consumption of crops and crop by-products, and home-consumed livestock. Because of uncertainty about how to deduct imputed land rent from agricultural income, no values for imputed land rent were calculated.[9] Similarly, because of the thin rental market for housing in rural Pakistan, no values were imputed for the rent of owner-occupied housing. Finally, because of uncertainty about how to accurately calculate wage rates for family members, no values were imputed for family labor involved in crop and livestock production.

Four further points about income in this study should be noted. First, income before taxes is recorded because during the study there was no taxation of agricultural income and general income tax collection in rural areas was virtually nonexistent. Second, all income is measured in terms of per capita household income. No attempt is made to convert income to equivalence scales to adjust for the age or gender of household members. According to some sources (Deaton and Mullbauer 1982), the failure to use equivalence scales could lead to an underestimation of the

[8]The 727 households were distributed as follows: 148 from Attock District (Punjab Province), 239 from Badin District (Sind Province), 193 from Dir District (North-West Frontier Province), and 147 from Faisalabad District (Punjab Province).

[9]If they were included in this study, imputed land rents would have to be deducted from the profits accruing to landowners growing different kinds of crops under the category of agricultural income. Since, however, no data were collected on the amount of owned versus rented land used for growing a particular crop (such as sugarcane), it proved impossible to deduct imputed land rents from agricultural income. Therefore, in this study imputed land rents are not calculated separately, but are implicitly included in the profits accruing to landowners for the various crops. See Chapter 5.

welfare of households with more members and more children because of potential economies of scale in consumption. Third, all income here is expressed in real terms. Income figures are deflated to a base year (1986/87) by using district-specific consumer price indices, consisting of food and nonfood price indices weighted by their respective average budget shares. These price indices are constructed from survey data: they suggest that inflation during the study period averaged 11.8 percent per year. Fourth, this study is based on income data pooled from households in the four survey districts. In the interests of clarity and conciseness, no attempt is made to disaggregate the income data either by district or by agroclimatic region. Several appendix tables, however, do present some district-level analysis.

Income Sources

The five sources of income into which total income is divided include the following kinds of income:

(1) *Nonfarm income* includes wage earnings from nonfarm labor, government, and private-sector employment, plus profits from nonfarm enterprises;[10]

(2) *Agricultural income* includes net income from all crop production including imputed values from home production and crop by-products plus wage earnings from agricultural labor;

(3) *Transfer income* includes internal and international remittances, government pensions, cash, and *zakat* (payments to the poor);[11]

(4) *Livestock income* includes net returns from traded livestock (cattle, poultry) plus imputed values of home-consumed livestock plus bullock traction power;

(5) *Rental income* includes rents received from ownership of assets including land, machinery (tractors, threshers), buildings, and water.

While the computation of several of these income sources was straightforward, the methods used to compute agricultural and livestock income merit some discussion.

In the surveys, detailed questions were asked on area cultivated, production, and prices for a total of 36 crops. This provided a complete estimate of the value of crop production for each farmer. Since interviews were held every three months, reliance on any particular farmer's memory of the values and quantities of inputs and outputs was minimized.

In calculating agricultural income, the prices used for crops were those received by the farmer. For crops not sold, mean village prices were employed. The value of crop by-products, such as straw from wheat, barley, and maize, was calculated by using average village prices. The value of stalks from cotton, which are used as firewood, have also been calculated, as were the values of trees that were cut and sold for firewood. Finally, the value of *gur* (local molasses) was included in agricultural income.[12]

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[10]Government and private employment are included in nonfarm income regardless of whether the person earning that income is employed full- or part-time.

[11]Transfer income includes income earned from seasonal migration, both within and outside of Pakistan. Income earned from the first kind of seasonal migration is treated as internal remittances; income from the latter as external remittances.

[12]The value of local molasses is very small. It was included in agricultural income because local molasses is made using sugarcane pressed in local, village mills.

To calculate livestock income, the surveys gathered detailed data on such outputs as purchase and sales prices of animals, milk production (consumed at home and sold), egg production (consumed at home and sold), and bullock plowing. Data were also collected on such inputs as value of fodder (own and purchased) and hired labor. From these output and input data, net livestock income was calculated following the detailed procedures described in Chapter 7.

Income Sources: Descriptive Statistics

Although the reasons for dividing total household income into five income sources should be apparent, the rationale for distinguishing between agricultural and livestock income may need clarification. On the one hand, some observers claim that within a rural subsistence economy, it is artificial (and empirically difficult) to distinguish between agricultural and livestock income, since outputs from one—such as straw and crop residuals from agriculture and draft power and manure from livestock—are used as inputs in the other. On the other hand, the goal of this study is to disaggregate the sources of income inequality as finely as possible. For this reason, it seems essential to distinguish between agricultural and livestock income, because these two income sources have very different effects on inequality. In Table 1, the three-year average simple correlation between agricultural income and total income is very high: 0.636. In contrast, the three-year average simple correlation between livestock income and total income is quite low: 0.174. As will be shown later in this report, one of the main reasons for this difference is land. In the sample, agricultural income is highly correlated with landownership, which is distributed very unevenly. However, other sources of income—such as livestock and nonfarm—are poorly correlated with landownership.

Even though this is a rural sample, summary data for the five income sources show the importance of rural income *other than* agriculture (Table 2). In each of the three years, nonfarm income represents the leading income source, accounting for between 30.7 and 34.5 percent of total per capita household income. Agricultural income is the second most important source. Depending on the year, agricultural income accounts for between 23.2 and 27.2 percent of total per capita household income.

Table 1—Simple correlations between total income and source incomes

	Total Per Capita Household Income			
Source of Income	1986/87	1987/88	1988/89	Three-Year Average
Nonfarm	0.161**	0.179**	0.302**	0.213**
Agricultural	0.632**	0.634**	0.645**	0.636**
Transfer	0.465**	0.436**	0.318**	0.413**
Livestock	0.142**	0.307**	0.040**	0.174**
Rental	0.468**	0.521**	0.655**	0.549**

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. All income figures are based on annual per capita household income expressed in constant 1986 terms.
** Significant at the .01 level.

Table 2—Summary of income data, 1986/87, 1987/88, and 1988/89

Source of Income	Mean Annual Per Capita Household Income[a] 1986/87	1987/88	1988/89
		(Rs)	
Nonfarm	1,007.39	1,204.65	959.54
	(1,158.40)	(1,364.28)	(1,086.19)
Agricultural	763.75	851.39	832.90
	(2,170.35)	(2,188.16)	(2,048.37)
Transfer	554.01	573.35	369.38
	(1,497.76)	(1,591.70)	(1,176.10)
Livestock	534.88	444.21	435.05
	(641.98)	(832.35)	(718.71)
Rental	425.07	405.46	473.84
	(1,429.80)	(1,357.63)	(1,610.71)
Total	3,285.10	3,479.06	3,070.71
	(3,015.60)	(3,288.21)	(3,107.57)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Numbers in parentheses are standard deviations. Mean income figures include negative source incomes recorded for some households in various years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

The figures recorded for nonfarm income in Table 2 are not surprising. While definitions of nonfarm income vary widely,[13] other studies in Pakistan have found that the share of nonfarm income ranges between 39 and 43 percent (Klennart 1986, 45). Similarly, studies in other South Asian countries have found that the share of nonfarm income ranges between 36 and 43 percent (Liedholm and Kilby 1989, 346). According to these surveys, the contribution of nonfarm income to total rural household income is especially high in South Asian countries (like Pakistan) where unfavorable labor-to-land ratios severely limit income-earning opportunities in agriculture.

Comparison of Data Set with Other Studies

The Gini coefficient of per capita household income increased over the three survey years from 0.400 in 1986/87 to 0.448 in 1987/88 to 0.454 in 1988/89. For the sample as a whole, the Gini coefficient for three-year average total per capita household income is 0.381.[14]

Several points need to be made. First, the slight rise in Gini coefficients over the three-year period of the study should not be interpreted as implying an increase in income inequality in rural Pakistan as a whole. As noted at the outset, this study is based

[13]The definition of nonfarm income used here is narrower than the definitions employed in many other studies. For example, Chinn (1979) includes rental income in nonfarm income, while Matlon (1979) includes livestock income.

[14]For a breakdown of these Gini coefficients of three-year average total per capita income by district, see Appendix Table 47.

on a nonrepresentative sample of rural households; it was never designed to measure the direction of income change in rural Pakistan as a whole. Moreover, the reasons for this increase in Gini coefficients are unclear, and may be related to factors such as weather or changing migration patterns that lie quite outside the scope of this analysis.[15]

Second, the Gini coefficients recorded in this study are only slightly higher than those that can be calculated from various years of a national survey undertaken by the Pakistani government, entitled the Household Income and Expenditure Survey (HIES). Calculations from the 1979, 1984/85, and 1987/88 HIES surveys suggest that the Gini coefficient of per capita household income in rural Pakistan was 0.325 in 1979, 0.339 in 1984/85, and 0.327 in 1987/88.[16]

There are, of course, a number of reasons why the Gini coefficients of this study differ from those of the various HIES studies. Most important, this report focuses on households in three nonrandomly selected poor (and one nonpoor) rural districts. In contrast, the HIES studies are large surveys using sampling frames and techniques designed to be representative of the rural population as a whole.[17] Whereas the IFPRI suvery gathered much detailed information on income, the HIES studies were never designed as income surveys: the collection of income data was always incidental, intended solely to serve as a check on expenditure. Thus, while the 1987/88 HIES contains 18 pages of questions on expenditures, it includes only 4 pages of queries on income. Finally, on the basis of the available documentation, it is not at all clear how income is defined in the HIES studies (for example, how income received in kind is treated and how livestock and remittance incomes are valued). These differences in the definition of income and the geographic coverage of the surveys make it extremely difficult to make any intertemporal comparisons between this study and the various HIES studies.

Decomposition of Overall Income Inequality

Decomposing the coefficient of variation and the Gini coefficient provides two ways for measuring the contribution of any income source to overall income inequality. First, does inequality in an income source increase or decrease overall income inequality? Second, how much does a particular income source contribute to overall income inequality?

The relative concentration coefficients based on the decompositions of both the coefficient of variation and the Gini coefficient show that, for all three years, three sources of income are inequality increasing: agricultural, transfer, and rental (Table 3). This means that, all things being equal, additional increments of agricultural, transfer, or rental income will increase overall income inequality. Similarly, both

[15]As will be discussed in Chapter 7, the level of internal remittances received by survey households fell by over 50 percent during the three-year study period.

[16]The Gini coefficients for the 1979 and 1984/85 HIES studies come from Ahmad and Ludlow 1988, Table 8. The Gini coefficient for the 1987/88 HIES is from Malik 1993b, Table 20.4.

[17]The 1979 HIES included 12,057 rural households, the 1984/85 HIES included 9,118 households, and the 1987/88 HIES included 9,760 households, compared with 727 households in the IFPRI survey.

Table 3—Relative concentration coefficients of source incomes in overall income inequality

Source of Income	1986/87		1987/88		1988/89	
	c	g	c	g	c	g
Nonfarm	0.202	0.555	0.214	0.495	0.336	0.598
Agricultural	1.961	1.622	1.719	1.452	1.570	1.427
Transfer	1.375	1.111	1.280	1.209	1.000	1.063
Livestock	0.184	0.397	0.607	0.857	0.064	0.424
Rental	1.703	1.551	1.843	1.410	2.194	1.543

Notes: N = 727 households. The relative concentration coefficients for the different sources of income are calculated from the coefficient of variation (c) and the Gini coefficient (g).

$$c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\ g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

decompositions agree that, for all three years, two income sources—nonfarm and livestock—are inequality-decreasing sources of income.[18]

The decomposition results for relative factor inequality weights of source incomes in overall income inequality indicate that, for all three years and both decompositions, agricultural income makes the largest contribution to overall inequality (Table 4). Depending on the year and the decomposition measure, agricultural income accounts for between 35.5 and 45.6 percent of overall inequality. Furthermore, with only one exception, both decompositions agree that livestock income makes the smallest contribution to overall inequality. Depending on the year and the measure, the data show that livestock income accounts for between 0.9 and 11.0 percent of overall income inequality.

Why does agricultural income make the largest contribution to overall income inequality? One explanation is the close relationship between agricultural income and land broached earlier.

In Pakistan, as in many developing countries, land is distributed far more unevenly than income.[19] Whereas the Gini coefficient for three-year average total per capita household income in this study is 0.381, the Gini coefficient of landownership is 0.769.[20] The latter figure is almost identical to the Gini coefficient of landownership that can be calculated for Pakistan as a whole: 0.780.[21]

[18]A decomposition of the Gini coefficient based on three-year average total per capita income by district yields similar results. In each of the survey districts—Faisalabad, Attock, Badin, and Dir—nonfarm and livestock income represent inequality-decreasing sources of income. See Appendix Table 47.

[19]For a discussion of the distribution of land in Pakistan, see Naqvi, Khan, and Chaudhry 1989 and Ercelawn 1984; for other developing countries, see Lecaillon et al. 1984.

[20]In the survey sites the Gini coefficient of landholding (land owned plus land rented in minus land rented out) is lower at 0.639. The Gini coefficients on landowning and landholding both include households with no land. For a breakdown of these Gini coefficients by district, see Appendix Table 47.

[21]This Gini coefficient for landownership in Pakistan as a whole comes from Ercelawn (1984, 1) and was calculated from the 1980 Pakistan Census of Agriculture.

Table 4—Factor inequality weights of source incomes in overall income inequality

	1986/87		1987/88		1988/89	
Source of Income	**wc**	**wg**	**wc**	**wg**	**wc**	**wg**
Agricultural	0.456	0.377	0.421	0.355	0.426	0.387
Livestock	0.030	0.065	0.077	0.110	0.009	0.060
Nonfarm	0.062	0.170	0.074	0.172	0.105	0.187
Rental	0.220	0.201	0.216	0.164	0.339	0.238
Transfer	0.232	0.187	0.211	0.199	0.120	0.128
Total	1.000	1.000	1.000	1.000	1.000	1.000

Notes: N = 727 households. wc is the factor inequality weight calculated from the coefficient of variation, and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i c_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu}.$$

$$w_i g_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Agricultural income is highly correlated with land owned: the three-year average simple correlation between the two is positive and highly significant (Table 5). In contrast, the three-year average simple correlation between nonfarm income and land owned is negative and statistically significant, as is the same correlation between livestock income and land owned. These results suggest that while agricultural income is closely linked with landownership, which is unevenly distributed in favor of the rich, nonfarm and livestock income are not linked with landownership and thus are potentially more important to the poor.

The results of the decomposition exercises can be elaborated by analyzing the results of the Gini decomposition. Table 6 presents the three elements of the Gini decomposition procedure: (1) source income weight (w_i), (2) source gini (G_i), and (3) the correlation ratio between source income and total income (R_i). In two of the three years agricultural income has the highest source gini and is thus the most unequally distributed income source. This is a reflection of the fact that in any given

Table 5—Simple correlations between size of land owned and source incomes

	Size of Land Owned[b]			
Source of Income[a]	**1986/87**	**1987/88**	**1988/89**	**Three-Year Average**
Nonfarm	−0.120**	−0.083	−0.033	−0.080**
Agricultural	0.137**	0.135**	0.282**	0.182**
Transfer	0.001	0.099**	−0.022	0.030
Livestock	0.019	−0.092	−0.223**	−0.099**
Rental	0.438**	0.430**	0.465**	0.444**

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Note: N = 727 households.
[a]All income figures are based on annual per capita household income expressed in constant 1986 terms.
[b]Land owned includes irrigated and rainfed land. Land classified as uncultivable is excluded.
** Significant at the .01 level.

Table 6—Decomposition of overall income inequality using the Gini coefficient

Measure/Source of Income	1986/87	1987/88	1988/89
Gini coefficient of total per capita household income	0.400	0.448	0.454
Source income weight			
Agricultural	0.232	0.245	0.272
Livestock	0.163	0.128	0.142
Nonfarm	0.307	0.345	0.312
Rental	0.129	0.117	0.154
Transfer	0.169	0.165	0.120
Total	1.000	1.000	1.000
Source Gini (G_i)[a]			
Agricultural	0.932	0.908	0.866
Livestock	0.617	0.886	0.741
Nonfarm	0.586	0.387	0.580
Rental	0.903	0.901	0.902
Transfer	0.785	0.861	0.877
Correlation ratio between source income and total income (R_i)			
Agricultural	0.697	0.717	0.749
Livestock	0.258	0.434	0.260
Nonfarm	0.379	0.387	0.469
Rental	0.688	0.702	0.778
Transfer	0.566	0.630	0.552

Notes: N = 727 households. All estimates are based on annual per capita household income expressed in constant 1986 terms.

$$G_i = \frac{2}{n\mu_i} \operatorname{cov}(y_i, r_i);\ R_i = \frac{\operatorname{cov}(y_i, r)}{\operatorname{cov}(y_i, r_i)}.$$

[a]Source Ginis are high because they include households with zero and negative incomes from different income sources.

year agricultural income has both a high mean income and a standard deviation of income that is two-to-three times the mean (see Table 2). Table 6 also shows that nonfarm income has the lowest source gini in each of the three years. In any given year between 71.3 and 76.2 percent of all households receive nonfarm income, and the standard deviation and mean of nonfarm income are roughly equal (see Table 2).

As might be expected, the correlation ratios between source income and total income indicate that although agricultural income has a high degree of correlation with total income, two other sources of income—nonfarm and livestock—have a low degree of correlation with total income.

The data in Table 6 explain the factor inequality weights reported earlier. For example, Table 4 showed that agricultural income has the highest factor inequality weight and makes the largest contribution to overall income inequality. This is because agricultural income has a large source income weight and a high source gini, and it is strongly correlated with total income. At the other extreme, livestock income makes the smallest contribution to overall income inequality because it has a small share of total income and a low- to middle-sized source gini, and it is poorly correlated with total income.

4

SOURCES OF NONFARM INCOME INEQUALITY

In the past many researchers and policymakers have viewed the rural economy of the Third World as being synonymous with agriculture.[22] According to this view, rural households receive the bulk of their income from the production of food and cash crops.

