Pakistan Journal of Applied Economics (1984) vol III, no. 1 (1–28)

INCOME INEQUALITY IN RURAL PAKISTAN:
A study of sample villages*

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Overall income inequality is decomposed into the contribution of various income sources. Wage employment, nonfarm enterprise, and livestock were found to be inequality-mitigating. Unequal access to land was the major influence upon income inequality, directly through highly unequal crop incomes and indirectly through inequity created in other income opportunities. The brief analysis of poverty suggests that rural poverty is largely borne by those with disadvantaged access to land. The situation of the landless demands more attention for this agrarian group than usually accorded in anti-poverty programs.

I. Introduction

The central purpose of this study is to examine the determinants of rural income inequality in Pakistan. Particular emphasis is given to analysing the contribution of unequal access to land in determining income inequality and poverty.[1]

A highly uneven access to land characterises rural Pakistan. From the 1980 Census of Agriculture, the estimated Gini coefficients of farm holdings and of landownership were 0.64 and 0.78, respectively. [2] The usual tenancy contract gives half of output to the landlord but sharing of most costs is

*An earlier version of this study was undertaken at Quaid-i-Azam University with the assistance of ARTEP (ILO), Bangkok. Discussions with Nigar Ahmed, Ijaz Nabi, and Mahmood Hasan Khan are gratefully acknowledged.

[1] Uneven distribution of land is seen quite often as the critical element in rural income inequality in Pakistan. See, e.g., Khan (1981) Hirashima (1978), and Naseem (1981).

[2] Both Ginis have been computed via the expression p+(1−p)G, where p is the proportion of house-

effectively at the discretion of the landlord. The distribution of rural incomes is also quite uneven. From the 1979 Household Income & Expenditure Survey, the Gini coefficient of income among rural households was 0.32.[3]

National survey data do not permit a direct assessment of the role of access to land in determining rural income inequality. The surveys on land distribution contain no information on income. The surveys on income distribution contain no information on land. Published data do not even permit any decomposition of income which could be meaningfully related to access to land.[4]

The present study is based on a small sample of 750 rural households located in 8 villages in Punjab, Sind, and NWFP. The survey covers the period 1976–77.[5] The size and coverage of the sample used certainly permits no claim to being completely representative of rural Pakistan. We do feel, however, that the findings based on this sample, when broadly interpreted, can serve as useful generalisations.

Section II begins with setting out a framework for evaluating the contribution of various income sources to overall income inequality. Two aspects are of interest – to first identify income sources that were inequality-mitigating and those which were inequality-augmenting, and then to allocate overall income inequality between the various sources of income. Results from the decomposition analysis are presented for six sources of income: crops, livestock, wages, nonfarm enterprise, remittances, and miscellaneous sources.

Section III deals with the link between access to land and income inequality. Interrelationships between sources of income are analysed with a view to establishing a measure of the contribution of the uneven distribution of land to the unequal distribution of incomes. The earlier decom-

holds with no land and G is the Gini among the subset of households with land. Census data is used from Tables 1.2, 1.7, 8.1, and 12.1. The Gini coefficients computed from this data underestimate inequality. The farm holding Gini is based on distribution by farm size rather than by farm size per household which would take into account joint farming. Both the farm holding and land ownership Ginis are based on populations which exclude those landless with less than a certain minimum live stock/poultry holding. In addition, landownership data most likely involves concealment by large landowners because of fear of land reform.

[3] Systematic underreporting of top incomes is generally considered to be present in the national income and expenditure survey. For some idea of the possible extent of underestimation of inequality, consider the rural Gini of 0.31 from the 1971-72 survey as against the rural Gini of 0.53 from the IRDP survey in 1973-74 [Ahmad (1981)].

[4] For example, agricultural income from cultivation is merged with other nonagricultural income under the general category of "income from self-employment." See Ayub (1977) for a decomposition analysis based on national surveys of household income.

[5] The survey was organised by the Department of Economics, Quaid-i-Azam University, in collaboration with ESCAP, Bangkok. For further details of the sample, see Ercelawn (1983).

position framework is adapted to generate results in terms of the direct and indirect effects of uneven access to land.

Section IV briefly deals with poverty. The agrarian composition of the poor is examined to "identify" the poor. Central aspects of poverty – incidence, poverty gap, and variation in incomes among the poor – are combined to evaluate the differing intensity of poverty among various agrarian groups.

II. Inequality Decomposition by Income Sources

Framework

We first set out the framework used to measure the contribution of various sources of income to overall income inequality. We would like to answer the following questions. First, what was the role of each income source in determining overall income inequality, i.e., did inequality within an income source serve to accentuate or mitigate overall income inequality? Second, how important was the role of each income source in determining overall inequality, i.e., how much of the overall inequality could be attributed to the inequality within an income source? The answer to both questions can be attempted in the framework of "inequality decomposition by factor components."

A recent paper by Shorrocks (1982) has shown that the results of decomposing any inequality index depend upon the rule used in the decomposition procedure.[6] There is a "natural" rule for decomposition of each index but the justification for using such a rule is generally quite arbitrary. Shorrocks (1983) has used income distribution data for the United States to show that even the "natural" rule can lead to substantial differences in the inequality contribution of a given income source, depending upon the inequality index used to measure overall inequality.[7]

In view of the above, we base our decomposition analysis on two inequality indices, rather than a single inequality measure, as a simple check on the "robustness" of our analysis. Each decomposition is based on the "natural" rule with the only ad-hoc justification that it is intuitively appealing. The particular choice of coefficient of variation and Gini coefficient as the two inequality indices is done partly on the basis of their wide-

[6] In the absence of any restrictions, for any index of inequality the inequality of total income can be allocated in infinite many ways between the components of total income. This fundamental result is proved in Shorrocks [(1982) pp. 199-200].

[7] See Shorrocks [(1983) p. 320]. This also illustrates the fundamental point that decomposition rules are not invariant to the inequality index and, hence, that the results of decomposing any inequality index are not unique

spread use. An additional preference for the Gini coefficient is its increasing use in empirical decomposition studies ever since Fei et al. introduced it as a tool to analyse the relationship between growth and distribution.[8] Additional considerations for basing inequality decomposition on the coefficient of variation are that the decomposition is particularly simple to grasp, and that Shorrocks (1982) has shown this decomposition to be the only one satisfying plausible theoretical restrictions.[9]

Consider first the inequality decomposition based upon the coefficient of variation. 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}:

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

This clearly shows that we cannot, in general, consider overall inequality to be the simple sum of inequality in source incomes. The inequality within any source income contains only (the "gross") part of its contribution to overall inequality, the remaining contribution being determined by whether the inequality serves to offset or reinforce inequality within other sources of income.

Let us therefore consider the contribution of the i-th source of income to total income variance as consisting of the i-th income variance and of that part of the covariances allocated to the i-th source. An allocation that seems reasonable is to assign to the i-th source exactly one-half of all covariances involving the i-th income source.[10] This manner of looking at how inequality in any source income determines overall income inequality leads to the expression:

$$\sigma^2 = \Sigma \sigma_{iy} \tag{2}$$

where the (absolute) contribution of the i-th source is measured by its covariance with total income. This relationship can be rewritten so as to express the contribution in relative terms. As is obvious, the relative contributions remain the same whether we measure inequality by the variance or by the coefficient of variation. Corresponding to the greater em-

[8] See Fei et al. (1978, 1979) and Pyatt et al. (1980) for the decomposition methodology and application to Taiwan. For applications to other countries, see Ayub (1977) and Fields (1979).

[9] See Shorrocks [(1982), pp. 203-204]. For applications see Shorrocks (1983) and, e.g., Nugent and Walther (1982).

[10] See Shorrocks [(1982), p. 184].

phasis on relative (rather than absolute) inequality the latter is used more extensively. Let us therefore express the decomposition equation as that corresponding to the coefficient of variation:

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

where μ_i and μ are the mean income from the i-th source and from all sources, respectively; ρ_i is the correlation coefficient between the i-th income source and total income.[11]

The inequality decomposition based on the Gini coefficient can be developed as follows. Pyatt et al. (1980) have shown that the Gini coefficient of total income, G, can be defined by:

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

where y refers to the series of total incomes and r refers to the series of corresponding ranks. On the same basis we can define the Gini coefficient of the i-th source of income as:

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

where y_i and r_i refers 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. We can then use (4) and (5) to express the total income Gini as a function of the source Ginis as:[12]

$$G = \Sigma \frac{\mu_i}{\mu} R_i G_i, \quad R_i = \operatorname{cov}(y_i, r)/\operatorname{cov}(y_i, r_i) \tag{6}$$

[11] The "natural" decomposition can be seen in using the coefficient of variation as the inequality measure *common* to both total income as well as source incomes.

[12] Alternatively, consider G as a function of the source concentration indices or Pseudo-Gini coefficients, $C_i = R_i G_i$. It is also useful to express the result in (6) alternatively as:

$$G = \Sigma(\mu_i/\mu)G_i + \Sigma(\mu_i/\mu)\,(R_i - 1)G_i$$

where the second term represents the error in evaluating total inequality simply as the weighted sum of source inequalities. The magnitude of the error term depends upon the correlation between the rank of source incomes and rank of total income. If each source income was a positively monotonic function of total income, the error term would vanish. See Fei et al., (1973).

The Gini decomposition equation for relative contribution of source incomes to total income inequality follows as:[13]

$$\Sigma w_i g_i = 1, \quad w_i = \frac{\mu_i}{\mu}, \quad g_i = R_i \frac{G_i}{G} \tag{7a}$$

For ease of reference the decomposition equation (3) for the coefficient of variation is reproduced.

$$\Sigma w_i c_i = 1, \quad w_i = \frac{\mu_i}{\mu}, \quad c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu} \tag{7b}$$

These decompositions allow us to assess the contribution of each source income in two ways. First, we can ask whether inequality in any given income source served to mitigate or augment overall income inequality. Second, we can ask how much of the overall inequality could be attributed to any given income source.

We can define an income source to have been inequality-mitigating or inequality-augmenting according to whether an increased share of that source in village income would have led to a decrease or increase in overall income inequality. From the decomposition equation (7) it follows that the i-th income source was inequality-mitigating or inequality-augmenting according to whether c_i (or g_i) was less than or greater than unity.[14]

The share of overall income inequality attributed to an income source is given by $w_i c_i$ (or $w_i g_i$). It can be seen to depend upon three factors. First, the importance of that source of income, as measured by the share of such income in aggregate income (w_i). Second, the nature and strength of the link between the source income distribution and total income distribution (ρ_i or R_i). Third, the extent of inequality (per se) within the source income as compared to overall (or average) income inequality.

Decomposition Results

We next present findings based on the decomposition of total income into the following six sources of income:[15] (1) crops, through cultivation and land rents; (2) livestock, through dairy products and sale of (mostly

[13] As in (3) the decomposition here follows a "natural" rule of measuring inequality in source income by the same index as used for measuring inequality in total income.

[14] We are ignoring feedback effects i.e., the assumption is that a change in any source income share will not affect the distribution within any source income. This, of course, may be quite unrealistic for large changes in any source income share.

[15] For details of computation see Ercelawn [(1983), Appendix A.].

young) animals; (3) wages and salaries; (4) nonfarm enterprise and artisan activities; (5) remittances; (6) other miscellaneous sources.

We first discuss the decomposition results with respect to the distinction between inequality-mitigating versus inequality-augmenting sources of income (Table 1). Except in the case of wage and salary income, the alternative decompositions (of the coefficient of variation and of the Gini coefficient) give some contradictory results in each of the remaining income sources.[16] These contradictions occur, however, in too few cases to vitiate the overall impressions. The broad patterns indicated by both decompositions are as follows.