In the past few years this view has started to change. There is now a growing recognition that the rural nonfarm sector, which includes such diverse activities as government, commerce, manufacturing, and services, also plays a vital role in the economies of many rural Third World households.

This changed view is largely due to the results of rural budget surveys in a number of developing countries. Using different definitions of nonfarm income, these budget surveys have found that nonfarm income represents between 13 and 67 percent of total rural household income.[23] According to these surveys, the contribution of nonfarm income to total rural income is especially high in land-scarce areas of the Third World. In these areas the nonfarm sector is now often viewed as a key source of income for rural households.

Despite such considerations, there is still no general agreement on one central issue: what is the impact of rural nonfarm income on income distribution? On the one hand, studies by Chinn (1979) and Ho (1979) in Taiwan indicate that nonfarm income reduces rural income inequality. According to Chinn, nonfarm income benefits the poor because the share of nonfarm income varies inversely with farm size. On the other hand, some studies have produced quite different results. For example, Reardon, Delgado, and Matlon (1992) in Burkina Faso; Collier, Radwan, and Wangwe (1986) in Tanzania; and Matlon (1979) in Nigeria all find that nonfarm income has a negative effect on rural income distribution.

Part of this inconsistency is perhaps due to differences in study sites. In land-scarce, labor-rich settings, like Taiwan and much of Asia, small and inadequate landholdings may tend to "push" poorer households out of agriculture and into the nonfarm sector. Thus, in these settings nonfarm income may be expected to have a favorable effect on equity. The obverse, then, could hold true in land-rich settings, such as Africa, where abundant land and scarce labor may tend to keep most people in agriculture and to "pull" only richer households into the nonfarm sector.[24]

[22]An earlier version of this chapter appeared as "Non-Farm Income and Inequality in Rural Pakistan," in the *Journal of Development Studies* 31 (October 1994).

[23]In their review of 13 rural household budget surveys, von Braun and Pandya-Lorch (1991) find that the share of nonfarm income in total rural income ranges from 13 percent in Brazil to 67 percent in Burkina Faso. For other estimates of the share of rural nonfarm income, see Liedholm and Kilby 1989 and Haggblade, Hazell, and Brown 1989.

[24]For more on this point, see Haggblade, Hazell, and Brown 1989.

Consistent with this hypothesis, Chapter 3 showed that nonfarm income has a favorable impact on income distribution in the land-scarce survey areas in rural Pakistan. According to Table 3, nonfarm income represents an income-decreasing source of income; moreover, in any year of the survey, nonfarm income accounts for only a small proportion of overall income inequality. Of the five sources of rural income, only livestock income makes a smaller contribution to overall income inequality.

Since nonfarm income has such a favorable effect on income distribution, this chapter will extend the debate on nonfarm income in two ways. First, descriptive statistics are used to demonstrate the importance of rural nonfarm income to the poor. Second, the sources of nonfarm income inequality are decomposed in order to understand the effects of various types of nonfarm income on income distribution. This is useful because, to the best of the authors' knowledge, no previous study has tried to pinpoint the effect of different kinds of nonfarm income on inequality.

Nonfarm Income and the Poor: Descriptive Statistics

In Table 7 the five sources of rural household income are presented by income quintile, aggregated over the entire three-year period. The results show the importance of nonfarm income for the poor, defined as those households in the lowest income quintile. According to the data, households in the lowest quintile receive almost 50 percent of their three-year average total per capita income from nonfarm income. This percentage is more than twice that received by the poor from any other income source, and more than seven times that received from agricultural income. Evidently, the very real land constraints in rural Pakistan—37.1 percent of the survey households own no land[25]—force the poor to seek the bulk of their livelihood outside of agriculture.[26]

Another way of demonstrating the dependence of the poor on nonfarm income is shown in Table 8, where households are ranked by size of landowning based on the three-year average. Like other studies in Pakistan, Taiwan, and Malaysia,[27] the data reveal an inverse relationship between size of land owned and the share of nonfarm income. For the poorest (landless) group, nonfarm income accounts for 47 percent of their three-year average total per capita income. This figure is roughly twice that received by the poor from any other income source, including agriculture. Moreover, the share of nonfarm income generally falls with size of land owned. In contrast, the share of agricultural income varies little with the size of land owned: both the top and bottom landowning groups receive about one-quarter of their total per capita income from agricultural income.

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[25]There is an active rental market for land in rural Pakistan. Thus, while 37.1 percent of the survey households own no land, in terms of landholding—land owned plus land rented in minus land rented out—only 17.3 percent of the survey households are landless.

[26]For more on this point, see Klennart 1986, 1988.

[27]For Pakistan, see Mohammad and Badar 1985; for Taiwan, see Chinn 1979; and for Malaysia, see Shand 1986, 1987.

Table 7—Sources of income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Total Per Capita Income[a]	Percent of Total Per Capita Income from				
		Nonfarm	Agricultural	Transfer	Livestock	Rental
	(Rs)					
Lowest	1,008.47	49.9	6.8	13.9	24.5	4.9
Second	1,818.35	48.4	9.3	13.4	23.5	5.3
Third	2,536.99	43.6	14.3	15.1	18.3	8.7
Fourth	3,638.61	42.7	21.4	12.7	15.6	7.6
Highest	7,353.50	16.8	36.5	17.1	8.8	20.8
Total	3,271.18	40.3	17.7	14.4	18.2	9.4

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Income figures are calculated by averaging total per capita household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

Tables 7 and 8 raise concerns about the distributional effects of agricultural growth in a rural situation—like Pakistan—where land is distributed so unevenly. There is now a large literature concerning the growth linkages effects of agricultural growth.[28] According to this literature, technological change in agriculture boosts production, thereby increasing the disposable income of landowning households. In turn, these landowning households use their new income to buy more labor-intensive goods and services, which are produced by the poor. Thus, accelerated growth in agriculture produces second- and third-round effects that benefit the poor in two ways: first, through production linkages that provide the poor with more food, and

Table 8—Sources of income ranked by three-year average size of land owned

Three-Year Average Size of Land Owned	Number of Households in Group	Three-Year Average Total Per Capita Income[a]	Percent of Total Per Capita Income from				
			Nonfarm	Agricul-tural	Transfer	Livestock	Rental
(acres)		(Rs)					
0	270	2,596.67	46.5	26.6	11.3	14.4	1.2
< 1	59	2,580.81	54.7	4.8	21.6	16.2	2.7
1 – < 5	154	3,100.67	30.4	24.2	23.7	17.2	4.4
5 – < 10	90	3,986.73	25.6	21.7	17.3	15.5	19.9
≤ 10	154	4,504.16	17.6	29.7	10.9	11.4	30.4
Total	727	3,287.29	32.2	24.9	15.2	14.4	13.3

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Income is calculated by averaging total per capita household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

[28]See, for example, Mellor 1976, Hazell and Röell 1983, Ranis and Stewart 1986, and Lipton and Longhurst 1989.

second, through consumption linkages that provide the poor with more employment and income-earning opportunities in and outside of agriculture.

While the methodology of this study cannot be used to measure the magnitude of the growth linkages between agriculture and the rest of the rural economy, it can be used to question the *distributional* effects of such growth. Tables 7 and 8 show quite clearly that the poor have not benefited much from the direct effects of accelerated growth in agriculture. When measured on an income basis, the poor in this study receive less than 10 percent of their three-year average total per capita income from agriculture;[29] when measured on a landowning basis, the poor receive only about one-quarter of their income from agriculture. In this study most of the direct, first-round benefits from agricultural growth have gone to those households that own land, namely, the rich.[30] Of course, this finding does not negate results from other studies,[31] which indicate that the second- and third-round effects of agricultural growth can be large and often do benefit the poor. If future agricultural growth in Pakistan occurs in a way that increases the demand for labor more than the demand for land, the direct and indirect effects of agricultural growth could have a positive effect on income distribution. Nevertheless, the results of this study *do* suggest that future efforts to improve income distribution in rural Pakistan need to involve a broader array of policies than just agriculture. More specifically, future policies need to be designed to meet the considerable dependence of the rural poor on nonfarm and livestock income.

Decomposition of Nonfarm Income Inequality

Given the importance of nonfarm income to the poor in this study, it is useful to decompose the sources of nonfarm income. Such an analysis can answer the question: Do all types of nonfarm income have a favorable effect on income distribution?

In this study nonfarm income can be divided into five sources:

(1) *Self-employment*, which includes profits and earnings from shopkeeping and artisan activities (such as bricklaying and shoe repair) plus labor contracting for construction and other types of work;

(2) *Unskilled labor*, which includes wages from any unskilled nonfarm activity, such as construction and ditch digging;

(3) *Government employment*, which includes wages from all grades (grades 1–22) of government service;

(4) *Private sector*, which includes wages from a private-sector company (such as the Dawood Hercules Fertilizer Company);

(5) *Other*, which includes other nonfarm wages.

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[29]In this study agricultural income includes wages from agricultural labor. For more on the contribution of agricultural wage labor to agricultural income, see Chapter 5.

[30]As shown in Table 5, a simple correlation between agricultural income and landowning yields a positive and significant relationship in all three survey years.

[31]See, for example, Hazell and Röell 1983 and Bell, Hazell, and Slade 1982.

Table 9—Summary of nonfarm income data, 1986/87, 1987/88, and 1988/89

Source of Nonfarm Income	Mean Annual Per Capita Nonfarm Income[a] 1986/87	1987/88	1988/89
		(Rs)	
Self-employment	305.61 (764.79)	361.64 (893.07)	228.07 (586.89)
Unskilled labor	237.48 (588.43)	239.60 (608.48)	269.05 (681.45)
Government employment	209.80 (618.50)	322.09 (810.93)	259.49 (683.84)
Private sector	139.06 (466.48)	200.31 (512.97)	177.60 (507.84)
Other	115.45 (369.28)	81.01 (300.51)	25.33 (123.70)
Total	1,007.39 (1,158.40)	1,204.65 (1,364.28)	959.54 (1,086.19)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Numbers in parentheses are standard deviations.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

Table 9 shows that three sources of nonfarm income predominate: self-employment, unskilled labor, and government employment. In any given year these three sources account for about 75 percent of mean per capita nonfarm income.

When the five sources of nonfarm income are presented by income quintile group (Table 10), the dependence of the poor on self-employment and unskilled labor is evident. Households in the lowest income group receive more than their quintile shares of nonfarm income from self-employment (24.9 percent) and unskilled labor (32.3 percent). But the poor receive only 14.6 percent of their nonfarm income from government employment. Moreover, the share of nonfarm income from government employment rises with the quintiles.

Table 10—Sources of nonfarm income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Per Capita Nonfarm Income[a]	Percent of Total Per Capita Nonfarm Income from				
		Self-Employment	Unskilled Labor	Government Employment	Private Sector	Other
	(Rs)					
Lowest	503.2	24.9	32.3	14.6	15.6	12.6
Second	880.5	24.1	28.7	24.0	14.2	9.0
Third	1,107.1	22.6	24.0	24.0	18.6	10.8
Fourth	1,553.6	29.6	18.6	32.9	15.2	3.7
Highest	1,235.5	30.6	21.1	29.3	18.1	0.9
Total	1,057.2	26.4	24.9	24.9	16.4	7.4

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Income figures are calculated by averaging per capita household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

Table 11—Relative concentration coefficients of source incomes in nonfarm income inequality

Source of Nonfarm Income	1986/87 c	1986/87 g	1987/88 c	1987/88 g	1988/89 c	1988/89 g
Self-employment	1.223	1.110	1.335	1.094	0.852	0.893
Unskilled labor	0.870	0.947	0.736	0.881	0.980	1.036
Government employment	1.032	1.035	1.072	1.122	1.116	1.099
Private sector	1.002	0.984	0.888	0.955	0.984	1.008
Other	0.615	0.774	0.281	0.561	0.279	0.505

Notes: N = 727 households. The relative concentration coefficients for the different sources of income are calculated from the coefficient of variation (c) and the Gini coefficient (g).

$$c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\ g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Distinguishing between inequality-increasing and -decreasing sources of nonfarm income, the decomposition results for nonfarm self-employment are mixed (Table 11). However, with only one exception both decompositions agree that for all three years unskilled labor represents an inequality-decreasing source of nonfarm income. Both decompositions also agree that for all three years government employment represents an inequality-increasing source of nonfarm income.

Table 12 presents the decomposition results for relative factor inequality weights of source incomes in nonfarm income inequality. With only one exception, the data show that government employment makes a larger contribution to nonfarm income inequality than unskilled labor. Depending on the year and the decomposition measure, government employment accounts for between 21.5 and 31.2 percent of nonfarm inequality, while unskilled labor accounts for between 14.6 and 29.1 percent.

Table 12—Factor inequality weights of source incomes in nonfarm income inequality

Source of Nonfarm Income	1986/87 wc	1986/87 wg	1987/88 wc	1987/88 wg	1988/89 wc	1988/89 wg
Government employment	0.215	0.216	0.287	0.300	0.312	0.297
Private sector	0.138	0.136	0.148	0.159	0.192	0.187
Self-employment	0.371	0.337	0.401	0.328	0.213	0.212
Unskilled labor	0.205	0.223	0.146	0.175	0.275	0.291
Other	0.071	0.088	0.019	0.038	0.007	0.013
Total	1.000	1.000	1.000	1.000	1.000	1.000

Notes: N = 727 households. wc is the factor inequality weight calculated from the coefficient of variation, and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i c_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu}.$$

$$w_i g_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Government Employment Versus Unskilled Labor

The results of Tables 10–12 suggest that nonfarm income has a dual effect on income distribution.[32] On the one hand, poor households are heavily dependent on nonfarm unskilled labor, and therefore, all else being equal, additional increments of such income have a favorable effect on inequality. On the other hand, rich households depend on nonfarm income from government employment; thus, with other factors held constant, more income from this source tends to increase nonfarm inequality.

Why is this so? A number of studies have found that government employees in the Third World tend to come from the wealthier and better-educated rural households.[33] Does this mean that nonfarm government employment has higher entry costs—especially in the form of education—than nonfarm unskilled labor, which makes the former more accessible to richer land-owning households? This question has much practical relevance today, as Pakistan and other Third World countries consider reducing the number of government employees. How will such cutbacks affect poverty and income distribution in rural areas?

To answer the question of entry costs, a tobit model is estimated in two ways: for nonfarm government employment and for nonfarm unskilled labor employment, using the equation:

$$\begin{aligned} NFGOV_i, NFLAB_1 = \beta_0 + \beta_1 AGE_i + \beta_2 AGESQ_i + \beta_3 MALE\,15_{ij} \\ + \beta_4 EDUC_i + \beta_5 EDUCHS_i + \beta_6 IRLNDMM_{ij} \\ + \beta_7 RNLNDMM_i, \end{aligned} \tag{9}$$

where for the i^{th} male in the j^{th} household, *NFGOV* is the amount of three-year average income received by a male from nonfarm government employment, *NFLAB* is the amount of three-year average income received by a male from nonfarm unskilled labor employment, *AGE* is the age of the male, *AGESQ* is the age of the male squared, *MALE*15 is the number of males in the household over 15 years of age, *EDUC* is education of the male (one if no schooling, zero otherwise), *EDUCHS* is education of the male (one if high school or higher, zero otherwise), *IRLNDMM* is the three-year average amount of irrigated land owned per male household member, and *RNLNDMM* is the three-year average amount of rainfed land owned per male household member.

The model is estimated for 1,461 males over 15 years of age. Table 13 shows the means and standard deviations for the variables in the equation.

The expected coefficients and results of the model are shown in Table 14. Since the purpose of this model is to pinpoint the entry costs for the two types of nonfarm employment, the discussion focuses on the results for the education and land vari-

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[32]Other researchers have noted the dual character of rural nonfarm income. See, for example, Hasbullah 1988 and Stokke, Yapa, and Dias 1991.

[33]See, for example, Adams 1986, Leonard 1977, and Lele 1975.

Table 13—Means of independent variables for tobit regression on determinants of nonfarm government and unskilled labor income

Variable	All Males	Males with Income from Nonfarm Government Employment	Males with Income from Nonfarm Unskilled Labor Employment
	(N = 1,461)	(N = 210)	(N = 432)
AGE (age of male)	34.94 (16.93)	31.10 (11.70)	32.66 (14.33)
AGESQ (age of male squared)	1,507.16 (1,424.52)	1,103.25 (817.16)	1,271.91 (1,147.47)
MALE 15 (number of males in household over 15 years of age)	3.29 (1.76)	3.23 (1.76)	2.99 (1.62)
EDUC (education of male, one if no schooling, zero otherwise)	0.48 (0.50)	0.26 (0.44)	0.68 (0.47)
EDUCHS (education of male, one if high school or higher, zero otherwise)	0.17 (0.38)	0.43 (0.50)	0.05 (0.21)
IRLNDMM (three-year average irrigated land owned per male household member in acres)	1.15 (2.77)	0.95 (2.41)	0.69 (1.95)
RNLNDMM (three-year average rainfed land owned per male household member in acres)	1.36 (6.46)	2.41 (10.85)	0.32 (1.28)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Note: Numbers in parentheses are standard deviations.

ables. For education, nonfarm government employment does have higher entry costs than nonfarm unskilled labor. As expected, the results for government employment for the *EDUC* and *EDUCHS* variables are negative and positive, respectively, and statistically significant. In other words, a male with no schooling receives less three-year average income from nonfarm government employment than his high-school educated counterpart. For unskilled labor employment, the variables *EDUC* and *EDUCHS* are also positive and negative, respectively, and significant. These two sets of results indicate that education does represent an entry requirement for nonfarm government employment, and that education does act as a barrier for keeping uneducated males in nonfarm unskilled labor employment.

The results for the land variables are more mixed in Table 14. Neither of the land variables—*IRLNDMM* (three-year average irrigated land owned per male household member) or *RNLNDMM* (three-year average rainfed land owned per male household member)—are statistically significant for nonfarm government employment. Therefore, land owned does not represent an entry requirement for males seeking to earn nonfarm government income. However, both of the land variables are negative and statistically significant for nonfarm unskilled labor employment, indicating that lack of land may indeed represent a barrier that keeps certain males in unskilled labor employment.

Table 14—Tobit analysis of determinants of nonfarm government and unskilled labor income

Variable	Government Employment		Unskilled Labor Employment	
	Expected Sign	Coefficient	Expected Sign	Coefficient
AGE (age of male)	?	460.561 (6.196)**	?	46.084 (1.585)
AGESQ (age of male squared)	?	−6.033 (−5.962)**	?	−1.023 (−2.840)**
MALE 15 (number of males in household over 15 years of age)	?	−120.027 (−1.155)	+	−272.982 (−4.639)**
EDUC (education of male, one if no schooling, zero otherwise)	−	−1,165.180 (−2.702)**	+	1,023.030 (4.850)**
EDUCHS (education of male, one if high school or higher, zero otherwise)	+	3,818.160 (8.280)**	−	−1,789.200 (−4.856)**
IRLNDMM (three-year average irrigated land owned per male household member in acres)	+	−93.398 (−1.310)	−	−186.301 (−4.130)**
RNLNDMM (three-year average rainfed land owned per male household member in acres)	+	17.500 (0.829)	−	−324.017 (−4.917)**
Sigma		4,205.040 (17.204)**		2,571.290 (25.439)**
Constant		−11,772.40 (−8.299)**		−1,140.970 (−1.962)*
Dependent variable		*NFGOV*[a]		*NFLAB*[b]
Log likelihood		−2,359.6		−3,897.5

Notes: Sample includes 1,461 males over 15 years of age. Numbers in parentheses are t-statistics (two-tailed).
[a]*NFGOV* is the amount of three-year average income received by the male from nonfarm government employment.
[b]*NFLAB* is the amount of three-year average income received by the male from nonfarm unskilled labor employment.
* Significant at the .05 level.
** Significant at the .01 level.

5

SOURCES OF AGRICULTURAL INCOME INEQUALITY

In recent years much has been written about the determinants of agricultural income distribution in the developing world.[34] On the whole, two main lines of argumentation can be identified in this literature. The first has already been presented, namely, the argument that unequal landownership represents a key determinant of rural income inequality in the Third World. Griffin (1976), Quan (1989), and others have suggested that since land is the dominant factor of production in most rural areas, and land itself is distributed very unequally, then uneven landownership is the main factor explaining rural income inequality. The second argument is more complicated, with authors taking positions on both sides of the issue of whether cash crops contribute to agricultural income inequality.[35] On the one hand, Bernstein (1982), Scott (1985), and others maintain that cash crops lead to greater inequality because most of the benefits from cash crop production go to the rich. However, Pinstrup-Andersen and Hazell (1985) and Lipton and Longhurst (1989) take an opposite view by arguing that cash crops can and do have a favorable effect on agricultural income distribution by providing the poor with new income and employment opportunities.

Since Chapter 3 has already analyzed the effect of unequal landownership on income inequality in Pakistan, this chapter examines the second point, the effects of cash and food crops on agricultural income inequality in Pakistan. This analysis shows that while income from a leading cash crop (sugarcane) has a large and negative impact on income distribution in Pakistan, income from the main foods (wheat and rice) has an equalizing effect on income distribution.

Overview of Agricultural Income

Table 15 presents summary data for nine sources of agricultural income: eight types of net crop income and agricultural wage labor.[36] In this table, net income for each crop is defined as the gross value of crop output minus fixed costs (land rent) and all variable costs for materials (seeds, fertilizer, and pesticides), machinery (tractors

[34]An earlier version of this chapter appeared as "Agricultural Income, Cash Crops, and Inequality in Rural Pakistan," in *Economic Development and Cultural Change* 43 (April 1995).

[35]In this study "cash crops" are defined as those nonfood crops that are sold for cash. This definition includes crops that require substantial off-farm processing (sugarcane and cotton) as well as those that are usually exported (basmati rice). For a useful review of the cash crop literature, see Maxwell and Fernando 1989.

[36]Because they include data for all 727 households, the figures for net agricultural income in Table 15 differ slightly from those presented for this study in Adams 1995.

Table 15—Summary of net agricultural income data, 1986/87, 1987/88, and 1988/89

Source of Agricultural Income	Mean Annual Per Capita Agricultural Income[a]		
	1986/87	1987/88	1988/89
		(Rs)	
Net crop income			
Sugarcane	226.9	274.4	245.5
	(959.6)	(1,109.5)	(968.5)
Wheat	131.1	113.6	153.9
	(352.0)	(449.8)	(837.6)
Rice	103.4	106.9	84.3
	(276.5)	(301.9)	(236.2)
Vegetables[b]	32.8	71.9	–4.8
	(570.3)	(977.9)	(–27.9)
Fodder	12.0	58.8	63.2
	(130.4)	(216.8)	(422.0)
Maize	6.5	25.6	37.5
	(193.7)	(128.5)	(111.8)
Barley	22.2	17.7	0.6
	(112.3)	(88.6)	(243.5)
Other crops[c]	198.6	138.2	219.6
	(1,224.9)	(837.4)	(1,196.8)
Other agricultural income			
Agricultural wages	30.2	44.3	33.1
	(128.1)	(203.8)	(97.5)
Total	763.7	851.4	832.9
	(2,170.3)	(2,188.2)	(2,048.4)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Numbers in parentheses are standard deviations. In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.
[a]Mean income figures include negative source incomes recorded for some households in various years.
[b]Vegetables include tomatoes, onions, potatoes, and others.
[c]Other crops include cotton, groundnuts, rapeseed and mustard, and others. Net crop income for cotton is not calculated separately because of the small number of cotton-growing households in the survey.

and threshers), water (canals and tubewells), and hired labor.[37] In these calculations imputed land rent and the imputed costs of own household labor are *not* netted out. Net income for all of the main cash crops and food crops in Pakistan except cotton is shown. Because of the small number of cotton-growing households in the survey,[38] net income figures for cotton are included in the category "other crops."

According to Table 15, two sources of agricultural income predominate: net crop income from sugarcane and from other crops (cotton, groundnuts, rapeseed and mustard, and others). In contrast, agricultural wages are quite small, representing less than 6 percent of mean per capita agricultural income in any given year. In the

[37]These calculations of net crop income are based in part on work by Hapke and Vosti (1992).

[38]In each year of the survey, less than 5 percent of the households grow cotton.

Table 16—Comparison of profitability of different *kharif/rabi* (autumn/spring) crop rotations with sugarcane, in Punjab Province, 1990/91

Kharif Crop	Net Crop Income[a]	*Rabi* Crop	Net Crop Income[a]	Total Net Crop Income[a]
	(Rs)			(Rs)
IRRI rice	−18.0	Irrigated wheat	862.0	844.0
Fresh sugarcane	2,382.0	...	...	2,382.0
Irrigated maize	−747.0	Irrigated wheat	862.0	115.0
Fresh sugarcane	2,382.0	...	...	2,382.0
Cotton (S-12)	1,740.0	Irrigated wheat	839.0	2,579.0
Fresh sugarcane	2,382.0	...	...	2,382.0

Source: Ahmad 1991.
Notes: Net crop income equals the gross value of crop output minus fixed costs (land rent) and all variable costs for materials (seed, manure, fertilizer, pesticides), machinery (tractors), irrigation (canals, tubewells), hired labor, and interest on capital. *Kharif* crops are planted May to July and harvested October to December. *Rabi* crops are planted November to December and harvested March to April. Sugarcane is a 12-month crop that can stay in the field two-to-four years before replanting.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

sample, the widespread sharing of agricultural labor between families apparently serves as a substitute for the hiring of wage labor.[39]

Sugarcane and other crops are profitable because of the large net contribution that these two crop categories make to per capita agricultural income.[40] This is one way to analyze crop profitability; an alternative method is to examine the net returns from competing crop rotations. This alternative method needs to be considered here because the most profitable crop in Table 15—sugarcane—is a 12-month crop. Thus, it is important to see whether sugarcane remains profitable when compared with different combinations of *kharif/rabi* (autumn/spring) crops that can be grown during a similar 12-month time span.[41]

Ahmad (1991) has recently used field data to calculate net income from different crop rotations in Punjab Province in 1990/91. In that province, three main *kharif/rabi* crop rotations compete with sugarcane: rice/wheat, maize/wheat, and cotton/wheat (Table 16). Ahmad's results underscore the profitability of sugarcane. Only one crop rotation—cotton/wheat—is more profitable than sugarcane over a 12-month period.[42]

Although pricing policies lie beyond the purview of this study, it should be emphasized that the results of Tables 15 and 16 reflect the effects of agricultural pricing policies pursued by the Pakistani government. While the specific form of government price intervention varies from crop to crop and from year to year, in

[39]On this point, see Nabi, Hamid, and Zahid 1986.

[40]According to one reviewer, sugarcane, which requires more water than most crops, might appear profitable in Table 15 because water is not properly priced. This study uses the water prices actually paid by farmers. In many cases these water prices are, in fact, quite low.

[41]*Kharif* crops are planted May to July and harvested October to December. *Rabi* crops are planted November to December and harvested March to April.

[42]In all likelihood, it is the relative profitability of cotton that makes net crop income from other crops (cotton, groundnuts, rapeseed and mustard, and others) so high.

general, sugarcane has received strong protection, and food crops such as wheat and rice have been taxed. The nominal rates of protection (NRPs), which compare domestic with border prices, adjusted for transport and other marketing costs and evaluated at the official exchange rate, have been calculated for various crops in Pakistan (Dorosh and Valdés 1990); for the period 1983–87, the NRP for sugarcane was 210 while that for wheat was –33 and that for rice was –17.

Agricultural Income: Descriptive Statistics

Because agricultural incomes fluctuate considerably from year to year, these fluctuations could conceivably affect any decomposition effort that is based on annual income data. Therefore the decomposition of agricultural income is aggregated over the entire three-year period of the study. The 727 households are ranked by income quintile on the basis of their three-year average total per capita income. For each quintile, Table 17 shows the percent of net income coming from each of the nine sources of agricultural income.

Households in the top quintile receive a disproportionately large share of their net agricultural income from the two most profitable crops in the survey: sugarcane and other crops (which includes cotton, groundnut, rapeseed and mustard, and others). While households in the lowest quintile receive a negative net agricultural income from sugarcane and other crops, households in the top quintile receive 37 percent of their net agricultural income from sugarcane and 32 percent from other crops. This relationship is, however, reversed for wheat and rice.[43] Wheat and rice are the two

Table 17—Sources of net agricultural income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Per Capita Agricultural Income[a]	Percent of Net Per Capita Agricultural Income from								
		Sugar-cane	Wheat	Rice	Vege-tables[b]	Fodder	Maize	Barley	Other Crops[c]	Agricul-tural Wage
	(Rs)									
Lowest	68.6	–9.5	64.1	71.5	–5.2	1.8	17.5	6.5	–88.3	41.6
Second	169.1	1.2	44.8	25.7	–3.1	10.2	10.4	3.0	–13.4	21.1
Third	361.7	9.2	30.8	14.1	–0.7	9.3	3.4	2.0	21.5	10.3
Fourth	779.8	27.7	14.8	8.9	1.7	8.6	3.3	2.5	26.5	6.1
Highest	2,686.9	37.0	11.8	5.1	6.1	3.9	1.8	1.1	32.0	1.1
Total	816.6	30.5	16.3	8.6	4.0	5.5	2.8	1.7	26.2	4.4

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Income figures are calculated by averaging per capita household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.
[b]Vegetable income includes net crop income from tomatoes, onions, potatoes, and others.
[c]Other crop income includes net crop income from cotton, groundnuts, rapeseed and mustard, and others.

[43]Although two types of rice—IRRI (ordinary rice) and basmati (a high-value export rice)—are grown in Pakistan, virtually all of the rice grown in the survey households is the IRRI variety.

most important sources of net agricultural income for the poor. Households in the lowest quintile receive 64.1 percent of their net agricultural income from wheat and 71.5 percent from rice. Moreover, the share of net agricultural income coming from wheat and rice falls sharply as household income rises.[44]

Two questions arise from the data in Table 17. Why do households in the lowest quintile receive *negative* net incomes from sugarcane and other crops? And why do poor households continue to grow these crops? Because poor households devote relatively little land to sugarcane—0.6 acres for the lowest quintile compared with 2.3 acres for the top quintile—they are unable to meet the minimum production quotas needed for selling sugarcane to local mills.[45] They are thus unable to benefit from the high, government-set prices for sugarcane at these mills.[46] Instead, most poor households have their sugarcane processed into *gur* (a form of molasses) at crude, local village presses. Most of this *gur* is consumed at home; very little is sold or traded. As a result, the expenses that poor households incur in growing sugarcane exceed their actual and imputed income for this crop.

According to Table 17, households in the lowest quintile also incur large negative net incomes from growing other crops. The reasons for this relate both to the size of net agricultural income of poor households and to the variability inherent in growing these other crops. As Table 17 shows, poor households receive only a very small amount of net income from agriculture—less than Rs 70 per capita averaged over three years.[47] On a year-by-year basis, the standard deviation of net agricultural income from other crops is five-to-six times the mean annual per capita income from these crops (Table 15). Thus, it is not surprising to find that while 59.7 percent of the households in the lowest quintile record negative net incomes from growing other crops, only 32.9 percent of the households in the top quintile have negative net incomes from this income source. Evidently, the high variability of agricultural income from other crops affects poor households more adversely than rich households. The coefficient of variation for three-year average agricultural income from other crops is higher for households in the lowest quintile (3.51) than it is for households in the top quintile (1.92).

The second question emerging from Table 17 is, if sugarcane is so profitable, why are poor households unable to grow this crop to the same extent as rich households? The answer to this question has been suggested earlier, namely, that sugarcane is a 12-month crop that can stay in the field for two-to-four years before replanting. For

[44]An attempt was made to estimate an income determination function for each of the four main sources of agricultural income: sugarcane, rice, wheat, and other crops. The function estimated was similar to equation (16) in Chapter 8. However, the results were poor. For example, only a small number of the independent variables—including the land variables—proved to be statistically significant. For this reason, the results are not reported.

[45]Writing on the political economy of sugarcane in Pakistan, Hamid, Nabi, and Nasim (1990, 108–109) note: "Since sugarcane production (in an area near a sugar mill) is several times as profitable as any other crop, (farmers) would like to have a sugar mill established in their area and often press this demand through various channels. Therefore, the decision to locate a sugar mill (in rural Pakistan) is more likely to be taken on political rather than economic grounds."

[46]In Pakistan the government announces the buying price for sugarcane before the sowing season. In most years, there are small differences in buying prices between provinces.

[47]In 1986, 1 Pakistani rupee = US$0.062.

this reason, sugarcane cannot be followed by another food crop in the same year. A sugarcane-growing household is thus forced to either use other land to grow its food crops or to buy its food from the market. Poor households usually lack the land needed to simultaneously grow both sugarcane and food crops, and poor households are reluctant to depend on the market for their food requirements. Because they are concerned about meeting their own food production needs, poor households tend to avoid planting a profitable crop like sugarcane. Therefore, households in the lowest income quintile devoted only 7.2 percent of their three-year average harvested land to sugarcane, but 29.0 percent to wheat and 19.6 percent to rice. In contrast, households in the top quintile devoted 18.1 percent of their three-year average harvested land to sugarcane, 18.6 percent to wheat, and 32.8 percent to rice.

Decomposition of Agricultural Income Inequality

Turning to the decomposition analysis, Table 18 reports the relative concentration coefficients based on the decomposition of the coefficient of variation and the Gini coefficient. Both decompositions agree that three income sources represent inequality-increasing sources of agricultural income: net crop income from sugarcane, vegetables, and other crops. These results parallel those of Tables 15–17, which show that sugarcane and other crops are the two most profitable crops in the sample,

Table 18—Decomposition of agricultural income inequality based on three-year average per capita agricultural income

Source of Agricultural Income[a]	Relative Concentration Coefficients		Factor Inequality Weights	
	c	g	wc	wg
Net crop income				
Sugarcane	1.211	1.094	0.370	0.334
Wheat	0.609	0.694	0.099	0.113
Rice	0.526	0.654	0.063	0.079
Vegetables[b]	1.927	1.154	0.079	0.047
Fodder	0.730	0.993	0.040	0.054
Maize	0.474	0.704	0.015	0.020
Barley	0.375	0.814	0.006	0.014
Other crops[c]	1.424	1.398	0.323	0.317
Other agricultural income				
Agricultural wages	0.081	0.500	0.005	0.022
Total	. . .	. . .	1.000	1.000

Notes: N = 727 households. The relative concentration coefficients for the different sources of income are calculated from the coefficient of variation (c) and the Gini coefficient (g). wc is the factor inequality weight calculated from the coefficient of variation, and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i = \frac{\mu_i}{\mu};\ c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\ g_i = R_i \frac{G_i}{G}.$$

[a]Income figures are calculated by averaging per capita household income over the three years. All income figures are in constant 1986 terms.
[b]Vegetables include tomatoes, onions, potatoes, and others.
[c]Other crops include cotton, groundnut, rapeseed and mustard, and others. Net crop income for cotton is not calculated separately because of the small number of cotton-growing households in the survey.

and that rich households receive more than their quintile shares of net agricultural income from each of these crops. The relative concentration coefficients show that all the remaining sources of agricultural income are inequality-decreasing sources of income, including both of the main food crops—wheat and rice.[48]

The decomposition results for relative factor inequality weights of source incomes in agricultural income inequality are also shown in Table 18. The two most profitable crops in the survey—sugarcane and other crops—make a large contribution to agricultural income inequality. Net crop income from sugarcane accounts for between 33.4 and 37.0 percent of agricultural inequality, while net crop income from other crops accounts for between 31.7 and 32.3 percent of such inequality. None of the other income sources account for more than 12 percent of agricultural income inequality.

Why does net income from sugarcane and other crops make such a large contribution to agricultural income inequality? One way to answer this question is to analyze the three elements of the Gini decomposition (Table 19). Sugarcane and other crops have the largest source income weights in the table. Sugarcane and other crops also have mid- to large-size source ginis. The source gini for sugarcane exceeds unity, while the source gini for other crops is among the highest recorded. These results reflect the fact that in any given year many households have negative net incomes from sugarcane and other crops.[49] Finally, the table shows that income from sugarcane and other crops is highly correlated with total agricultural income. It is the combination of these three factors—large source income weights, mid- to large-size source ginis, and high correlation with total agricultural income—that makes sugarcane and other crops contribute so much to agricultural income inequality.