Inequality-augmenting sources of income were found to be crop income, remittances, and other miscellaneous sources of income. For each of these the concentration of source income generally exceeded the concentration of total income. This was due both to a high degree of inequality within source income and a high degree of correlation between source and total income.[17]

Inequality-mitigating sources of income were found to be wages and salaries, nonfarm enterprise, and livestock.[18] If these sources had constituted a larger share (than they actually did) of village income, overall inequality of income would have been even smaller. As between these income sources, wage and enterprise incomes were income-mitigating sources primarily because of a low correlation with total income, whereas livestock income was income-mitigating primarily because of a low level of inequality within livestock income. The relative effectiveness of these sources in mitigating income inequality may be examined in two ways. One approach is to evaluate the impact on overall income inequality due to a change in the share of source income in total income. On this basis, wage and salary income was most effective in mitigating overall income inequality.[19] An-

[16] The contradiction occurs either when $c_i < 1$ and $g_i \geq 1$ or when $c_i \geq 1$ and $g_i < 1$. The contradictions appear to reflect the greater sensitivity of the Gini to middle-income groups and of the coefficient of variation to extreme incomes. For example, we find $g < 1$ and $c > 1$ for nonfarm enterprise income in Jatli. Comparing shares in source income to those in total income, we find that the 4th decile and the top decile had much larger shares in source income whereas there was hardly any difference for the bottom decile.

[17] Recall that $c_i = \rho_i \frac{\sigma_i/\mu_i}{\sigma/\mu}$ and $g_i = R_i \frac{G_i}{G}$.

[18] The inequality-mitigating role of wage income is also evident in nation-wide rural data on income distribution during the 1960's; see Ayub [(1977), p. 66]. The same characteristic of wage income also appears from a 1978-79 survey of rural Sind; see Abbasi [(1982) pp. 61, 85]. The role of specific nonwage incomes is not compared because of a different income classification used by these studies.

[19] We look at the percentage change in overall income inequality (i.e., in σ/μ and G) due to a one per cent change in the share of source income (i.e., $dw_i = 0.01$). Comparisons are therefore made on the basis of $-(1-c_i)/(1-w_i)$ and $-(1-g_i)/(1-w_i)$.

TABLE 1

Relative concentration coefficients of source incomes, sample villages, 1976–77

	Crops		Livestock		Wages		Enterprise		Remittances		Miscellaneous	
	c	g	c	g	c	g	c	g	c	g	c	g
Khunda	3.06	1.64	0.19	0.64	0.13	0.29	0.60	0.97	0.17	1.01	0.18	1.34
Mehdiabad	1.91	1.69	0.30	0.65	−0.04	0.08	1.27	0.87	−0.02	0.47	0.14	1.57
Mano Jamali	1.21	1.19	0.30	0.59	−0.23	−0.21	0.32	0.38	—	—	3.17	2.15
Nari	2.28	2.05	0.27	0.44	−0.01	0.18	0.80	0.91	2.08	1.38	4.46	3.06
Rukrani	1.12	1.14	0.41	0.83	−0.01	0.10	−0.11	−0.13	0.31	1.26	4.96	2.00
Jatli	0.97	1.05	0.41	0.76	0.12	0.63	1.01	0.92	1.39	1.13	1.65	1.36
Mahnder	1.28	0.97	0.50	1.00	−0.04	0.18	0.11	0.49	2.01	1.45	0.26	0.74
Chak 305	1.29	1.25	0.75	1.02	−0.01	0.34	0.05	0.34	1.53	1.55	7.86	2.56

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

All estimates based on income per capita.

other way is to compare the distribution of source incomes only with respect to the low-income group. Again, it was wage income which was distributed more equitably than enterprise or livestock income.[20]

The decomposition results for relative shares of source income in overall income inequality (Table 2) are discussed next. Shorrocks (1983) has illustrated how widely such shares can vary depending upon the index used to measure overall income inequality, and this is also borne out by our data. Consider the more modest question of ranking income sources by their relative share in overall income inequality. Even answering this question, however, entails some contradictions between the two decompositions.[21] This suggests caution in interpreting the relative inequality shares. The overall impressions are given below.

The *dominant* contributor to overall income inequality was generally crop income. Its dominance reflected all three factors working in the same direction – crop income constituted a substantial, and very often the largest, share of village income; crop income had a high positive correlation with total income; and there was a high degree of inequality within the distribution of crop income.

Income from livestock generally took second or third place with respect to share of overall income inequality. This was primarily a reflection of its large share of village income (which was second to crop income), for, as compared to livestock income, there were other sources of income which had a higher correlation with total income or greater inequality within the distribution of source income.

Wage and salary income generally made the smallest contribution to overall income inequality. This was only partly a reflection of the low share of such income in total village income, the more substantive reason being the low correlation between wage and total income. Nonfarm enterprise income made a larger contribution to overall income inequality than did wage income, more often because of a higher correlation of enterprise income with total income, rather than due to a higher share of enterprise income in total income.

Remittances also generally made a small contribution to overall income inequality. Unlike the case of wage income, however, the low share of remittances in inequality was primarily due to a low share in village income which offset the highly concentrated distribution of remittances.

In two villages, remittances accounted for the dominant share of overall income inequality. These were rainfed villages with overseas migrants contributing most of the remittances. In these villages the share of remit-

[20] We look at the share of source income received by the poorest 20 per cent of the population (ranked by total income).

[21] The contradiction occurs because either $(g_j/g_i) < 1$ and $(c_j/c_i) > 1$ or $(g_j/g_i) > 1$ and $(c_j/c_i) < 1$.