[48]A decomposition of the Gini coefficient based on three-year average per capita agricultural income by district yields similar results. In each of the four survey districts, wheat and rice represent inequality-decreasing sources of agricultural income. See Appendix, Table 48.

[49]According to Table 15, in any given year the standard deviation of net crop income from sugarcane is three-to-four times the mean. For other crops, the standard deviation is five-to-six times the mean.

Table 19—Decomposition of agricultural income inequality using the Gini coefficient and based on three-year average per capita agricultural income

Measure	Source of Income	Coefficient
Source income weight	Sugarcane	0.305
	Other crops[a]	0.227
	Wheat	0.163
	Rice	0.120
	Fodder	0.055
	Agricultural wages	0.044
	Vegetables[b]	0.041
	Maize	0.028
	Barley	0.017
	Total	1.000
Source Gini (G_i)[c]	Barley	2.065
	Other crops[a]	1.509
	Vegetables[b]	1.195
	Maize	1.192
	Fodder	1.098
	Sugarcane	1.046
	Agricultural wages	0.866
	Wheat	0.860
	Rice	0.846
Correlation ratio between source income and agricultural income (R_i)	Sugarcane	0.883
	Vegetables[b]	0.815
	Other crops[a]	0.782
	Fodder	0.763
	Wheat	0.680
	Rice	0.652
	Maize	0.499
	Agricultural wages	0.488
	Barley	0.332

Notes: N = 727 households.

$$G_i = \frac{2}{n\mu_i} \operatorname{cov}\left(y_i, r_i\right);\ R_i = \frac{\operatorname{cov}\left(y_i, r\right)}{\operatorname{cov}\left(y_i, r_i\right)}.$$

[a]Other crops include cotton, groundnuts, rapeseed and mustard, and others.
[b]Vegetables include tomatoes, onions, potatoes, and others.
[c]Source Ginis are high because they include households with zero and negative incomes from different income sources. Source Ginis can exceed unity if many of y_i are negative.

6

SOURCES OF TRANSFER INCOME INEQUALITY

Most transfer income in this study comes from remittances. These remittances are sent to rural households by migrants working outside of their village communities, either in urban areas within Pakistan or outside of the country. In any given year, remittances from both internal and external migrants account for over 80 percent of mean per capita transfer income.

In Pakistan, as in other developing countries, remittances can have a profound effect on rural income distribution. In these countries, rural incomes tend to be lower than incomes earned in the urban sector. It is this disparity between rural and urban incomes that causes villagers to seek work elsewhere, either in cities or abroad. And it is this disparity in income levels that should be of concern to policymakers and others interested in equity issues.

Despite these considerations, there is still no general consensus about the effect of either internal or external remittances on rural income distribution in the Third World. Lipton (1980) argues that in India internal remittances worsen rural inequality because they are earned mainly by upper-income villagers. Gilani, Khan, and Iqbal (1981) in Pakistan and Adams (1991) in Egypt produce similar findings for external remittances. But some empirical studies suggest a very different outcome. For example, Oberai and Singh (1980) find that internal remittances in India have an egalitarian effect on rural income distribution. Stark, Taylor, and Yitzhaki (1986) reach a similar conclusion on the effects of internal remittances in two Mexican villages, but for external remittances, they find an equalizing influence on income distribution in one village and an unequalizing influence in the other.

Two major reasons account for this lack of consensus on the effect of remittances on rural income distribution: the use of local data collection techniques that preclude making unambiguous empirical judgments about the effects of remittances, and the reluctance or inability to use predicted income functions to accurately estimate income before and after remittances.

In this chapter, these and similar problems are overcome, first, by using income decomposition techniques to pinpoint the effects of five different sources of transfer income, including internal and external remittances, on inequality, and second, by using predicted income equations to estimate the incomes of households in two situations: excluding and including remittances. The results are then used to evaluate the changes in income distribution that occur when internal and external remittances are excluded, compared with when they are included.

Transfer Income Inequality

Table 20 presents summary data for the five sources of transfer income:

(1) *External remittances* include income (money and goods) received from an international migrant;

Table 20—Summary of transfer income data, 1986/87, 1987/88, and 1988/89

Source of Transfer Income	Mean Annual Per Capita Transfer Income[a]		
	1986/87	1987/88	1988/89
		(Rs)	
External remittances	289.11 (1,448.68)	319.50 (1,391.91)	202.94 (928.83)
Internal remittances	232.79 (493.39)	197.56 (664.68)	109.79 (347.85)
Government pension	22.38 (124.33)	37.13 (396.26)	48.35 (640.57)
Cash	8.34 (65.70)	17.69 (142.14)	6.61 (58.18)
Zakat	1.38 (9.17)	1.47 (17.44)	1.68 (12.63)
Total	554.01 (1,497.77)	573.35 (1,591.70)	369.38 (1,176.10)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Numbers in parentheses are standard deviations.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

(2) *Internal remittances* include income (money and goods) received from an internal migrant in Pakistan;

(3) *Government pension* includes pensions received by retired government employees;

(4) *Cash* includes cash transfers between households; and

(5) *Zakat*, is an alms tax that Muslims pay to support poor households.

It should be emphasized that the external and internal remittance figures recorded here refer *only* to the income and goods that households reported receiving from migrants. These remittance figures do not include the value of savings held outside the household by migrants. It is likely that these data limitations tend to underestimate the actual value of remittances—defined as money, goods, and savings—received by migrant households.

In Table 20, the two main sources of transfer income are external and internal remittances. However, between the first and third years of the survey, the mean level of internal remittances fell by more than 50 percent. The reasons for this sharp decline are unclear, but may relate to changing work opportunities for internal migrants in Karachi and other large Pakistani cities.

When the five sources of transfer income are presented by income quintiles aggregated over the entire three-year period, the results show that the poor are very dependent on one income source: internal remittances (Table 21). Households in the lowest quintile receive over 75 percent of their three-year average per capita transfer income from internal remittances. While the share of transfer income from internal remittances falls monotonically with income class, the share from external remittances rises steadily with income class.

These results suggest that the two types of remittances have very different effects on income distribution. This finding is bolstered by Table 22. For all three years, both decompositions agree that internal remittances represent an inequality-decreasing

Table 21—Sources of transfer income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Per Capita Transfer Income[a]	Percent of Total Per Capita Transfer Income from				
		External Remittances	Internal Remittances	Government Pension	Cash	*Zakat*
	(Rs)					
Lowest	140.1	7.3	76.7	7.6	5.6	2.8
Second	244.4	26.8	62.5	5.5	4.5	0.8
Third	384.6	48.3	42.2	4.7	4.5	0.4
Fourth	462.6	50.4	32.1	14.9	2.5	0.1
Highest	1,259.9	67.9	26.1	5.4	0.5	0.1
Total	498.3	40.2	47.9	7.6	3.5	0.8

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Income figures are calculated by averaging household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

source of transfer income and that external remittances represent an inequality-increasing source of income. This means that, all things being equal, an additional increment of internal remittances will decrease transfer income inequality, whereas an increment of external remittance income will increase inequality.

The decomposition results for relative factor inequality weights of source incomes in transfer income inequality show that, for all three years, external remittance income makes the largest contribution to transfer inequality (Table 23). Depending on the year and the measure, external remittances account for between 58.5 and 91.0 percent of transfer income inequality. Of the remaining sources of transfer income, only internal remittances account for more than 15 percent of transfer income inequality.

Table 22—Relative concentration coefficients of source incomes in transfer income inequality

Source of Transfer Income	1986/87		1987/88		1988/89	
	c	g	c	g	c	g
External remittances	1.744	1.184	1.359	1.074	1.131	1.065
Internal remittances	0.201	0.806	0.491	0.901	0.285	0.886
Government pension	0.136	0.828	0.995	1.002	2.235	1.035
Cash	0.010	0.641	0.184	0.815	0.054	0.737
Zakat	–0.065	0.187	–0.070	0.471	–0.014	0.574

Notes: N = 727 households. The relative concentration coefficients for the different sources of transfer income are calculated from the coefficient of variation (c) and the Gini coefficient (g).

$$c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\ g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Table 23—Factor inequality weights of source incomes in transfer income inequality

Source of Transfer Income	1986/87		1987/88		1988/89	
	wc	wg	wc	wg	wc	wg
External remittances	0.910	0.618	0.757	0.598	0.620	0.585
Internal remittances	0.084	0.339	0.169	0.311	0.293	0.263
Government pension	0.004	0.033	0.065	0.065	0.085	0.136
Cash	0.001	0.009	0.006	0.025	0.001	0.013
Zakat	0.001	0.001	0.002	0.001	0.001	0.002
Total	1.000	1.000	1.000	1.000	1.000	1.000

Notes: N = 727 households. wc is the factor inequality weight calculated from the coefficient of variation, and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i c_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } c_i = \rho_i \frac{\sigma_i / \mu_i}{\sigma / \mu}.$$

$$w_i g_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Analyzing the elements of the Gini decomposition helps explain why external remittances make such a large contribution to transfer income inequality (Table 24). In each year, external remittances have both a larger source income weight and a higher source gini than the other main source of transfer income, internal remittances. Moreover, in each of the three years, external remittance income has the highest correlation ratio with total transfer income. External remittance income therefore makes the largest contribution to transfer inequality because it has a high source income weight and a large source gini, and it is highly correlated with total transfer income. In comparison, internal remittance income accounts for a much smaller share of transfer inequality income, because it has a low source gini and it is poorly correlated with total transfer income.

Predicted Income Equations

In order to analyze the large, negative impact of external remittances on rural income distribution, it is also useful to use predicted income equations to solve two methodological problems. First, the analysis thus far has been based on the income of households including remittances: that is, the households have been ranked in terms of three-year average total per capita income from all sources, including remittances. However, migration, especially international migration, greatly increases household income. For example, in this report external remittances raise the three-year average total per capita income of international migrant households by 50 percent.[50] For this reason, it is not clear whether analyzing the effects of remittances on rural income distribution should be done on the basis of household income including remittances.

[50]In contrast, internal remittances raise the three-year average total per capita income of internal migrant households by only 8 percent.

Table 24—Decomposition of transfer income inequality using the Gini coefficient

Measure/Source of Income	1986/87	1987/88	1988/89
Source income weight			
External remittances	0.522	0.557	0.549
Internal remittances	0.420	0.345	0.297
Government pension	0.040	0.065	0.131
Cash	0.015	0.031	0.018
Zakat	0.002	0.003	0.005
Total	1.000	1.000	1.000
Source gini $(G_i)^a$			
External remittances	0.952	0.952	0.957
Internal remittances	0.782	0.890	0.898
Government pension	0.971	0.986	0.988
Cash	0.986	0.982	0.986
Zakat	0.978	0.992	0.984
Correlation ratio between source income and total transfer income (R_i)			
External remittances	0.977	0.970	0.976
Internal remittances	0.809	0.871	0.865
Government pension	0.669	0.874	0.919
Cash	0.510	0.714	0.655
Zakat	0.150	0.408	0.511

Notes: N = 727 households. All estimates are based on annual per capita household income expressed in constant 1986 terms.

$$G_i = \frac{2}{n\mu_i} \operatorname{cov}(y_i, r_i);\ R_i = \frac{\operatorname{cov}(y_i, r)}{\operatorname{cov}(y_i, r_i)}.$$

[a]Source ginis are high because they include households with zero and negative incomes from different income sources.

To gauge the true effect of remittances on income distribution, it might be better to rank households by income *excluding* remittances. If this point is granted, then a second methodological problem arises: how to rank households without remittances. In this report, a large number of households have an internal or international migrant currently working outside of the household. Thus, in attempting to determine income excluding remittances for all households, it is not known what the total per capita incomes of these households would have been had these migrants stayed home.

To solve these methodological problems, the following procedure is adopted. Predicted income equations are used to estimate the three-year average total per capita incomes of all migrant households excluding remittances. And then, to be consistent in the treatment of incomes, another set of predicted equations is used to estimate the three-year average total per capita incomes of all migrant households including remittances.

To predict household incomes excluding remittances *(PREX)*, parameters are estimated from the 181 households that received no remittances. These parameters are then applied to households receiving internal or external remittance income.[51] The equation used is

[51]This method of predicting the incomes of households receiving remittances assumes that the only way in which these households differ from nonmigrant households is that the latter receive *no* remittance income. It is assumed that households receiving remittances do not differ in any entrepreneurial or other way that might affect their income aside from the relationships captured by the variables used in the predicted income equations.

$$PREX = \beta_0 + \beta_1 IRLAND + \beta_2 RNLAND + \beta_3 HS + \beta_4 MALE15 + \beta_5 EDMS, \quad (10)$$

where *PREX* is predicted three-year average total per capita income (excluding remittances), *IRLAND* is the amount of three-year average irrigated land owned by the household, *RNLAND* is the amount of three-year average rainfed land owned by the household,[52] *HS* is household size, *MALE*15 is the number of males in the household over 15 years of age, and *EDMS* is the number of household males with middle school or higher education.

In order to predict per capita incomes including remittances for migrant households, it is necessary to address a final methodological problem. In this report, 87 households receive both internal and external remittances. Thus, using a single equation to estimate incomes with remittances would have the effect of overestimating the internal or external remittances of households with both sets of income. To avoid this problem, it is necessary to predict incomes with remittances by revising equation (10) into equations (11) and (12). In equation (11), the dependent variable becomes predicted three-year average total per capita income (including internal remittances) for internal migrant households *(PRINTMIG)*. In equation (12), the dependent variable becomes predicted three-year average total per capita income (including external remittances) for international migrant households *(PREXTMIG)*. Migration dummy variables—*INTMIG* and *EXTMIG*—are also added to each equation.[53] The revised equations can be written as

$$PRINTMIG = \beta_0 + \beta_1 IRLAND + \beta_2 RNLAND + \beta_3 HS + \beta_4 MALE15 + \beta_5 EDMS + \beta_6 INTMIG; \quad (11)$$

$$PREXTMIG = \beta_0 + \beta_1 IRLAND + \beta_2 RNLAND + \beta_3 HS + \beta_4 MALE15 + \beta_5 EDMS + \beta_6 EXTMIG, \quad (12)$$

where *INTMIG* is one if the household receives internal remittances, zero otherwise, and *EXTMIG* is one if the household receives external remittances, zero otherwise.

The results of equation (10), which is designed to predict household income excluding remittances, are presented in Table 25. Three of the five variables in this table are statistically significant. The variable *IRLAND* is strongly and positively correlated with predicted three-year average total per capita income (excluding

[52]To avoid the problem of endogeneity, it would be best if these land variables—irrigated land *(IRLND)* and rainfed land *(RNLND)*—were measured at time of migration, rather than at the time of the survey. This is a concern because many past studies have found that migrants tend to spend their remittances on land. However, more recent studies (for example, Adams 1991; Gilani, Khan, and Iqbal 1981) have found that migrants tend to devote only a small portion (15–20 percent) of their total remittance expenditures on land. Moreover, migrants—especially international migrants—tend to spend more on land for building purposes (for example, house construction) rather than on agricultural land. On these bases, it seems unlikely that using agricultural land variables measured at time of survey introduces any serious bias into the predicted income equations.

[53]In equations (11) and (12), predicted three-year average total per capita income (including remittances) for nonmigrant households is calculated by setting the migration dummy variables (*INTMIG* and *EXTMIG*) to zero.

Table 25—Regression to estimate predicted three-year average total per capita household income (excluding remittances)

Variable	Regression Coefficient	t-Ratio
IRLAND (irrigated land owned by household)	164.916	7.101**
RNLAND (rainfed land owned by household)	47.679	1.481
HS (household size)	–234.767	–4.392**
*MALE*15 (number of males in household over 15 years of age)	105.294	0.724
EDMS (number of males in household with middle school or higher education)	612.961	2.202*
Constant	3,957.036	9.544**
Adjusted $R^2 = 0.320$		
F-statistic = 17.9		

Notes: Regression is based on 181 households that received no remittances. The parameters are used to estimate predicted three-year average total per capita income (excluding remittances) for households receiving internal and external remittances. The dependent variable is *PREX* (predicted three-year average total per capita household income excluding remittances). All independent variables are at three-year average values.
*Significant at the .05 level.
**Significant at the .01 level.

remittances). This is to be expected, given the importance of irrigated land in this and most other rural Third World areas. The variable *EDMS* is also positively correlated with predicted three-year average total per capita household income (excluding remittances). This relationship is also to be expected in an environment where education has positive rates of return, and social custom and tradition normally permit only males to earn income outside of the household.

Table 26 reports the results obtained from using equation (11) to predict three-year average total per capita income (including internal remittances) for internal migrant households. All of the coefficients are statistically significant. The results for the internal migration variable *(INTMIG)* suggest that the presence of an internal migrant raises predicted three-year average total per capita income for internal migrant households by Rs 255.40 (US$16).

Turning to the international migrant households, the results obtained from using equation (12) to predict three-year average total per capita income (including external remittances) indicate that five of the six coefficients are statistically significant (Table 27). The coefficient for the external migration variable *(EXTMIG)* suggests that the presence of an international migrant raises predicted three-year average total per capita income for international migrant households by Rs 1,307.70 (US$81).

Remittances, Predicted Incomes, and Inequality

Now that household incomes have been predicted for all households, with and without remittances, it is possible to evaluate the effects of remittances on rural income inequality. This can be done by comparing the first-order changes that occur in income distribution when internal and external remittances are excluded with those that occur when such remittances are included. In this exercise, the effects of

Table 26—Regression to estimate predicted three-year average total per capita income (including internal remittances) for households with internal migrants

Variable	Regression Coefficient	t-Ratio
IRLAND (irrigated land owned by household)	170.396	36.456**
RNLAND (rainfed land owned by household)	47.242	10.858**
HS (Household size)	−244.641	−17.682**
*MALE*15 (number of males in household over 15 years of age)	137.922	3.551**
EDMS (number of household males with middle school or higher education)	663.572	10.085**
INTMIG (internal migration, one if household receives internal remittances, zero otherwise)	255.389	2.416*
Constant	3,928.727	29.854**
Adjusted $R^2 = 0.735$		
F-statistic = 309.7		

Notes: Regression includes 668 households: 181 households with no remittances and 487 households receiving internal remittances. The parameters are used to estimate predicted three-year average total per capita income (including remittances) for internal migrant households. The dependent variable is *PRINTMIG* (predicted three-year average total per capita household income including internal remittances). All independent variables are at three-year average values.
*Significant at the .05 level.
**Significant at the .01 level.

internal and external remittances on overall income inequality, rather than just transfer income inequality, are evaluated (Table 28).[54]

Table 28 ranks the 727 households into quintiles according to their predicted three-year average total per capita income (excluding remittances). Column (1) shows the share of predicted three-year average total per capita income going to each quintile, excluding remittances. The next two columns show the share of such income going to each quintile when internal remittances (column 2) and external remittances (column 3) are included. The final two columns summarize the percentage changes in shares of income between the excluding and including remittances situations.

Table 28 is instructive because it shows that the results of the decomposition analysis are robust: internal remittances do have an equalizing effect on income distribution, while external remittances have just the opposite effect. According to columns (1) and (2), when internal remittances are included in predicted total per capita income both the Gini coefficient and the Theil's entropy measure decline: the Gini coefficient falls from 0.333 to 0.326 and the Theil measure falls from 0.175 to 0.169. This means that internal remittances have an egalitarian effect on rural income inequality. However, when column (1) is compared with (3), it can been seen that external remittances have a negative impact on rural income distribution. When external remittances are included in predicted total per capita income both the Gini coefficient and the Theil's entropy measure rise. The Gini coefficient increases from 0.333 to 0.337 and the Theil measure rises from 0.175 to 0.180 when external remittances are included.

[54]The decomposition analysis presented in Tables 22–24 evaluated the effect of internal and external remittances on transfer income inequality.

Table 27—Regression to estimate predicted three-year average total per capita income (including external remittances) for international migrant households

Variable	Regression Coefficient	t-Ratio
IRLAND (irrigated land owned by household)	160.980	8.971**
RNLAND (rainfed land owned by household)	42.699	2.073*
HS (household size)	−176.559	−5.382**
*MALE*15 (number of males in household over 15 years of age)	−26.287	−0.282
EDMS (number of household males with middle school or higher education)	852.992	5.413**
EXTMIG (international migration, one if household receives external remittances, zero otherwise)	1,307.714	5.211**
Constant	3,643.105	13.007**
Adjusted $R^2 = 0.363$		
F-statistic = 31.9		

Notes: Regression includes 327 households: 181 households with no remittances and 146 households receiving external remittances. The parameters are used to estimate predicted three-year average total per capita income (including remittances) for international migrant households. The dependent variable is *PREXTMIG* (predicted three-year average total per capita household income including external remittances). All independent variables are at three-year average values.

*Significant at the .05 level.

**Significant at the .01 level.

Table 28—Effects of internal and external remittances on predicted per capita household income distribution

Households Ranked by Predicted Three-Year Average Total Per Capita Income (Excluding Remittances) Quintile	Percent of Predicted Three-Year Average Total Per Capita Income			Percent of Change Between Columns (1) and (2) for Internal Remittances	Percent of Change Between Columns (1) and (3) for External Remittances
	Excluding Remittances (1)	Including Internal Remittances (2)	Including External Remittances (3)	(4)	(5)
Lowest	13.57	13.48	12.53	−0.68	−7.62
Second	15.12	15.22	14.29	0.62	−5.51
Third	17.29	17.34	17.01	0.25	−1.65
Fourth	20.28	20.07	20.04	−1.03	−1.20
Top	33.74	33.90	36.13	0.49	7.10
Gini coefficient[a]	0.333	0.326	0.337	−1.18	2.24
Theil's entropy measure[b]	0.175	0.169	0.180	−3.88	2.74

Note: N = 727 households.

[a]The Gini coefficient of inequality can be represented as

$$G = 1-\sum_{i=0}^{n-1}\left(F_{i+1}-F_i\right)\left(\phi_{i+1}+\phi_i\right),$$

where

n = number of households,
F_i = cumulative population shares corresponding to household$_i$, and
ϕ_i = cumulative income shares corresponding to household$_i$.

[b]Theil's entropy measure can be written as

$$T=\sum_{i=1}^{n}\frac{1}{n}\frac{y_i}{\mu}\log\frac{y_i}{\mu},$$

where

n = number of households,
y_i = income of household$_i$, and
μ = mean income.

A main reason why external remittances have such a negative effect on income distribution is the high entry costs involved in international migration in Pakistan. During the period of the study, the average estimated cost of international migration was Rs 21,000 (US$1,302). This cost, which included travel expenses (Rs 8,000) plus fees (Rs 13,000) paid to a Pakistani agent for a visa, work permit, and other documentation, was too onerous for many lower-income households to bear.

While the results of both the decomposition analysis and the predicted income equations show that external remittances have an inegalitarian effect on income distribution, the two approaches differ regarding the magnitude of this negative effect: the results of the decomposition suggest that external remittances have a much larger negative effect on inequality than the predicted income equations. However, two points should be noted. First, the decomposition analysis was based on transfer income, rather than on overall income. While external remittances account for a large proportion of transfer income inequality, they contribute much less to overall income inequality. The predicted income equations capture this smaller contribution to overall income inequality. Second, the use of predicted income figures to calculate changes in income distribution may have the effect of underestimating the actual degree of increase in inequality caused by the inclusion of remittance income. Depending on the percentage of variance explained by the predicted equations, the predicted income figures will tend to have a smaller variance than actual incomes. This may cause estimates of changes in the degree of inequality to be smaller than they actually were.

7

SOURCES OF LIVESTOCK INCOME INEQUALITY

In the past, too little attention has been given to livestock as a means for improving rural equity and poverty. In Pakistan, as in many developing countries, livestock income is distributed far more equally than either agricultural income or land. Therefore efforts to improve rural income distribution should place more emphasis on the livestock sector. Moreover, recent work in several countries has shown that livestock is an important asset for the poor. Studies by Lasson (1981) in Bangladesh, Jabbar and Green (1983) in Bangladesh, and Sharma (1982) in Nepal all show that there is an inverse relationship between farm size and livestock: small farms consistently have more animals per unit of land than large farms. Finally, in many developing countries it now seems clear that the agricultural sector will not be able to grow fast enough to meet the burgeoning income and employment needs of the rural population. As a result, more emphasis will have to be placed on alternative income and employment opportunities, such as those provided by livestock.

Chapter 3 showed that livestock income is an inequality-decreasing source of overall income and that it accounts for a small share of overall income inequality. In order to see if all types of livestock income have a favorable effect on income inequality, this chapter decomposes the sources of livestock income by type of animal. This analysis shows that the poor are heavily dependent on livestock income from female animals (local cows and female buffalo) and that livestock income from these two animals has a positive effect on income distribution. In contrast, livestock income from male buffalo is monopolized by the rich and therefore has a negative effect on income distribution.

Overview of Livestock Data

Summary data on the mean number of animals (excluding poultry) owned by households in each year are presented in Table 29. Four types of animal dominate: local cows, male buffalo, female buffalo, and goats. Bullocks (male cattle) constitute a relatively small share of household herds.[55]

For each type of animal in the study, data were collected on purchase and sale price, calves born to livestock, milk yields, number of lactating animals, and values of fodder (own and purchased) and purchased feed. In addition, information was

[55]Writing on livestock in South Asia, Singh (1990, 206) notes that "[male cattle] are scarce and expensive because poor peasants have difficulty making the investment needed to rear healthy calves and waiting to get a return on this investment." Walker and Ryan (1990) also note this phenomenon in India.

Table 29—Mean number of animals (excluding poultry) owned per household by type of livestock

Year	Local Cows	Male Buffalo	Female Buffalo	Bullocks	Goats	Donkeys	Sahiwal Cows	Imported Cows	Sheep
				(number of animals)					
1986/87	2.12	0.81	0.85	0.01	1.60	0.20	0.03	0.01	0.59
	(2.45)	(1.21)	(1.37)	(0.10)	(2.46)	(0.57)	(0.29)	(0.14)	(3.64)
1987/88	1.51	0.84	0.78	0.61	2.03	0.23	0.03	. . .	0.39
	(2.14)	(1.48)	(1.33)	(0.98)	(2.97)	(0.61)	(0.49)		(2.07)
1988/89	1.47	0.83	0.84	0.53	2.28	0.26	0.01	0.01	0.66
	(2.16)	(1.28)	(1.36)	(0.92)	(3.70)	(0.67)	(0.11)	(0.19)	(2.97)
Total	1.70	0.83	0.83	0.38	1.97	0.23	0.02	0.01	0.55
	(2.27)	(1.33)	(0.35)	(0.82)	(3.10)	(0.62)	(0.33)	(0.13)	(2.97)

Source: IFPRI Rural Survey of Pakistan, 1986/87-1988/89.
Notes: N = 702 households. Chickens and commercial poultry are excluded. Numbers in parentheses are standard deviations.

gathered on egg production, bullock plowing, and hired labor used in livestock care.[56] These data are used to measure the costs and benefits to the household of owning specific kinds of animals.

Evaluating the contribution of livestock farming to the household raises some complex issues of measurement and imputation. First, the output produced by an adult animal may include not just milk but also calves and rental services (bullock plowing, for example).[57] Second, livestock farming involves both changes in stock (through animal purchases and sales) and changes due to herd growth (through animal reproduction and maturation). Since animal purchases are generally considered investments, animal sales can be viewed as disinvestments. Here, however, neither investments nor disinvestments are viewed as components of income; rather both are considered to be decisions on how income is spent. Changes in herd growth (from animal reproduction and maturation) are viewed as income. Yet herd growth, especially in the form of animal maturation, is difficult to measure. If, for example, an animal is still in the household's possession at the end of any time period (not having died or been sold), then changes in the value of that animal need to be imputed. To capture these processes, the procedure adopted here is to consider livestock farming as an annual process employing inputs (fodder, feed, and hired labor) and yielding as outputs both the conventional ones (milk, eggs, and plowing services) *and* the growth of the animal.

Livestock Outputs and Inputs

In order to identify net livestock income by 10 types of animal—local cows, male buffalo, female buffalo, bullocks, goats, chickens, donkeys, commercial poultry,[58]

[56]No attempt is made to calculate imputed values for household labor used in livestock care.

[57]Although manure is another output of livestock, it is not included here because there is little exchange of manure between households in rural Pakistan.

[58]In each year of the survey, less than 3 percent of the households produced and sold chickens for the commercial market.

Sahiwal and imported cows,[59] and sheep—outputs and inputs need to be calculated for each type of animal.

Six types of livestock outputs can be identified:

Gross output = Growth of value of livestock + Value of milk, milk products (consumed at home and sold) + Value of bullock plowing (consumed at home and sold) + Value of chickens (consumed at home and sold) + Value of commercial poultry + Value of eggs (consumed at home and sold). (13)

The variation from year to year in the mean values of certain livestock outputs like growth of livestock and chicken is quite high (Table 30). Unfortunately, it is not clear whether this variation is due to problems in the data set or whether these livestock outputs are, in fact, highly variable.[60]

Table 30—Livestock outputs and inputs, 1986/87, 1987/88, and 1988/89

Input/Output	1986/87 Mean Annual Gross Household Value[a] (Rs)	1986/87 Standard Deviation	1987/88 Mean Annual Gross Household Value[a] (Rs)	1987/88 Standard Deviation	1988/89 Mean Annual Gross Household Value[a] (Rs)	1988/89 Standard Deviation
Livestock inputs						
Fodder, own and purchased	2,309.5	3,359.1	3,568.3	4,754.9	3,408.5	4,933.0
Feed, purchased	272.3	632.6	59.1	85.4	20.8	41.3
Hired labor	3.9	36.5	92.1	529.1	2.4	22.6
Total	2,585.6	3,380.5	3,719.5	4,801.7	3,431.7	4,939.2
Livestock outputs						
Growth of livestock	3,608.8	3,321.4	3,098.2	3,430.7	3,024.8	3,193.3
Milk, milk products[b]	3,064.9	3,262.5	3,387.7	4,607.1	3,586.7	3,772.6
Bullock plowing	724.6	1,314.1	523.1	991.9	450.4	886.2
Chickens[b]	120.4	255.8	485.9	1,077.9	382.8	785.9
Commercial poultry	58.7	2,214.8	137.7	2,429.2	100.3	1,814.7
Eggs[b]	67.9	91.4	100.5	202.6	127.1	193.0
Total	7,645.2	6,332.8	7,733.1	7,574.7	7,672.1	6,585.9

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Note: N = 702 households.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.
[b]Includes both home-consumed and sold goods.

[59]Sahiwal is a local breed of cow that is a high milk producer. The average purchase price of a Sahiwal cow is about 70 percent higher than that of a local cow: Rs 4,150 versus Rs 2,439. However, because of the limited number of Sahiwal cows in this study, Sahiwal and imported cows are combined in calculating net livestock income.

[60]Since some of the livestock values for 1986/87 in Tables 29 and 30 are much lower than those for the other two survey years, the authors reestimated the decompositions of livestock income by dropping the 1986/87 data and using only data from the second and third years. These decompositions, however, yielded results quite similar to those obtained by using livestock data for the full three-year data set. Therefore, only the three-year results are reported.

Since Table 30 shows that growth of livestock is a key output, it is important to explain the measurement of this output. If, for example, an animal was born during a survey year it was assigned a value of half the average district sale price for that type of adult livestock. If the animal was sold, its value was the sale price. If that animal was not sold, in the year following birth its value was imputed to be the full district sale price for that type of adult livestock. Since growth of value of livestock is measured as a yearly variable, it is possible to take into account inflation. This is useful because during the course of the study inflation averaged 11.8 percent per year.

In determining the value of two other livestock outputs—milk and milk products, and eggs—imputed values had to be calculated for items consumed at home, using average village sale prices for milk, butter, ghee, and eggs. In determining the value of chicken outputs, imputed values for meat consumed at home were calculated in a similar fashion. Determining the value of bullock plowing required calculating imputed values for plowing services used on-farm, and then adding these values to those recorded for the sale of plowing services.

On the input side, three livestock inputs can be identified:

$$\text{Input} = \text{Fodder (own and purchased)} + \text{Purchased feed} + \text{Hired labor.} \quad (14)$$

On the input side no account was taken of either animal purchases or imputed labor values. As explained earlier, animal purchases are considered to be investments, and are not included as components of income. Imputed labor values are not assigned for household labor because of the difficulty of accurately calculating wage rates for those household members most directly involved in livestock care, namely, women and children.[61]

Fodder (own and purchased) represents the main input for livestock (Table 30). Fodder includes that produced by the household explicitly for livestock consumption, such as berseem, and crop by-products, such as wheat straw. No fodder is allocated to chickens because none of the households reported using fodder in this manner. For commercial poultry, an allowance was made for purchased feed inputs, but commercial poultry was raised by less than 3 percent of the survey households. Finally, it proved impossible to allocate either fodder or purchased feed among the remaining eight types of livestock. Thus, the costs for these two inputs were calculated for each type of animal by regressing the total household cost of fodder (own and purchased) and purchased feed on the following variables: number of animals of each type in the household; percent of bovines (cows and buffalo) lactating in the household; and percent of young bovines in the household. This regression was estimated separately by district and by year, thereby allowing for differences in local costs and feeding practices. The imputed fodder and feed costs for the different types of animals are the regression coefficients for the various independent variables.

[61]In rural Pakistan, market wage rates differ dramatically for men, women, and children. Even if it were possible to assign market wage rates for different types of laborers, these "full wage costs" would have to be adjusted according to whether or not a particular household member was actually employed outside of the home. Wage rates adjusted for length and status of outside employment are very difficult to calculate accurately.

Descriptive Statistics for Livestock Income

On the basis described, net livestock income for each type of animal is calculated using the following identity:

$$\text{Net income for animal}_a = \text{Gross output for animal}_a - \text{Gross input for animal}_a. \quad (15)$$

The results of equation (15) are presented in Table 31. The net income data here are expressed in per capita terms and are based on 702 households from the original 727 for which data are available.

Most net livestock income comes from four types of animals: local cows, male buffalo, female buffalo, and bullocks. In any given year, these four types of animals account for over 80 percent of net mean per capita livestock income. The figures in Table 31 underscore the variability of livestock income, a point made by other studies (Seabright 1991, 1992). For the sample as a whole, the interyear coefficient of variation of livestock income is quite modest: between 1.0 and 1.7 percent. However, for certain types of livestock, such as male buffalo, bullocks, and sheep, it is quite high. For

Table 31—Summary of net livestock income data by type of animal, 1986/87, 1987/88, and 1988/89

Type of Animal	Mean Annual Per Capita Livestock Income[a]		
	1986/87	1987/88	1988/89
		(Rs)	
Local cows	174.8	142.0	128.1
	(248.5)	(288.9)	(219.9)
Male buffalo	130.9	−10.9	56.5
	(209.2)	(151.9)	(117.3)
Female buffalo	111.3	196.1	193.9
	(169.0)	(367.0)	(321.1)
Bullocks	85.7	39.6	30.9
	(183.7)	(140.5)	(124.2)
Goats	31.1	40.9	20.0
	(66.6)	(132.6)	(81.5)
Chickens	16.3	35.4	33.2
	(29.7)	(75.9)	(61.0)
Donkeys	10.8	−20.8	−20.2
	(50.3)	(123.2)	(94.7)
Commercial poultry	6.6	7.5	19.4
	(157.4)	(136.9)	(275.5)
Sahiwal/imported cows	4.6	6.6	4.5
	(60.2)	(85.2)	(68.5)
Sheep	2.9	6.5	9.2
	(44.7)	(104.8)	(97.2)
Total	574.7	442.9	475.5
	(614.9)	(759.8)	(715.0)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 702 households. Numbers in parentheses are standard deviations.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

example, the interyear coefficient of variation for male buffalo ranges between 2.1 and 13.9 percent, while that for sheep ranges between 10.6 and 16.1 percent.

Such fluctuations in livestock income could conceivably affect any decomposition effort that is based on annual data. It is therefore desirable to base the decompositions on livestock income aggregated over the entire three-year period of the study.