TABLE 2

Relative inequality contributions (%) of source incomes, sample villages, 1976–77

	Crops		Livestock		Wages		Enterprise		Remittances		Miscellaneous	
	w.c	w.g	w.c	w.g	w.c	w.g	w.c	w.g	w.c	w.g	w.c	w.g
Khunda	70.7	37.9	4.1	13.9	1.2	2.7	22.6	36.6	1.1	6.5	0.3	2.4
Mehdiabad	71.9	63.2	7.5	16.6	0.5	1.0	21.1	14.6	−0.1	3.2	0.1	1.4
Mano Jamali	78.6	77.1	6.1	12.0	−1.3	−1.1	1.4	1.7	—	—	15.2	10.3
Nari	71.5	64.2	10.2	16.6	−0.2	3.3	7.6	8.5	1.1	0.7	9.8	6.7
Rukrani	64.5	65.1	10.8	21.8	−0.1	0.8	−0.2	−0.3	0.7	2.8	24.3	9.8
Jatli	25.1	27.1	8.4	15.5	0.6	3.2	16.1	13.5	35.5	28.9	14.3	11.8
Mahnder	25.8	19.5	13.7	27.2	−0.2	0.8	1.5	6.9	57.9	41.8	1.3	3.8
Chak 305	39.9	38.4	28.0	38.0	−0.2	4.7	0.5	3.4	7.5	7.6	24.3	7.9

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

All estimates based on income per capita.

tances in village income was no less than the share of crop income. Furthermore, remittances were even more concentrated than were crop incomes. The combined influence of these two factors gave remittances an even larger share of income inequality than the share of crop income in overall income inequality. Unless these villages had substantially greater concentration in the distribution of nonremittance incomes before the overseas migration, it seems likely that overseas migration led to a considerable increase in inequality *within* villages even as it reduced inequality *between* villages.[22]

III. Income Inequality and Access to Land

Reflecting the prevailing situation in Pakistan, our sample villages were characterised by a high degree of land concentration (Table 3). Sample data are used to establish the strong link between unequal land access and the unequal distribution of income. This is done by analysing the links between access to land and the various sources of village income.

Two issues are taken up. We first attempt to estimate the proportion of overall income inequality that may be assigned to the uneven access to land. The second issue explored concerns the role of access to land in determining the income distribution impact of the Green Revolution.

Unequal access to land would be expected to make the major contribution to income inequality for the following reasons. Income from crop cultivation and land rents constitutes a substantial part of village income. The distribution of such income would closely reflect the disparities in access to land. It then follows that unequal land access would be an important determinant of overall income inequality – highly unequal access to land directly implies a correspondingly high degree of inequality within a sizeable component of village income.

The inequality in crop income would be of little consequence if incomes from remaining sources followed an appropriately countervailing distribution. The burden of such compensatory access to alternative income sources is obviously very large when access to land is extremely unequal and when crop incomes are a sizeable source of village income. Contrary to what is required to offset the inequality in crop income, in actual fact this inequality can only be partially offset because access to land and access to other income opportunities have an asymmetrical relationship – favour-

[22] This conjecture is based partly on the data, and partly on the impression that data on overseas remittances underestimate inequality because we could not record the value either of overseas remittances in kind or of remittances sent for special purposes. For further discussion of the impact of overseas migration in Pakistan see Naseem [(1981) Ch. XI]. Lipton (1982) reviews a wide variety of data to present a plausible case for expecting migration to increase inequality.

TABLE 3

Inequality in access to land and income, sample villages, 1976–77

	Gini Coefficient			Coefficient of Variation		
	Land owned	Land holding	Income	Land owned	Land holding	Income
Khunda	0.97	0.71	0.46	8.90	1.83	1.36
Mehdiabad	0.97	0.79	0.48	8.27	2.91	2.45
Mano Jamali	0.89	0.31	0.44	3.07	0.81	1.21
Nari	0.89	0.67	0.28	2.94	1.44	0.57
Rukrani	0.79	0.44	0.45	2.28	1.11	1.17
Jatli	0.67	0.64	0.43	2.28	1.57	1.14
Mahnder	0.58	0.51	0.38	1.80	1.00	1.41
Chak 305	0.66	0.54	0.33	1.44	1.15	0.84

All estimates based on income per capita.

able access to land may be of advantage in, but is unlikely to be a barrier to, securing access to other income opportunities.

Consider livestock income derived through dairy products and breeding animals for sale. It is true that the relationship between land access and livestock income should be weaker than that between land access and crop income.[23] We would, however, still expect a positive association between access to land and livestock income. Consider also the concentrated ownership of tubewells and tractors among medium and large landowners. Aside from the benefits derived from use of such assets in cultivation, additional incomes are derived from selling services of these assets. Such additional incomes flow to the very same households which are major beneficiaries of the inequality in access to land.[24]

Let us now consider incomes from wages and salaries and from nonfarm enterprise (including self-employment as artisans). It should be apparent that access to these income opportunities does not, by and large, intrinsically favour those households disadvantaged with respect to land access.[25] If there are any underlying interrelationships, these are more likely to run in the other direction, i.e., for those with the better access to land to also have a better access to employment and enterprise opportunities. For example, having a high enough income to spare family members for receiving higher education and to absorb the costs of training will usually bias opportunities for highly skilled employment towards the relatively larger farmers. The ability to secure the better-paid jobs will also generally favour the larger farmers, particularly landowners, in a society where status and influence are positively associated with access to land. Finally, consider the fact that average returns from wage and nonfarm enterprise are on the low side. As a result, even if all such incomes were to go only to those with poor access to land, this would hardly make any difference to the income gap created by unequal crop and livestock incomes.

[23] The two obvious illustrations of the reasons for a weaker link between land access and livestock income are as follows – that even landless labour households derive some income from dairy products and livestock breeding as against no income from crop cultivation, and that tenants usually do not have to share any part of livestock income as against sharing half of the income from crop cultivation.

[24] Even if we concede that overall income inequality declines – which appears doubtful when changes in the relative position of landless labour households are taken into account – because renting farm machinery reduces crop income inequality, the point still remains that overall income inequality is higher than otherwise because farm machinery ownership is concentrated among those with already high incomes.

[25] As we will see below, the correlation between wage and crop incomes was often negative. This should not, however, be interpreted as evidence of a preferential access to employment opportunities for those with limited access to land. What the negative correlation simply reflects is that the mostly unskilled employment opportunities were taken up largely by those with limited access to land because of their *need* to supplement meagre land-based incomes, and those with better access to land generally *chose* not to enter the unskilled labour market.

Access to land embraces a number of aspects – ownership, holding, and rental terms. In general, more than one aspect influences access to other income opportunities.[26] We would also expect that different aspects assume varying importance in determining access to different (noncrop) income opportunities. As a single variable reflecting the composite effect of all aspects of access to land, the level of crop income (received by a household) may be considered as the most obvious proxy for access to land. A reasonably close approximation to the association between access to land and access to other income opportunities may therefore be obtained through the association between the level of crop income and levels of income from other sources. Sample evidence is presented in Table 4 which gives the correlation coefficients between crop income and income from other sources.

As expected, the correlation between crop and livestock income is always found to have been positive, and generally moderately strong. Also observed generally was a moderately strong, positive correlation between crop and other miscellaneous sources of income (which includes income from hiring farm machinery). On the other hand, negative correlations were generally present between crop income and income from wages and nonfarm enterprise. No systematic pattern for remittances was observed – a positive correlation with crop income was present as often as a negative correlation.[27] The net correlation between crop income and noncrop income was generally moderately positive, both because the negative correlations were relatively weak and because the negatively correlated income sources had relatively small weights.[28]

The contribution of unequal access to land to overall income inequality may be measured as the direct and indirect effects of unequal access to land. The direct effect can be identified with the disparity in crop income. The indirect effect depends upon the relationship between access to land and access to other income opportunities. As discussed above, the indirect effect may be captured through the relationship between crop and noncrop income.

One measure of the total contribution – direct and indirect – of unequal land access to overall income inequality emerges from the decomposition analysis carried out earlier. These results show that a substantial proportion

[26] Livestock income is perhaps the most obvious example. Given an identical (farm) holding, tenants may have a disadvantage vis-a-vis owners because rental terms constrain the amount of fodder available either through the level of rents or through the cropping pattern imposed by landlords.

[27] Even for the two villages with substantial overseas migration, one village had a very large, positive correlation between remittances and crop income, whereas the other village had a small, negative correlation.

[28] In the present context, weight to an income source refers to the ratio of standard deviations of source income and of total noncrop income. Exceptions to the general pattern – Nari and Khunda – can be partly explained by the presence of atypically large weights to wage and nonfarm enterprise incomes and of exceptionally small weight to livestock income.

TABLE 4

Simple correlation coefficients between crop and noncrop incomes, sample villages, 1976–77

	All noncrop income	Livestock	Wages	Enterprise	Remittances	Miscellaneous
Khunda	− 0.02	0.10	0.12	− 0.09	0.03	0.05
Mehdiabad	0.75	0.61	− 0.13	0.76	− 0.08	0.05
Mano Jamali	0.36	0.24	− 0.21	− 0.04	−	0.48
Nari	− 0.16	0.05	− 0.40	− 0.06	0.03	0.46
Rukrani	0.48	0.28	− 0.16	− 0.09	− 0.02	0.58
Jatli	0.23	0.38	0.04	0.09	− 0.02	0.32
Mahnder	0.71	0.57	− 0.07	− 0.04	0.70	− 0.04
Chak 305	0.27	0.43	− 0.29	− 0.24	0.12	0.35

Crop income is from cultivation and rents.
All estimates based on income per capita.

of overall income inequality could be attributed to unequal access to land: the direct and indirect contribution of crop income accounted, on average, for more than half the variation in overall income.[29]

We suggest that the decomposition procedure used above leads to an understatement of the contribution of crop income, and hence of access to land, to overall income inequality. The reason for this understatement is as follows.

Variance of total income consists of two terms: a variance term consisting of variances in individual income sources, and a covariance term consisting of *twice* the covariances between income sources. According to the Shorrocks procedure, the inequality contribution of any income source consists of two parts, corresponding to the two terms in total variance. The part drawn from the variance term equals the variance of the income source. The other part is drawn from the covariance term and equals the sum of covariances involving the given income source. In other words, the covariance term is partitioned *equally* between each of the income sources having a nonzero covariance. It is this partitioning that leads to an underestimation of the inequality contribution of crop income.

The Shorrocks procedure takes, so to speak, a "neutral" stance on the direction of causation as regards the income sources involved in any covariance. Since our present purpose is to measure the income inequality contribution of access to land, and we have a specific view of the asymmetrical relationship between access to land and access to other income opportunities, it seems quite reasonable to partition the covariances involving crop income in an asymmetrical manner. If we observe a positive covariance with another source of income – e.g., with livestock income – that is wholly due to the disparity in access to land. On the other hand, when we observe a negative covariance between crop income and another source of income – e.g., with wage income – that should be wholly attributed to the noncrop source of income as its contribution to offsetting uneven access to land.[30]

Table 5 gives the sample results for the contribution of uneven land access to overall income inequality. The direct contribution is measured by the variation in crop income. The indirect contribution is measured in two alternative ways. One corresponds to the Shorrocks decomposition procedure, the resulting total contribution for which is given in col. 3. The other corresponds to that we have suggested as preferable, i.e., to measure the indirect effect as twice the positive covariation between crop

[29] See Table 2, col. 1.

[30] For the example given it is true that distribution of wage income would be an immediate consequence of uneven access to land if wages were wholly restricted to farm labour. That, however, is not the case with our sample data.