This is done in Table 32, which shows the percent of net livestock income coming from each of 10 sources of income. Here the 702 households are ranked by quintiles on the basis of their three-year average total per capita income. Households in the poorest quintile receive a disproportionately large share of their net livestock income from two female animals: local cows and female buffalo. In fact, poor households receive more than 85 percent of their net livestock income from these two animals. However, in a rather paradoxical way, local cows and female buffalo are also important to households in the top quintile, who receive over one-half of their net livestock income from these two animals. Yet, for these rich households, the relative importance of income from local cows versus that from female buffalo is reversed. According to the data, while the proportion of net livestock income from local cows falls steadily with income group, the proportion of such income from female buffalo rises with income group.

It is not surprising that households in the poorest quintile are so dependent on livestock income from female animals. Previous work in Bangladesh and India also found that poorer farmers (those with less than 2 acres of land) owned more cows and female buffalo than bullocks and male buffalo.[62] According to Lasson and Dolberg (1985, 346), the reasons reflect the rationality of the poor farmer. With smaller farm size, plowing requirements decline, but feeding costs remain the same. Since cows and female buffalo can plow as well as produce milk and offspring, poor peasants prefer female stock.

Table 32—Sources of net livestock income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Per Capita Livestock Income[a]	Percent of Net Per Capita Livestock Income from									
		Local Cows	Male Buffalo	Female Buffalo	Bull-ocks	Goats	Chick-ens	Don-keys	Com-mercial Poultry	Sahiwal/ Imported Cows	Sheep
	(Rs)										
Lowest	254.7	59.7	8.6	27.1	11.6	5.7	9.2	−12.3	−0.5	−3.9	−5.3
Second	449.0	33.1	9.7	28.3	9.1	8.2	6.2	−1.0	2.5	2.7	1.3
Third	499.1	33.4	10.1	30.3	8.3	7.2	6.6	−1.5	1.9	1.2	2.5
Fourth	558.7	28.5	12.5	34.2	10.8	6.0	4.9	−1.7	2.3	1.4	1.1
Highest	738.1	15.3	15.0	41.1	12.2	4.4	4.1	0.5	3.3	1.4	2.8
Total	497.2	29.8	11.8	33.5	10.5	6.2	5.7	−2.0	2.3	1.0	1.2

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 702 households. Income figures are calculated by averaging per capita household income over the three years.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

[62]See, for example, Lasson and Dolberg 1985; Gill 1981; and Vaidyanathan, Nair, and Harriss 1979.

Table 33—Distribution of animals (excluding poultry) among quintiles on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Number of Animals Owned Per Household							
	Local Cows	Male Buffalo	Female Buffalo	Bullocks	Goats	Donkeys	Sahiwal/ Imported Cows	Sheep
Lowest	1.77	0.42	0.43	0.28	1.83	0.30	0.02	0.44
Second	1.80	0.62	0.61	0.28	1.85	0.24	0.03	0.38
Third	1.63	0.76	0.76	0.31	2.12	0.25	0.02	0.69
Fourth	1.89	0.95	0.98	0.49	2.08	0.23	0.02	0.21
Highest	1.40	1.41	1.37	0.57	1.98	0.12	0.06	1.07
Total	1.70	0.83	0.83	0.39	1.97	0.23	0.03	0.55

Source: IFPRI Rural Survey of Pakistan, 1986/87-1988/89.
Notes: N = 702 households. Chickens and commercial poultry are excluded. Income figures are calculated by averaging total per capita household income over the three years.

This hypothesis can be checked by looking at the three-year average number of animals (except poultry) owned by the different income quintiles of households (Table 33). The three-year average number of local cows varies only slightly by income group, but ownership of female buffalo is strongly and positively related with income: households in the top quintile own more than three times the average number of female buffalo as households in the poorest quintile.

Why is this so? In the literature poor peasants are often depicted as preferring female buffalo over cows because of the higher quantity and quality of buffalo versus cow milk.[63] Buffalo milk has a higher fat content (National Research Council 1981), which makes it more useful as a supplement in poor diets and in the preparation of ghee, which is itself a lucrative cash product. Indeed, data from this study show that the three-year average household value of "milk and milk products" for female buffalo is more than two-and-one-half-times higher than that for cows: Rs 1,494 for female buffalo versus Rs 556 for cows.

While poor rural households in Pakistan may well *prefer* female buffalo over cows, poor households simply lack the means to purchase and keep buffalo. First, female buffalo are far more costly than cows: the average purchase price for a female buffalo is Rs 4,516 versus Rs 2,439 for a cow. Second, female buffalo are more expensive to feed.[64] Annual fodder (own and purchased) and purchased feed costs for a female buffalo are Rs 525 as opposed to Rs 473 for a cow.

Decomposition of Livestock Income Inequality

The relative concentration coefficients for livestock income based on the decompositions of the coefficient of variation and the Gini coefficient are presented in Table 34. For the three-year period both decompositions agree that the two main

[63]On this point, see Adams 1986; Shrestha and Evans 1984; and Sharma 1982.

[64]In a detailed study of the livestock market in South India, Seabright (1991, 69) also finds that female buffalo are more expensive to feed than cows.

Table 34—Decomposition of livestock income inequality based on three-year average per capita livestock income

Source of Livestock Income	Relative Concentration Coefficients		Factor Inequality Weights	
	c	g	wc	wg
Local cows	0.462	0.562	0.138	0.168
Male buffalo	1.146	1.261	0.137	0.149
Female buffalo	0.862	0.939	0.290	0.316
Bullocks	1.222	1.173	0.128	0.123
Goats	0.979	0.896	0.061	0.055
Chickens	0.321	0.442	0.018	0.025
Donkeys	−1.837	−1.747	0.037	0.035
Commercial poultry	4.663	1.970	0.106	0.044
Sahiwal/imported cows	3.595	3.640	0.038	0.039
Sheep	3.712	3.679	0.046	0.046
Total	...	...	1.000	1.000

Notes: N = 702 households. The relative concentration coefficients for the different sources of agricultural income are calculated from the coefficient of variation (c) and the Gini coefficient (g). wc is the factor inequality weight calculated from the coefficient of variation and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i = \frac{\mu_i}{\mu};\ c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\ g_i = R_i \frac{G_i}{G}.$$

types of male animals—male buffalo and bullocks—represent inequality-increasing sources of livestock income. These results parallel those of Tables 32 and 33, which show that net income from and ownership of male buffalo are concentrated in the upper-income quintiles. For the three-year period both decompositions also agree that the two principal types of female animals—local cows and female buffalo—represent inequality-decreasing sources of livestock income. These results are also consistent with previous analyses.[65]

The relative factor inequality weights in Table 34 show that only one source of income—female buffalo—makes a large contribution to livestock income inequality. This finding may seem to contradict the finding that net income from female buffalo represents an inequality-decreasing source of livestock income. However, two points need to be considered. First, in this table the relative factor weights for all sources of livestock income—including female buffalo—are relatively low. Even net income from female buffalo accounts for less than one-third of livestock inequality. Second, Tables 32 and 33 show quite clearly that both net income from and ownership of female buffalo are concentrated among upper-income households. The relative factor inequality weights in Table 34 evidently capture the impact of these phenomena.

[65]A decomposition of the Gini coefficient based on three-year average per capita livestock income by district shows that in each of the four survey districts male buffalo is an inequality-increasing source of livestock income, and local cows and female buffalo are inequality-decreasing sources of income. See Appendix Table 49.

8

SOURCES OF RENTAL INCOME INEQUALITY

Rental income in this study can be divided into six sources:

(1) *Land rent (in-kind),* which includes the net value of crops received by a landowner from a tenant or sharecropper;

(2) *Tractor, thresher rent,* which includes net income received for the rent of tractors, threshers, and other farm machinery;

(3) *Land rent (cash),* which includes cash income received for the rent of land;

(4) *Off-farm rent,* which includes income received from the rent of apartments or buildings;

(5) *Tubewell and water rent,* which includes income received from the rent of canal and tubewell water; and

(6) *Other rental income.*

Summary data for these six sources of rental income indicate that in-kind land rent dominates (Table 35). In any given year in-kind land rent accounts for about 70 percent of mean per capita rental income.

Two basic types of in-kind land rental (or sharecropping) arrangements are found in the survey sites. In the first, a 50–50 agreement exists between landlord and tenant.

Table 35—Summary of rental income data, 1986/87, 1987/88, and 1988/89

Source of Rental Income	Mean Annual Per Capita Rental Income[a]		
	1986/87	1987/88	1988/89
		(Rs)	
Land rent (in-kind)[b]	296.50	281.40	316.80
	(1,147.05)	(1,075.00)	(1,326.35)
Tractor, thresher rent[b]	56.85	66.48	77.65
	(490.37)	(518.13)	(577.38)
Land rent (cash)	53.32	45.96	68.85
	(503.76)	(489.13)	(518.37)
Off-farm rent	8.09	8.81	7.74
	(69.24)	(85.99)	(96.79)
Tubewell, water rent	3.54	1.25	1.88
	(47.79)	(25.53)	(32.30)
Other	6.76	1.56	0.92
	(98.89)	(38.58)	(21.51)
Total	425.07	405.46	473.84
	(1,429.79)	(1,357.63)	(1,610.71)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Notes: N = 727 households. Numbers in parentheses are standard deviations.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.
[b]In-kind land rent and tractor and thresher rent are net of any inputs paid by owner.

Here the tenant supplies all of the inputs (such as tractor, fertilizer, and seeds), and crop outputs are shared equally between landlord and tenant. In the second arrangement, a 75–25 agreement exists. Here the landlord provides some of the inputs—tractor, fertilizer, and sometimes seeds—and in return receives 75 percent of the crop output.

Rental Income: Descriptive Statistics and Multivariate Analysis

The sources of rental income by quintile aggregated over the three-year period of the study are presented in Table 36. The data show that the amount of rental income received by the lowest quintile is extremely low: this group receives less than 4 percent of the three-year average per capita rental income received by households in the top quintile. Even though the amount of rental income received rises steadily by quintile, households in the fourth quintile still receive less than one-quarter of the average per capita rental income received by the top quintile households. In this sample, the bulk of rental income clearly goes to the rich households.

Why is this true? Part of the answer lies in the close relationship between rental income and land owned, already discussed in Chapter 3. Of the five sources of income, Table 5 showed that rental income had the highest three-year average simple correlation with size of land owned (0.444). In other words, rental income is highly correlated with landownership, which in this study is unevenly distributed in favor of the rich. As previously demonstrated, this unequal distribution of landownership is one of the main reasons why the poor are so dependent on those sources of income that are not connected with land, such as nonfarm and livestock income.

Two questions now need to be posed. First, is rental income closely related with *all* kinds of land owned, both irrigated and rainfed land? Second, are there any assets besides land—such as livestock or farm machinery—that also significantly influence the flow of rental income to upper-income households?

To answer these questions the determinants of rental income are estimated using a multivariate model. To see if the determinants of rental income vary by type of rent,

Table 36—Sources of rental income ranked by quintile on the basis of three-year average total per capita household income

Total Per Capita Income Quintile	Three-Year Average Per Capita Rental Income[a]	Percent of Total Per Capita Rental Income from					
		Land Rent (In-Kind)[b]	Tractor, Thresher[b]	Land Rent (Cash)	Off-Farm	Tubewell, Water	Other
	(Rs)						
Lowest	49.2	61.1	27.4	3.3	5.2	3.0	. . .
Second	96.5	57.3	22.5	14.5	5.3	0.1	0.2
Third	219.5	64.5	17.6	12.4	4.8	0.4	0.3
Fourth	276.8	63.0	18.4	15.7	0.9	0.3	1.6
Highest	1,524.8	71.1	13.7	12.6	1.3	0.5	0.6
Total	434.8	63.4	19.9	11.7	3.5	0.9	0.6

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.

Notes: N = 727 households. Mean income figures are calculated by averaging per capita household income over the three years. Ellipses indicate a nil or negligible amount.

[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

[b]Land rent (in-kind) and tractor, thresher rent are net of any inputs paid by owner.

the model can be estimated for total rental income as well as for the two most important sources of rental income: in-kind land rent and tractor and thresher rent. The equation used is:

$$RENTINC, LNDIK, TRACRT = \beta_0 + \beta_1 IRLAND + \beta_2 RNLAND + \beta_3 LIVALUE + \beta_4 CAPVALUE + \beta_5 MALE15 + \beta_6 EDMS + \sum_{j=1}^{3} \lambda_j DIS_j, \tag{16}$$

where *RENTINC* is three-year average per capita rental income; *LNDIK* is three-year average per capita land rent (in-kind); *TRACRT* is three-year average per capita tractor and thresher rent; *IRLAND* is the amount of three-year average irrigated land owned by the household; *RNLAND* is the amount of three-year average rainfed land owned by the household; *LIVALUE* is the three-year average value of livestock owned by the household; *CAPVALUE* is the three-year average value of capital (such as tubewell, tractor, and tools) owned by the household; *MALE*15 is the number of males in the household over 15 years of age; and *EDMS* is the number of males in the household with middle school or higher education. Because the data come from four widely scattered rural districts, three district dummy variables, DIS_j, are also included in the model.

Equation (16) is estimated using ordinary least squares. Because of data limitations, the equation is estimated on only 642 households. Table 37 shows the means and standard deviations for the variables.

Table 37—Average three-year values of independent variables for regression on determinants of rental income

Variable	All Households (N = 642)
IRLAND (irrigated land owned by household, in acres)	4.88 (12.47)
RNLAND (rainfed land owned by household, in acres)	7.87 (30.09)
LIVALUE (value of livestock, in rupees)	5,156.10 (11,202.00)
CAPVALUE (value of capital, such as tubewell, tractor, and tools, in rupees)	3,205.10 (9,926.50)
*MALE*15 (number of males in household over 15 years of age)	2.78 (1.56)
EDMS (number of males in household with middle school or higher education)	0.46 (0.77)
FAISAL (district dummy)	0.20 (0.39)
ATTOCK (district dummy)	0.40 (0.49)
DIR (district dummy)	0.25 (0.44)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Note: Numbers in parentheses are standard deviations.

The results of the model, which appear in Table 38, reveal the dominant role that irrigated land plays in the determination of rental income. For rental income as a whole as well as for the two types of rental income, the irrigated land variable *(IRLAND)* is positive and statistically significant. Depending on the type of rent, the size of the coefficient for irrigated land is two-to-five times larger than that for rainfed land *(RNLAND)*. When compared with the irrigated land variable, the coefficients for the various nonland assets—value of livestock assets *(LIVALUE)* and value of capital assets *(CAPVALUE)*—are also quite small.

The variable *MALE*15 (number of household males over 15 years of age) is negatively and significantly related with three-year average per capita rental income as well as with in-kind land rent (Table 38). This means that households with more males receive less rental income as a whole and less in-kind land rent. Evidently, households with more males over 15 years of age prefer to use that extra manpower to farm their own land, rather than to rent it out.

Table 38—Regression analysis of determinants of rental income

	Three-Year Average Per Capita Rental Income from		
Variable	Total Rental Income	Land Rent (In-Kind)	Tractor, Thresher Rent
IRLAND	61.771 (17.407)**	49.511 (17.210)**	3.241 (2.157)*
RNLAND	11.904 (8.770)**	9.773 (8.881)**	1.450 (2.524)*
LIVALUE	−0.009 (−2.368)*	−0.003 (−1.014)	−0.003 (−2.524)*
CAPVALUE	0.014 (3.420)**	−0.009 (−2.623)**	0.024 (13.618)**
*MALE*15	−114.204 (−4.489)**	−90.516 (−4.389)**	2.323 (0.216)
EDMS	175.405 (3.150)**	108.042 (2.394)*	16.119 (0.684)
FAISAL	502.930 (4.003)**	247.112 (2.426)*	99.572 (1.872)
ATTOCK	−128.952 (−1.054)	−107.153 (−1.081)	−47.308 (−0.914)
DIR	−65.501 (−0.612)	−1.832 (−0.136)	−105.515 (−2.327)*
Constant	272.521 (2.928)**	242.608 (3.215)**	−2.510 (0.949)
Adjusted R^2	0.469	0.416	0.301
F-statistic	64.1	51.7	31.6

Notes: N = 642 households. The number of observations is reduced because of missing data for some variables. Numbers in parentheses are t-statistics (two-tailed). All independent variables are at three-year average values. Variables are defined in Table 37.

*Significant at the .05 level.

**Significant at the .01 level.

Decomposition of Rental Income Inequality

The relative concentration coefficients based on the decomposition of the coefficient of variation and the Gini coefficient are presented in Table 39. For the largest source of rental income—in-kind land rent—the results are mixed. In two of the three years, in-kind land rent represents an inequality-decreasing source of rental income; however, in the third year it represents an inequality-increasing source of income.

With only one exception in each case, two types of rental income are inequality-increasing: (1) tractor and thresher rent and (2) land rent for cash. These results are as expected. It is somewhat puzzling, however, to find that tubewell and water rent represents an inequality-decreasing source of rental income. Researchers in India and other South Asian countries have typically found that tubewell ownership and rental income from such ownership is concentrated among large farmers (Singh 1990; Griffin 1976). One possible answer to this puzzle is that relatively few households in this sample own tubewells and thus the income received from this rental source is quite small.[66]

The decomposition results for relative factor inequality weights of source incomes in rental income inequality are given in Table 40. For the three-year period both decompositions agree that in-kind land rent makes the largest contribution to rental income inequality; depending on the year and the measure, in-kind land rent accounts for between 66.9 and 71.9 percent of rental income inequality. This finding is consistent with previous tables.