TABLE 5

Income inequality contribution (%) of access to land, sample villages, 1976-77

	var (crop)	var (crop)+ 2 Σ cov (crop, noncrop)	var (crop) + Σ cov(crop, noncrop)
		cov > 0	cov $\gtrless$ 0
Khunda	71.8	78.8	70.7
Mehdiabad	54.1	91.7	71.9
Mano Jamali	68.3	93.5	78.6
Nari	80.1	97.3	71.5
Rukrani	49.1	83.7	64.5
Jatli	17.4	33.6	25.1
Mahnder	9.4	43.4	25.8
Chak 305	29.2	67.4	39.9

Variances and covariances are measured relative to total income variance.
All estimates based on income per capita.

and noncrop income and to exclude the negative covariation between crop and noncrop income.[31] The resulting total contribution is given in col. 2.

The sample data clearly suggest that uneven access to land was a major determinant of rural income inequality.[32] Furthermore, a substantial impact of the inequitable distribution of land often arose through the inequity it generated in access to other income opportunities. This was particularly noticeable in villages where the direct contribution was relatively small.[33]

[31] In all villages the positive covariation term includes livestock income and miscellaneous sources of income. Virtually in all villages the term excludes wage income and nonfarm enterprise income.

[32] Ahmed (1982) analyses inter-district variations in inequality to determine the structural sources of rural inequality. His findings also confirm the dominant role of access to land in rural income inequality.

[33] Note the data for Jatli, Mahnder, and Chak 305. The former illustrate the pervasive influence of access to land even at rather low degrees of inequality in access to land. Land ownership and holdings in these villages were relatively less unevenly distributed as compared to most other villages (Table 3). Overall income inequality was not, however, always lower as compared to the latter villages. Obviously, then, a much higher degree of income inequality in noncrop income offset the lower inequality within crop incomes. What is interesting is that a large part of the inequality in noncrop incomes was generated in sources of income indirectly associated with access to land.

An aspect of unequal access to land that continues to generate much debate is the income distribution consequences of the Green Revolution.[34] Income inequality is expected to worsen on essentially two counts. First, that relative income gaps would widen further in favour of those with better access to land – the incremental crop incomes would be distributed even more unequally (than before) and the level and distribution of additional noncrop incomes would be unable to offset the increased inequality in crop incomes. Second, that access to land would become even more unequal as landowners resumed land for self-cultivation, an extreme consequence of which would be that tenant households would be turned into landless households with a corresponding increase in income gaps between the poor and the rich.

Our sample data provides support to some of these predictions when we contrast rainfed and irrigated villages to approximate the pre- and post-Green Revolution inequality situations.[35] Consider first the hypothesis of widening income gaps between agrarian groups. Let us compare the landless to landowners, these groups being those expected to have the smallest and largest shares, respectively, in the prosperity associated with the Green Revolution. Table 6 shows that, as between irrigated and rainfed villages, the position of landless relative to landowners was noticeably worse in irrigated villages.[36] Using average landowner income as the base (of 100), the average index of landless income declines from 57 in the rainfed sample to 41 in the irrigated sample.[37]

The increased income inequality may be analysed in terms of the distribution and level of noncrop income. Reflecting the higher agricultural productivity, the crop income gap was larger in the irrigated sample. To offset the additional gap, a much more favourable distribution – biased towards the landless – of noncrop income was required. This would have meant that the ratio of average income of landless to average noncrop income of landowners be higher in the irrigated sample. The actual ratio, however, was virtually the same in the irrigated sample as in the rainfed

[34] In the Pakistani context, see Khan (1975; 1983), Hirashima (1978), Naseem (1981), Chaudhry (1982; 1983).

[35] The irrigated villages had, as compared to the rainfed villages, considerably more widespread use of modern seed varieties, chemical fertilizer, and mechanization. Both land owned and land holding among landowners was *smaller*, on average, in irrigated villages as compared to rainfed villages.

[36] By comparison with data from other surveys of irrigated villages it appears that our sample *underestimates* the gap in average incomes. See Hirashima (1978), Khan (1975; 1981) and Ercelawn (1983).

[37] Even within the rainfed sample a similar deterioration was present. Village Jatli had, as compared to village Mahnder, considerably more widespread use of modern farm inputs; we also find the index of landless incomes in Jatli to be lower than that in Mahnder.

TABLE 6

Agrarian groups and incomes per capita, sample villages, 1976–77

	Crop income (Rs.)			Total income (Rs.)		
	Landless	Tenants	Landowners	Landless	Tenants	Landowners
Rainfed						
Khunda	0	171	1432	1166	760	2353
				(50)		(100)
Jatli	0	—	541	944	—	1869
				(50)		(100)
Mahnder	0	—	278	882	—	1246
				(71)		(100)
Average	0	171	750	997	760	1823
				(57)		(100)
Irrigated						
Mehdiabad	0	567	2248	1123	1540	3504
				(32)		(100)
Mano Jamali	0	821	3207	1102	1189	4274
				(26)		(100)
Nari	0	576	1584	1069	1097	2428
				(44)		(100)
Rukrani	0	943	2300	1372	1652	3700
				(37)		(100)
Chak 305	0	433	654	1045	1200	1612
				(65)		(100)
Average	0	668	1999	1142	1336	3104
				(41)		(100)

Crop income is from cultivation and rents.

Landless: own = hold = 0; Tenants: own= 0, hold > 0; Landowners: own >0, hold ⩾ 0.

sample. The combined level of noncrop income available to landless and landowners was sufficient to offset the additional crop income gap if appropriately distributed between the landless and landowners.[38] We can therefore attribute the worsened income distribution in the irrigated sample to the particular pattern of *distribution* of additional crop and noncrop incomes – worse for crop incomes and no better for noncrop incomes, as compared to the rainfed sample.