Using the three elements of the Gini decomposition, Table 41 explains the factor inequality weights. In the table, all the sources of rental income have high source

Table 39—Relative concentration coefficients of source incomes in rental income inequality

Source of Rental Income	1986/87		1987/88		1988/89	
	c	g	c	g	c	g
Land rent (in-kind)	0.960	0.992	0.967	0.994	1.075	1.002
Tractor, thresher	1.047	1.023	1.039	1.021	0.925	1.005
Land rent (cash)	1.356	1.042	1.248	1.031	0.841	1.003
Off-farm	0.308	0.905	0.607	0.908	0.237	0.907
Tubewell, water	0.073	0.802	0.486	0.928	0.098	0.863
Other	0.869	1.025	0.120	0.859	0.005	0.746

Notes: N = 727 households. The relative concentration coefficients for the different sources of agricultural income are calculated from the coefficient of variation (c) and the Gini coefficient (g).

$$c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};\; g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

[66]Because there are no tubewells in two of the four districts in this sample (Attock and Badin), less than 5 percent of the 727 survey households actually own a tubewell. For more on this point, see Meinzen-Dick and Sullens 1993.

Table 40—Factor inequality weights of source incomes in rental income inequality

Source of Rental Income	1986/87		1987/88		1988/89	
	wc	wg	wc	wg	wc	wg
Land rent (in-kind)	0.669	0.692	0.671	0.690	0.719	0.670
Tractor, thresher rent	0.140	0.137	0.170	0.167	0.152	0.165
Land rent (cash)	0.170	0.131	0.142	0.117	0.122	0.146
Off-farm rent	0.006	0.017	0.013	0.019	0.004	0.015
Tubewell, water rent	0.002	0.007	0.002	0.003	0.002	0.003
Other	0.013	0.016	0.001	0.003	0.001	0.001
Total	1.000	1.000	1.000	1.000	1.000	1.000

Notes: N = 727 households. wc is the factor inequality weight calculated from coefficient of variation, and wg is the factor inequality weight calculated from the Gini coefficient.

$$w_i c_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu};$$

$$w_i g_i, \text{ where } w_i = \frac{\mu_i}{\mu}, \text{ and } g_i = R_i \frac{G_i}{G}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms.

Table 41—Decomposition of rental income inequality using the Gini coefficient

Measure/Source of Income	1986/87	1987/88	1988/89
Source income weight			
Land rent (in-kind)	0.698	0.694	0.669
Tractor, thresher rent	0.134	0.164	0.164
Land rent (cash)	0.125	0.113	0.145
Off-farm rent	0.019	0.022	0.016
Tubewell, water rent	0.008	0.004	0.004
Other	0.016	0.004	0.002
Total	1.000	1.000	1.000
Source gini (G_i)[a]			
Land rent (in-kind)	0.921	0.919	0.928
Tractor, thresher rent	0.987	0.983	0.981
Land rent (cash)	0.990	0.989	0.981
Off-farm rent	0.989	0.991	0.994
Tubewell, water rent	0.993	0.999	0.997
Other	0.997	1.000	1.002
Correlation ratio between source income and total rental income (R_i)			
Land rent (in-kind)	0.973	0.974	0.974
Tractor, thresher rent	0.936	0.936	0.924
Land rent (cash)	0.950	0.940	0.922
Off-farm rent	0.826	0.826	0.823
Tubewell, water rent	0.728	0.837	0.781
Other	0.928	0.774	0.672

Notes: N = 727 households.

$$G_i = \frac{2}{n\mu_i} \operatorname{cov}(y_i, r_i); \; R_i = \frac{\operatorname{cov}(y_i, r)}{\operatorname{cov}(y_i, r_i)}.$$

All estimates are based on annual per capita household income expressed in constant 1986 terms. Source ginis can exceed unity if some of y_i are negative.

[a]Source ginis are high because they include households with zero and negative incomes from different income sources.

ginis, 0.919 or higher. When compared with these high measures of source income distribution, in-kind land rent is the most evenly distributed source of rental income. However, the first row of the table shows that in-kind land rent has the largest source income weight. Moreover, the correlation ratio between this income source and total rental income is also the highest in the table. It is this combination of factors—large income weight and very high correlation ratio—that causes in-kind land rent to make the largest contribution to rental income inequality.

9

POVERTY

There is a large literature on both the concept and the measurement of poverty in the developing world.[67] So far this report has largely ignored this literature, since the primary focus has been to identify and to measure the sources of income inequality in rural Pakistan.

However, as noted at the outset, while inequality and poverty are not synonymous, they are closely enough related so that a careful study of the first (income inequality) also yields instructive insights into the second (poverty). The purpose of this chapter is therefore to bring together the various findings of this report on poverty and to analyze these findings in light of the ever-growing literature on this subject.

Measurement and Definition of Poverty

It is now clear that how poverty is defined has an important bearing on the identification of the poor. Using cross-section data from Côte d'Ivoire, Glewwe and van der Gaag (1990) show that different definitions of poverty select different population groups as poor. Using adjusted per capita expenditure as their preferred definition of poverty, Glewwe and van der Gaag find that some poverty definitions—such as those based on land per capita or food consumption per capita—result in misleading identifications of the poor. In a similar effort, Lanjouw and Stern (1991) compare different definitions of poverty based on one-year and cross-section income data from India. These authors find that poverty definitions based on one-year income data lead to imprecise identifications of the poor.

In this report the poor are defined as those people living in households in the lowest income quintile, when households are ranked by three-year average total per capita income. Like any definition of poverty, this one has advantages and disadvantages. On the positive side, this definition is based not on one round or even one year of data, but on three-year panel data gathered over 12 rounds of surveying. This means that the income measures used in this analysis should be less subject to random measurement error than other studies. On the negative side, however, the poverty definition used here is based on income data. In recent years a number of studies, including Glewwe and van der Gaag 1990, have suggested that it is better to define the poor using consumption expenditure data. The main reason for this concerns consumption smoothing. These studies argue that since the incomes of the poor in rural Third World areas tend to be derived from agriculture, such incomes are fluctuating and uncertain. Thus, the poor can use consumption smoothing to save income in good years and to dissave in bad years. On the basis of this reasoning,

[67]See, for example, Alderman and Garcia 1993, Ravallion 1993, Ravallion and Bidani 1993, Glewwe and van der Gaag 1990, and Lipton 1988.

consumption expenditure data may provide a more reliable and precise estimate of the long-term standard of living of the poor than income. Indeed, several studies in rural India (Gaiha 1989; Walker and Ryan 1990) have found that consumption expenditure data is less volatile than income data.[68]

To provide a perspective on these issues, it is possible to identify the leading sources of income for the poor in this study when the poor are defined in different ways. This exercise is clearly relevant for policymaking because decisionmakers in Pakistan and elsewhere need to know exactly who the poor are in order to devise public programs to help them.

Of the 35 sources of income identified here, the seven most important sources of income for the poor are listed in Table 42. In this table the poor are defined as before, namely, as those households in the lowest income quintile based on three-year average total per capita income. On the basis of Chapter 4, it should come as no surprise that nonfarm income provides the bulk of income for the poor. In fact, all five of the sources of nonfarm income used in this study appear to be important sources of income for the poor.

Table 42—Seven most important sources of income for households in the lowest quintile when households are ranked by three-year average total per capita income

Type of Income	Source of Income	Three-Year Average Total Per Capita Income from Source[a]	Percent of Three-Year Average Total Per Capita Income from Source[b]
		(Rs)	
Nonfarm	Unskilled labor	162.3	16.1
Livestock	Local cows	148.5	14.7
Nonfarm	Other[c]	137.8	13.7
Nonfarm	Self-employment	125.2	12.4
Transfer	Internal remittances	107.4	10.7
Nonfarm	Private sector[d]	78.7	7.8
Nonfarm	Government employment	74.3	7.4
Total		834.2	82.8

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.

Notes: All 727 households are ranked into income quintiles based on three-year average total per capita incomes. This table only records data for households in the lowest income quintile.

[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.

[b]The three-year average total per capita income for the lowest income quintile is Rs 1,008.50.

[c]Nonfarm other income includes nonfarm wages other than those earned from unskilled labor, government employment, and the private sector.

[d]Nonfarm private-sector income includes wages from a private-sector company.

[68]Of course, this does not necessarily mean that consumption expenditure data is a better indicator of poverty than income. For example, after analyzing panel data from rural India, Chaudhuri and Ravallion (forthcoming) conclude that "current consumption is not in general a better indicator of chronic poverty than income. Both, however, perform much better than other common indicators, such as food share and land access."

Table 43 presents a different view of the income sources of the poor. Here poor households are defined according to expenditure data; specifically, the poor are those households in the lowest expenditure quintile when households are ranked by three-year average total per capita *expenditure*. The table then shows the seven most important sources of income for households in the lowest expenditure quintile.[69]

The results of Table 43 support the findings of the preceding table in several ways. Nonfarm income still accounts for a large percentage—38.2 percent—of the three-year average total per capita income of the poor. Moreover, only one of the five sources of nonfarm income—nonfarm other—fails to appear in Table 43. Finally, five of the seven income sources that are listed as being important for the poor in Table 43 also appear in Table 42. The only two exceptions are agricultural income from sugarcane and agricultural income from other crops (cotton, groundnuts, rapeseed and mustard, and others).

However, these two exceptions are somewhat troubling. Why does agricultural income from sugarcane and other crops appear to be so important for the poor when they are identified by expenditure data? In earlier analysis (in Chapter 5), agricultural income from sugarcane and other crops was found to be inequality increasing and to account for a large proportion of agricultural income inequality. How, then, can these two income sources now be important sources of income for the poor?

Table 43—Seven most important sources of income for households in the lowest quintile when households are ranked by three-year average total per capita expenditures

Type of Income	Source of Income	Three-Year Average Total Per Capita Income from Source[a]	Percent of Three-Year Average Total Per Capita Income from Source[b]
		(Rs)	
Nonfarm	Unskilled labor	346.9	15.3
Agricultural	Sugarcane	317.4	13.9
Agricultural	Other crops[c]	284.7	12.5
Nonfarm	Self-employment	186.5	8.2
Nonfarm	Private sector[d]	172.9	7.6
Nonfarm	Government employment	160.8	7.1
Transfer	Internal remittances	117.8	5.2
Total		1,587.0	69.8

Notes: All 727 households are ranked into expenditure quintiles based on three-year average total per capita expenditures. This table records only data for households in the lowest expenditure quintile.
[a]In 1986, 1 Pakistan rupee = US$0.062. All rupees are in constant 1986 terms.
[b]The three-year average total per capita income for the lowest expenditure quintile is Rs 2,274.80.
[c]Agricultural income from other crops includes net income from cotton, groundnuts, rapeseed and mustard, and others.
[d]Nonfarm private-sector income includes wages from a private-sector company.

[69]Table 42, note b, shows that three-year average total per capita income for households in the lowest income quintile is Rs 1,008.50. Table 43, note b, shows that three-year average total per capita income for households in the lowest *expenditure* quintile is Rs 2,274.80. Since income and expenditure data define the poor differently, there is no a priori reason why the income of poor households when ranked by income should match the income of poor households when ranked by expenditures.

First, and most obviously, the overlap between poverty defined on the basis of income and poverty defined by expenditure is poor. When the 145 households in the lowest quintile are ranked by three-year average total per capita income, only 52 households (35.8 percent) also appear in the lowest quintile when households are ranked by three-year average total per capita expenditure. This type of reranking of households points to the problem noted at the outset of this chapter: different definitions of poverty select different population groups as poor. Second, with respect to income from sugarcane and other crops, both of these income sources are positively and significantly correlated (at the 0.01 percent level) with total income. In fact, the three-year average simple correlation between sugarcane income and total income is 0.560, while the correlation between income from other crops and total income is 0.397. However, neither of these income sources is statistically correlated with total expenditure.[70] In other words, income from sugarcane and other crops can be important income sources for the poor when the poor are defined by expenditure data, since there is no significant correlation between these two income sources and total expenditure.

Income Fluctuations and the Poor

How much do the incomes of the poor fluctuate? The answer to this question points to the key distinction between temporary and chronic poverty. Some households may move in and out of poverty, while others may remain mired in poverty for a long time.

In a panel data set from rural India, Walker and Ryan (1990) found that the incidence of temporary poverty was quite high. When ranked by income data, about two-thirds of the households in their study moved in or out of poverty in at least one year of the nine-year study.

Working with a national-level data set from India, Gaiha (1989) has produced similar results. Gaiha found that when households were ranked by income, about three-quarters of the households were temporarily poor, that is, they were poor at least one year during the three-year study. When households were ranked by expenditure data, a slightly lower percentage—two-thirds of all households—were temporarily poor.

In this report, when ranked by total per capita income, only 44 households (30.3 percent) of the 145 households in the lowest quintile in year one were in that quintile in both of the successive years. The results of this study are very similar to those of Walker and Ryan (1990). When ranked by income data, about two-thirds of the survey households were temporarily poor; that is, they were poor in at least one of the three survey years.

When ranked by total per capita expenditure data, only 71 households (49.0 percent) of the 145 households in the lowest quintile in year one were in that quintile in both of the successive years. Again, this finding parallels those of earlier studies in

[70]The three-year average simple correlation between sugarcane income and total expenditure is 0.067, while the three-year average simple correlation between income from other crops and total expenditure is –0.092.

that expenditure data are less volatile than income data.[71] When ranked by expenditure data, about half of the households in this survey were poor at least one year during the three-year study. On the basis of these findings, poverty in this study appears to be a temporary, rather than a chronic phenomenon. Households tend to move in and out of poverty depending on changes in their income or expenditure levels.

How much of these fluctuations in income by the poor can be explained either by changes in their physical assets or by income shocks that are covariate across districts? These (and similar) questions are highly relevant for policymaking. Government officials who are anxious to reduce poverty should be interested in how changes in the asset structure of the poor affect their incomes. Similarly, highly correlated income shocks over large areas, such as rural districts, are likely to make it more difficult for policymakers to design effective public insurance and credit schemes.

Following the methodology of Alderman and Garcia (1993), changes in mean total per capita household income between the third and first years of the study are regressed on changes in various physical assets as well as on changes in the household labor force (Table 44). Columns (1) and (2) present regression results for all households in the sample, both with and without district dummy variables. Because of missing data, the number of households in these two columns is 509 rather than the full sample of 727. Columns (3) and (4) present similar results for poor households, that is, those households in the lowest income quintile, when ranked by three-year average total per capita income. These columns include 103 poor households.[72]

Strictly speaking, the changes being measured in Table 44 reflect a series of endogenous rather than exogenous choices made by the household. However, the management and taste factors that affect such choices should be fixed, and, therefore, should not seriously bias the estimates.

The results of the regressions are estimated using ordinary least squares (Table 44). For all households (column 1), the findings are disappointing; they suggest that changes in physical assets and household labor force do a poor job in explaining income fluctuations. For all households, changes in physical assets and household labor explain only 4.1 percent of the differences in income between the first and third year. When district variables are included (column 2), these figures rise only slightly to 7.3 percent. For poor households, the results of the regressions of first differences are much better. Column (3) shows that changes in assets and household labor force explain 26.1 percent of the changes in incomes of the poor. When the district variables are included, these figures rise to 26.8 percent.

There are two reasons why the regressions of first differences are better able to explain changes in the incomes of the poor. First, there may be less measurement error involved in capturing the incomes of the poor than those of the sample as a whole. In taking first differences, there is an increase in the noise-to-signal ratio (the ratio of measurement error to information), and it is possible that the regressions for

[71]When ranked by income data, the mean annual total per capita income of households in the lowest quintile group in this study increased by 94.3 percent between years one and three. In contrast, when ranked by expenditure data, the mean total per capita income of this group increased by only 21.1 percent between years one and three.

[72]The data in Table 44 were tested for multicollinearity. There was no serious multicollinearity problem, since the correlation between any two independent variables was rather small.

Table 44—Regressions explaining first differences in incomes between third and first years of study

Variable	Income Year 3 Minus Income Year 1: All Households (1)	All Households with District Variables (2)	Poor Households[a] (3)	Poor Households with District Variables[a] (4)
Household physical assets				
IRLAND	−6.813	−3.391	−31.456	−31.194
	(−1.756)	(−0.864)	(−5.332)**	(−5.224)**
RNLAND	−0.677	−2.612	4.847	2.938
	(−0.214)	(−0.797)	(0.459)	(0.258)
LIVALUE	0.029	0.019	0.031	0.028
	(2.756)**	(1.816)	(1.794)	(1.628)
CAPVALUE	0.016	0.011	−0.006	−0.005
	(1.619)	(1.084)	(−0.176)	(−0.153)
Household labor force				
*MALE*15	−1,131.538	−888.602	−1,664.749	−1,547.948
	(−1.251)	(−0.997)	(−0.793)	(−0.731)
EDMS	304.263	333.026	1,306.021	1,332.971
	(0.947)	(1.045)	(2.352)*	(2.386)*
INTMIG	674.423	897.522	137.409	18.974
	(2.468)*	(3.276)**	(0.362)	(0.048)
EXTMIG	2,334.975	2,246.309	. . .	. . .
	(3.076)**	(2.965)**		
District dummy variables				
FAISAL	. . .	108.618	. . .	1,252.978
		(0.234)		(1.642)
ATTOCK	. . .	−1,442.728	. . .	−47.686
		(−3.338)**		(−0.082)
DIR	. . .	−1,537.536	. . .	−157.824
		(−3.802)**		(−0.261)
Constant	−176.579	771.384	500.387	367.477
	(−1.047)	(2.883)**	(2.131)*	(1.101)
N	509	509	103	103
Adjusted R^2	0.041	0.073	0.261	0.268
F-statistic	3.72	4.67	6.14	4.73

Notes: Numbers in parentheses are t-statistics (two-tailed). The dependent variable is the difference in mean total per capita household income between years three and one. The number of observations for all households and poor households is reduced because of missing data for some variables. Variables are defined in Table 45. Ellipses indicate a nil or negligible amount.

[a]Poor households are those households in the lowest quintile when ranked by three-year average total per capita income.

*Significant at the .05 level.

**Significant at the .01 level.

the sample as a whole reflect this increase in noise. A second explanation is that physical assets and household labor structure *are* more important to the poor than to the population as a whole. As Lipton (1988) and others have argued, the poor not only lack assets, but changes in the ownership of assets—especially land and capital—do much to explain the movement of households into and out of poverty. Therefore, adding the district covariates (column 4) only slightly improves the explanation of changes in income for the poor; most of the explanation comes from changes in physical assets and household labor force.

Determinants of Poverty

In addition to analyzing changes in the income of the poor, any analysis of poverty should also be concerned with pinpointing the determinants of poverty. Such an analysis has clear policy implications, as government officials seek to design programs that address the root causes of poverty.

As noted earlier, the main econometric problem in identifying the determinants of poverty lies in the specification of variables. Specifying variables that are truly exogenous to the household is both difficult and complex. Some poverty-related variables—such as the amount of land owned—relate to factors that are largely exogenous to the household's decisionmaking process. However, other variables—such as those relating to household sex ratio, education, and migration—reflect a series of more-or-less internal choices made by the household at some point in time. However, since the management and taste factors that affect such endogenous choices should be fixed, it is not likely that they will seriously bias any estimates.

A logit model can be used to estimate the determinants of poverty. This logit can be defined on the basis of either income *(POORINC)* or expenditure data *(POOREXP)*.[73] The equation used is:

$$\begin{aligned} POORINC, POOREXP = {} & \beta_0 + \beta_1 IRLAND + \beta_2 RNLAND + \beta_3 LIVALUE \\ & + \beta_4 CAPVALUE + \beta_5 MALE15 + \beta_6 EDMS \\ & + \beta_7 INTMIG + \beta_8 EXTMIG + \sum_{j=1}^{3} \lambda_j DIS_j , \qquad (17) \end{aligned}$$

where *POORINC* is one if the household is in the lowest quintile when households are ranked by three-year average total per capita income, zero otherwise; *POOREXP* is one if the household is in the lowest quintile when households are ranked by three-year average total per capita expenditures, zero otherwise; *IRLAND* is the amount of three-year average irrigated land owned by the household; *RNLAND* is the amount of three-year average rainfed land owned by the household; *LIVALUE* is the three-year average value of livestock owned by the household; *CAPVALUE* is the three-year average value of capital (such as tubewell, tractor, and tools) owned by the household; *MALE*15 is the number of males in the household over 15 years of age; *EDMS* is the number of males in the household with middle school or higher education; *INTMIG* is one if household has an internal migrant, zero otherwise; and *EXTMIG* is one if household has an external migrant, zero otherwise. Since the data

[73]Estimating the model using a probit function produces similar results.

Table 45—Average three-year values of independent variables for logit regression on characteristics of poor households

Variable	All Households (N = 642)
IRLAND (irrigated land owned by household, in acres)	4.88 (12.47)
RNLAND (rainfed land owned by household, in acres)	7.87 (30.09)
LIVALUE (value of livestock, in rupees)	5,156.10 (11,202.00)
CAPVALUE (value of capital such as tubewell, tractor, and tools, in rupees)	3,205.10 (9,926.50)
*MALE*15 (number of males in household over 15 years of age)	2.78 (1.56)
EDMS (number of males in household with middle school or higher education)	0.46 (0.77)
INTMIG (one if household has internal migrant, zero otherwise)	0.18 (0.38)
EXTMIG (one if household has external migrant, zero otherwise)	0.07 (0.25)
FAISAL (district dummy)	0.20 (0.39)
ATTOCK (district dummy)	0.40 (0.49)
DIR (district dummy)	0.25 (0.44)

Source: IFPRI Rural Survey of Pakistan, 1986/87–1988/89.
Note: Numbers in parentheses are standard deviations.

come from four widely scattered rural districts, three district dummy variables, DIS_j, are also included in the model.

Because of missing data for certain variables, equation (17) is estimated for 642 households rather than for the full sample of 727 households. Table 45 shows the means and standard deviations for the variables in the equation.

The results of the equation are presented in Table 46. When the poor are defined by income data (column 1), four variables (other than district variables) are statistically significant: *IRLAND*; *LIVALUE*; *MALE*15; and *EDMS*. As expected, all of these variables are negatively correlated with poverty.

In column (1) two of the four variables measuring household physical assets—*IRLAND* and *LIVALUE*—are inversely correlated with poverty. These results serve to underscore the findings of Table 44, which showed that physical assets—especially land and capital—are important to the poor. These results also serve to corroborate findings from other parts of this report. For example, Chapter 8 showed that irrigated land is an important determinant of rental income, and therefore it is reasonable to conclude, as column (1) shows, that the lack of irrigated land is positively associated with poverty. Similarly, Chapters 4 and 7 revealed that livestock income is a key

Table 46—Logit analysis of characteristics of poor households

Variable	Poorest Quintile of Households Ranked by Total Per Capita	
	Income (1)	Expenditures (2)
IRLAND (irrigated land owned by household, in acres)	−0.134 (−2.940)**	−0.044 (−2.987)**
RNLAND (rainfed land owned by household, in acres)	−0.005 (−1.039)	−0.092 (−1.389)
LIVALUE (value of livestock)	−0.001 (−2.587)**	−0.001 (−2.141)*
CAPVALUE (value of capital such as tubewell, tractor, and tools)	−0.001 (−0.463)	0.001 (0.362)
*MALE*15 (number of males in household over 15 years of age)	−0.198 (−2.153)*	0.349 (4.201)**
EDMS (number of males in household with middle school or higher education)	−0.612 (−2.627)**	−0.929 (−3.163)**
INTMIG (one if household has internal migrant, zero otherwise)	−0.125 (−0.396)	−0.516 (−1.315)
EXTMIG (one if household has external migrant, zero otherwise)	−17.479 (−0.008)	−0.821 (−1.017)
FAISAL (district dummy)	−2.435 (−4.985)**	1.998 (2.539)*
ATTOCK (district dummy)	1.146 (3.420)**	−3.626 (−4.698)**
DIR (district dummy)	−0.020 (−0.065)	−2.348 (−5.594)**
Constant	−0.264 (−0.931)	−0.449 (−1.915)
Dependent variable	*POORINC*[a]	*POOREXP*[b]
Log likelihood	−242	−226

Notes: N = 642 households. The number of observations is reduced because of missing data for some variables. Numbers in parentheses are t-statistics (two-tailed). All independent variables are at three-year average values.
[a]*POORINC* = 1 if household is in the lowest quintile when ranked by three-year average total per capita income, 0 otherwise.
[b]*POOREXP* = 1 if household is in the lowest quintile when ranked by three-year average total per capita expenditures, 0 otherwise.
*Difference is significant at the .05 level.
**Difference is significant at the .01 level.

source of income for the poor, and thus it is consistent for column (1) to show that the lack of livestock assets is positively associated with poverty.

When the poor are defined by expenditure data in column (2), the same four variables (other than district variables) are significant. However, for reasons that are unclear, the sign for the *MALE*15 variable changes. This paradoxical result suggests that having more household males actually increases the probability of household poverty, when poverty is defined using expenditure data. This result might be plausible if large numbers of household males are either unemployed or underemployed.

10

CONCLUSIONS AND POLICY RECOMMENDATIONS

During the last two decades Pakistan has achieved an impressive rate of income growth. Between 1970 and 1990 annual per capita gross national product (GNP) in Pakistan more than doubled, from $170 to $380. Since 70 percent of the population lives in rural areas, and agriculture represents the most important sector of the economy, it seems reasonable to conclude that agriculture dominates the economic lives of rural households.

However, the findings of this report indicate that such a conclusion might be premature. Of the five sources of rural household income—nonfarm, agricultural, transfer, livestock, and rental—nonfarm is the most important. In any given year, nonfarm income from such diverse sources as unskilled labor, self-employment, and government employment accounts for between 30 and 34 percent of total per capita household income. In contrast, agricultural income accounts for between 23 and 27 percent of such income. These results suggest that any future effort to stimulate rural development in Pakistan should involve a broader array of policies than just agriculture.

Overall Income Inequality

Not only does nonfarm income represent the largest source of rural household income, it also has a favorable impact on income distribution. The decomposition analysis in this report shows that nonfarm income is an inequality-decreasing source of income. In other words, with all other factors held constant, additional increments of nonfarm income will reduce overall income inequality. Moreover, in any given year of the study, nonfarm income accounts for only a small proportion—between 6 and 18 percent—of overall income inequality. Of the five sources of income, only livestock income makes a smaller contribution to overall inequality.

In contrast, agricultural income makes the largest contribution to overall inequality. Depending on the year, agricultural income accounts for between 35 and 45 percent of overall income inequality. This is largely because agricultural income is strongly correlated with landownership, which is distributed quite unevenly both in the area of this report and in rural Pakistan as a whole. However, nonfarm and livestock income are poorly correlated with land owned.

These findings suggest two key policy conclusions. First, policymakers who are interested in improving income distribution and poverty in Pakistan must pay more attention to the nonfarm and livestock sectors. Together, these two sectors provide about 75 percent of the three-year average total per capita income for households in the lowest income quintile. Second, Pakistani policymakers need to realize that most of the direct, first-round benefits from agricultural growth are likely to go to those households that own land, which are the richer households. In this sample over one-third of households own no land and the Gini coefficient of landowning is very high (0.769)..To be sure, the second- and third-round effects of agricultural growth may have a positive effect on the poor and landless. However, until ways can be found to distribute land more evenly in Pakistan, policymakers concerned with the poor should devise programs to meet the considerable dependence of the rural poor on sources of income outside the agriculture sector, such as nonfarm and livestock income.

Nonfarm Income Inequality

While nonfarm income as a whole reduces income inequality, not all sources of nonfarm income have a favorable effect on income distribution. Of the three main sources of nonfarm income—unskilled labor, self-employment, and government employment—only unskilled labor is an inequality-decreasing source of income. This is because the poor depend heavily on unskilled labor employment. In contrast, nonfarm government employment is an inequality-increasing source of income and accounts for a larger proportion—21 to 31 percent—of nonfarm income inequality. Because it has higher entry costs, especially education requirements, this source of nonfarm income is more accessible to richer households.

Agricultural Income Inequality

Government officials who are interested in reducing poverty and improving equity in rural Pakistan should focus on technologies for producing wheat and rice, the main food crops, because these food crops account for a large share of the agricultural income of the poor. Wheat and rice are also inequality-decreasing sources of agricultural income, and they account for only a small proportion (less than 12 percent) of agricultural income inequality.

At the other extreme, one cash crop—sugarcane—accounts for between 33 and 37 percent of agricultural income inequality. Although Pakistan possesses no particular comparative advantage in the production of sugarcane, government pricing policies have made it a very profitable crop. As a result, rich households dominate sugarcane production; they receive over one-third of their net agricultural income from this single crop. These results suggest that efforts to improve income distribution in Pakistan should either revise sugarcane pricing policies or deemphasize sugarcane production.

Transfer Income Inequality

Most transfer income in this report comes from remittances, either internal remittances earned working in urban areas in Pakistan or external remittances earned working abroad. These two types of remittances have very different effects on income distribution. Internal remittances are important for the poor: households in the lowest income quintile receive more than 75 percent of their total per capita transfer income from internal remittances. External remittances, however, tend to go to those who are better off. As a result, external remittances represent an inequality-increasing source of income, accounting for between 58 and 91 percent of transfer income inequality.

To improve the distributional effects of external remittances, policymakers should take steps to help poorer households send migrants abroad. One measure that could be considered is the establishment of rural "migration centers" to process visas, work contracts, and loan arrangements for prospective external migrants.

Livestock Income Inequality

From the standpoint of equity, policymakers in Pakistan would be well advised to pay less attention to male animals—male buffalo and bullocks—and more attention to one female animal—local cows. Livestock income from male buffalo and bullocks is inequality increasing and has a negative effect on equity.

However, income from the leading female animal—local cows—has a positive effect on income distribution. Income from local cows is well distributed among the rural population; the poor receive almost 60 percent of their total per capita livestock income from local cows. The poor prefer local cows over male animals (male buffalo and bullocks) because they can use cows to plow and to produce milk and offspring. To improve equity and poverty in rural Pakistan, policymakers should take steps to upgrade the productivity of local cows through crossbreeding schemes and veterinarian programs.

Rental Income Inequality

About 80 percent of rental income in this study comes from land rent, either in-kind or cash. Because land is distributed so unevenly in rural Pakistan, this means that most rental income goes to the rich. Households in the top income quintile receive almost 20 percent of their total per capita income from rental income, but households in the lowest quintile receive less than 5 percent of such income from this source.

Poverty

Nonfarm income accounts for almost 50 percent of the total per capita income of the poor, when the poor are defined as those households in the lowest income quintile. When expenditures are used to define poverty, nonfarm income accounts for 34 percent of the total per capita income of those in the lowest expenditure quintile. These results underscore the need to pay more attention to nonfarm income.

The incomes of the poor fluctuate considerably. When ranked by income data, only one-third of the 145 households in the lowest quintile in the first year of the study were in that quintile in both of the successive years. This means that most poverty in this study is temporary, rather than chronic. Households tend to move in and out of poverty for a variety of reasons. According to data in this report, changes in physical assets (such as landownership) and in household labor (through education and migration, for example) account for about one-quarter of the changes in the incomes of the poor. In the future, policymakers should consider how policies that bring about changes in physical assets and household labor affect the movement of households into and out of poverty.

APPENDIX: SUPPLEMENTARY TABLES

Table 47—Decomposition of overall income inequality by district using the Gini coefficient and based on three-year average total per capita household income

	Faisalabad (Punjab Province)	Attock (Punjab Province)	Badin (Sind Province)	Dir (North-West Frontier Province)
Overall Gini coefficients of three-year average				
Per capita household income[a]	0.392	0.358	0.386	0.322
Landholding[b]	0.630	0.578	0.456	0.718
Landownership	0.727	0.757	0.742	0.761
Relative concentration coefficients[c] of source incomes in overall income inequality				
Nonfarm	0.322	0.829	0.297	0.615
Agricultural	1.510	3.736	1.311	0.232
Transfer	1.272	1.192	0.624	1.828
Livestock	0.445	0.226	0.514	0.205
Rental	1.732	1.642	1.756	1.309
Factor inequality weights[d] of source incomes in overall income inequality				
Nonfarm	0.095	0.404	0.070	0.242
Agricultural	0.437	0.105	0.557	0.012
Transfer	0.121	0.247	0.034	0.626
Livestock	0.072	0.034	0.067	0.029
Rental	0.275	0.210	0.272	0.091
Total	1.000	1.000	1.000	1.000

Note: N = 727 households.

[a]Income figures are calculated by averaging total per capita household income over the three years.

[b]Landholding includes land owned plus land rented in minus land rented out.

[c]The relative concentration coefficient is $g_i = R_i \frac{G_i}{G}$.

[d]The factor inequality weight is $w_i g_i$, where $w_i = \frac{\mu_i}{\mu}$, and $g_i = R_i \frac{G_i}{G}$.

Table 48—Decomposition of agricultural income inequality by district using the Gini coefficient and based on three-year average per capita agricultural income

	Faisalabad (Punjab Province)	Attock (Punjab Province)	Badin (Sind Province)	Dir (North-West Frontier Province)
Relative concentration coefficients[a] of source incomes in agricultural income inequality				
Sugarcane	1.082	−0.035	1.094	−0.742
Wheat	0.836	0.278	0.847	0.858
Rice	0.465	...	0.368	0.591
Vegetables[b]	1.168	0.228	0.039	0.724
Fodder	0.832	−0.284	0.876	1.413
Maize	1.001	0.281	0.859	0.774
Barley	1.154	...	0.957	0.893
Other crops[c]	1.711	−0.178	1.241	1.976
Agricultural wages	0.328	0.260	0.150	0.709
Factor inequality weight[d] of source incomes in agricultural income inequality				
Sugarcane	0.343	0.019	0.380	0.029
Wheat	0.251	0.717	0.013	0.410
Rice	0.001	...	0.048	0.010
Vegetables[b]	0.169	0.001	0.001	−0.111
Fodder	0.080	0.029	0.026	0.260
Maize	0.050	−0.024	0.001	0.231
Barley	−0.029	...	0.030	0.066
Other crops[c]	0.120	0.196	0.496	0.096
Agricultural wages	0.015	0.062	0.006	0.010
Total	1.000	1.000	1.000	1.000

Notes: N = 727 households. Ellipses indicate a nil or negligible amount.

[a]The relative concentration coefficient is $g_i = R_i \frac{G_i}{G}$.

[b]Vegetables include tomatoes, onions, potatoes, and others.

[c]Other crops include cotton, groundnuts, rapeseed and mustard, and others.

[d]The factor inequality weight is $w_i g_i$, where $w_i = \frac{\mu_i}{\mu}$, and $g_i = R_i \frac{G_i}{G}$.

Table 49—Decomposition of livestock income inequality by district using the Gini coefficient and based on three-year average per capita livestock income

	Faisalabad (Punjab Province)	Attock (Punjab Province)	Badin (Sind Province)	Dir (North-West Frontier Province)
Relative concentration coefficients[a] of source incomes in livestock income inequality				
Local cows	0.960	0.673	0.612	0.660
Male buffalo	1.531	1.197	1.012	2.687
Female buffalo	0.714	0.978	0.939	0.963
Bullocks	1.091	1.107	0.840	–9.330
Goats	0.834	0.722	1.750	0.920
Chickens	0.735	0.257	0.744	0.560
Donkeys	9.789	–0.005	7.889	–4.627
Commercial poultry	1.729	0.206	–3.515	2.856
Sahiwal and imported cows	1.428	149.000	10.281	5.570
Sheep	1.803	–0.491	2.151	2.764
Factor inequality weights[b] of source incomes in livestock income inequality				
Local cows	0.138	0.429	0.087	0.302
Male buffalo	0.075	0.136	0.252	0.052
Female buffalo	0.301	0.216	0.361	0.236
Bullocks	0.158	0.106	0.128	0.038
Goats	0.078	0.046	0.033	0.077
Chickens	0.023	0.011	0.016	0.082
Donkeys	0.040	0.001	0.036	0.031
Commercial poultry	0.097	–0.001	0.001	0.099
Sahiwal and imported cows	0.040	0.036	0.035	0.040
Sheep	0.050	0.020	0.052	0.043
Total	1.000	1.000	1.000	1.000

Note: N = 702 households.

[a]The relative concentration coefficient is $g_i = R_i \frac{G_i}{G}$.

[b]The factor inequality weight is $w_i g_i$, where $w_i = \frac{\mu_i}{\mu}$, and $g_i = R_i \frac{G_i}{G}$.

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Richard H. Adams, Jr., is a research fellow and Jane J. He is a research analyst at IFPRI.

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