Let us next consider the hypothesis that tenant evictions would increase income inequality partly because tenants would earn lower incomes after eviction. For this purpose let us compare average incomes among tenants and landless households. Since tenant evictions are expected to follow as a consequence of increased agricultural productivity, we restrict comparisons to the irrigated sample. Table 6 shows that average income among tenants exceeded that among the landless – average landless income being 13 per cent lower than average tenant income within the irrigated sample. Tenant evictions may, in fact, result in a larger drop in income than this suggests. Ejection from land is usually resisted, and the legal costs result in substantial depletion of assets. Upon eviction, on the other hand, income is almost wholly from unskilled wage labour. Average landless income includes the relatively better-off artisans and those engaged in commerce, and hence overstates the income likely to be earned by tenants after eviction.[39]

IV. Poverty and Access to Land

This section briefly discusses sample data on poverty.[40] Evidence is examined primarily to highlight the relationship between poverty and access to land. We look first at selected characteristics of the poor as a whole, and then examine data on specific agrarian groups among the poor. Certain implications for anti-poverty policies are then briefly examined.

The poor population is defined here in two ways. One method is to simply equate the bottom 40 per cent of the population with the poor. This is the "relative poverty" approach favoured by the World Bank.[41] The second method used relies on an "absolute poverty" line.

[38] On average, landless and landowners each constituted about 35 per cent of the population in the irrigated sample. From Table 5, the average noncrop income of landowners in the irrigated sample was Rs.1105. If about one-third of this noncrop income had instead accrued to the landless, the ratio of total average incomes of landless to landowners would have remained the same as the average for the rainfed sample (0.57).

[39] Comparison of income *levels* also ignores the fact that on becoming landless the evicted tenants will become more vulnerable to market forces and hence subject to larger fluctuations in real income.

[40] A proper discussion of poverty would require a complete paper by itself.

[41] See Chenery, et al., (1974).

The absolute poverty line is constructed here in a rather crude fashion. We take the poverty lines estimated on the basis of national income and expenditure surveys by Naseem (1977) and by Irfan and Amjad (1983) and simply adjust them for price changes. The base poverty line estimated by Naseem was in 1959-60 prices. Using national urban price indices and a rural-urban inflation adjustment factor, the poverty benchmark in 1976-77 prices is taken as an annual income of Rs.900 per capita.[42] A very similar figure is yielded from the rural poverty line estimated for 1979 by Irfan and Amjad.[43]

From the sample data, on average about 33 per cent of the village population could be classified as poor on the basis of the absolute poverty line (of Rs. 900). This proportion was not too different from the rural poverty estimates for the mid- and late- 70's.[44]

For each of the sample villages we find that intense poverty coexisted with a small minority receiving very large absolute incomes (Table 7). This emphasizes the deep concern with which we must view the unequal distribution of incomes. From the earlier discussion on relative income inequality it is evident that the poverty situation was determined largely by the very uneven access to land.[45] A most striking characteristic of the poor was, not unexpectedly, their very limited access to land. Virtually all of the sample poor population belonged to those agrarian groups which own little or no land and who can rent land only under highly unfavourable terms – the landless, tenants, and marginal landowners.[46]

The effects of unequal access to land were found to extend even further via a discrimination along the same lines even as among the poor. In particular the landless appeared to suffer from a greater intensity of poverty as compared to tenants and marginal landowners. Consider the incidence of poverty. In most sample villages the incidence of poverty within the landless population was higher than the incidence within the tenants and

[42] This corresponds to the lower poverty line of Rs 287 in 1959-60 prices, which was computed by Naseem on the basis of 90 per cent of minimum calorie requirements. For details of extrapolation to 1976-77 prices see Ercelawn (1983).

[43] Again, it was the lower poverty line of Rs.1140 in 1979 prices – which we adjusted for 1976-77 prices on the basis of national urban price indices and a rural-urban inflation adjustment factor.

[44] The lower estimates for the incidence of rural poverty based on national surveys of income and expenditure are as follows:

1971-72	:	43% Naseem (1977)
1977	:	27% Irfan and Amjad (1983)
1979	:	29% Irfan and Amjad (1983)
1979	:	34% Planning Commission (1983).

[45] This point has, of course, been repeatedly emphasized by studies of rural poverty. See, e.g., the case studies in ILO (1977).

[46] Marginal landowners are defined here as those households which own 5 acres or less. No particular justification can be given for this cut off point.

TABLE 7

Poverty in sample villages, 1976–77

	Poor population (%)	Mean income (Rs.)			Landless+tenants+marginal owner among population (%)		
	Income < Rs. 900 per capita	Inc < 900	Bottom 40%	Top 10%	Inc < Rs. 900	Bottom 40%	Village
Rainfed							
Khunda	49	544	487	5323	98	99	88
Jatli	33	675	719	6428	84	86	61
Mahnder	52	617	556	3970	74	76	59
Irrigated							
Mehdiabad	30	646	724	7966	96	93	87
Mano Jamali	30	691	757	6946	96	98	81
Nari	28	682	790	3292	100	100	82
Rukrani	14	639	1014	9734	100	87	56
Chak 305	33	622	666	4068	81	76	66

Landless: own = 0, hold = 0; Tenants: own = 0, hold > 0.

Marginal owners: own < 5 acres per household; hold ≥ 0.

marginal landowner population.[47] Average income among the poor is another indicator of the acuteness of poverty. Again, for most villages the average income of the landless poor was lower than average income among the poor tenants and marginal landowners.

The differing intensity of poverty between landless, on the one hand, and tenants and marginal landowners, on the other, may be expressed through the index of poverty suggested by Sen (1976).[48] Three aspects are taken into account by this index – the incidence of poverty, H, the average income of the poor, $\bar{y}$, relative to the poverty line, z, and the Gini coefficient of income inequality among the poor, G.[49] The Sen index of poverty may be written as:

$$S = H\left(1 - \frac{\bar{y}}{z} + \frac{\bar{y}}{z} \cdot G\right) \tag{8}$$

S has been computed separately for two groups: landless as one group; tenants and marginal landowners as another group. Due to the small number of cases within individual villages, data has been pooled across 3 rainfed villages as one combined sub-sample, and across 5 irrigated villages as another sub-sample. Results for both the absolute and relative poverty approaches are given in Table 8.[50]

Differences in poverty between agrarian groups – with the landless being affected more intensely – are apparent in both rainfed and irrigated villages, though much more so in the latter.[51] The data therefore clearly indicate that the distribution of poverty was directly related to access to land.

Certain implications for the alleviation of poverty deserve emphasis. A reliance on general rural development schemes will mean the persistence of acute poverty for a very long time. In the absence of a major redistribu-

[47] A similar pattern is implied by national survey data for rural Pakistan. Irfan and Amjad (1983) estimate that poverty affected 39 per cent of nonfarm population as compared to 34 per cent of the farm population in the Micro-Nutrient Survey of 1977.

[48] For a critique of the Sen poverty index and an alternative poverty index, see Clark et al., (1981).

[49] Inequality among the poor takes into account both the fact that the poorest suffer absolutely more than that captured by the average degree of deprivation implied by $\bar{y}/z$, and the fact that the poorest suffer relatively more when they compare themselves with the rest of the poor.

[50] For the relative poverty approach we have located the poor on the basis of the bottom 40 per cent *within* each village and then aggregated across villages. The pooled poverty line, z, then represents an average of the poverty lines implicity defined by the bottom 40 per cent within each village.

[51] Recall our earlier discussion on the deterioration in the relative income position of the landless as between rainfed and irrigated villages. The deterioration assumes added significance because it appears associated with a worsened poverty position of landless (vis-a-vis other groups) in irrigated areas.

TABLE 8

Index of poverty for landless, tenants and marginal landowners, sample villages, 1976–77

	Poor: income per capita < Rs.900			
	H	$\bar{y}/z$	G	S
	z = 900			
Rainfed				
Landless	0.53	0.60	0.21	0.28
Tenants and marginal owners	0.57	0.67	0.16	0.25
	z = 900			
Irrigated				
Landless	0.38	0.69	0.15	0.16
Tenants and marginal owners	0.29	0.78	0.12	0.10
	Poor: bottom 40% of village population			
	z = 815			
Rainfed				
Landless	0.46	0.62	0.21	0.24
Tenants and marginal owners	0.51	0.72	0.16	0.20
	z = 1105			
Irrigated				
Landless	0.52	0.65	0.18	0.24
Tenants and marginal owners	0.44	0.74	0.15	0.16

Landless : own = 0, hold = 0; Tenants : own = 0, hold > 0; Marginal owners: own > 0, hold ⩾ 0.

tion of assets and income opportunities, the share of incremental incomes going to the poor will not exceed their share of existing incomes. The prevailing distribution of incomes is so highly unequal, and the poverty so intense, that the additional incomes hence obtained by the poor would make little impact upon the absolutely low living standards of the poor.[52]

[52] Ahluwalia [(1974) pp. 19–21]. For our sample villages the poor obtained, on average, less than 20 per cent as their share of village income. As compared to an absolute poverty line of Rs.900 per capita (per year), mean income among the poor was around Rs.650. Nearly 50 per cent of the poor, however, had incomes smaller than the average.

To achieve any reasonable impact upon poverty in the short run, anti-poverty policies require that incremental incomes be redistributed heavily in favour of the poor. A redistribution of assets, particularly of land, would obviously attack the poverty problem at its root. An alternative strategy would be to focus efforts on increasing incomes within such sources as relatively favour the poor.[53] It follows that the poor would benefit substantially more from policies that increased incomes from wages, nonfarm enterprise, and artisan activities as compared to policies that increased incomes from crop and livestock activities.[54] Anti-poverty policies that emphasized the former sources of income would have the added advantage of minimizing discrimination among the poor – the landless poor would tend to have a lesser disadvantage in access to larger wage incomes as compared to larger crop and livestock incomes.

V. Summary

Sample data for villages was used to analyse the determinants of overall income inequality in rural Pakistan. The decomposition results show that the dominant source of income inequality was generally crop income. Wage employment, nonfarm enterprise and livestock were inequality-mitigating sources of income and hence made much smaller contributions to overall income inequality. In the two villages which had substantial overseas migration, remittances accounted for the dominant share of overall income inequality.

The role of unequal access to land in income inequality was examined via the links between access to land and various sources of village income. The sample data suggest that the major contributor to village income inequality was the uneven distribution of land. Another aspect of unequal land access that emerged from the sample was the worsened relative income position of the landless in irrigated villages as compared to rainfed villages. This suggests that the Green Revolution in Pakistan has exacerbated rural income inequality.

[53] The success of such efforts is, however, problematic. If asset redistribution is politically infeasible then not much hope can be vested in other efforts at significant income redistribution, since policy implementation, if not also formulation, depends upon the same rural groups who would be adversely affected through asset redistribution.

[54] For the sample villages, average shares of the poor in village incomes from different sources were as follows:

Wages and salaries	:	24%
Nonfarm enterprise	:	23%
Livestock	:	14%
Remittances	:	10%
Crops	:	9%

Remittances among the poor largely originated from wage employment.

Poverty in the sample villages was found to be primarily borne by those with disadvantaged access to land. The intensity of poverty among the landless appeared to be more acute as compared to other agrarian groups. This suggests that anti-poverty programs would be more effective if the programs reflected the fact that the poor own little or no land.

The sample data confirm the widely held view that rural income inequality and poverty cannot be seriously mitigated without attacking the problem at its root, i.e., without substantive redistribution of land. Unequal distribution of land is a major obstacle because it leads to a parallel inequality in access to other income opportunities. Unequal distribution of land is also of urgent concern because it leads to an income inequality that engenders acute poverty. Successful anti-poverty programmes that do not rely on redistribution of assets will require extremely high rates of growth in income sources that favour the poor. It seems foolish, however, to expect such programmes to be implemented within the same social structure that is hostile to any significant taxation of agricultural incomes, let alone a meaningful redistribution of land.

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