

## Rural Poverty, Agricultural Production, and Prices: A Reexamination

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In his insightful but unfinished work, Dharm Narain drew attention to the behavior of prices as one of the important factors determining the extent of poverty in rural India. His empirical investigations, summarized in Guvant Detail contribution 10 this volume (chap 1), provide strong prima facie evidence of such influence. Dharm Narain found that rural poverty is not only inversely related to the level of output per head of the rural population, as established in Ahluwalia (1978a), but also positively related to the level of prices. What is equally interesting is that he found that when account is taken of the effect of variations in both output per head and prices, the underlying time trend in rural poverty, is negative, a very different conclusion from mine — I reported no underlying trends— and the very opposite of that of Griffin and Ghose (1979) and Saith (1981), who assert a rising underlying trend.

This chapter pursues the issue raised by Dharm Narain using an expanded data base. His results are based on all-India data comprising 12 observations for 1956/57 to 1970/71. An additional estimate is available for the year 1936/99, and the period can be extended by including data for 1971/72, 1972/73, 1973/74, and 1977/78 (see table 7.1).

### Rural Poverty in India, 1956/57 to 1977/78

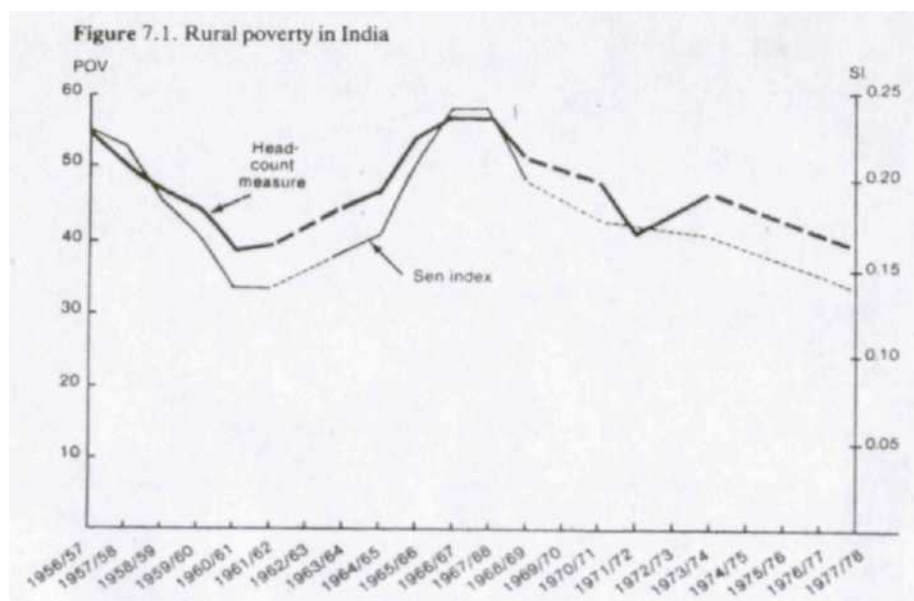
A complete assessment of trends in rural poverty should take account of several dimensions of poverty, of which income or consumption levels per head is only one. Equally relevant are factors such as longevity, access to health and education facilities, and perhaps also security of consumption levels from extreme shocks. However, time-series data on all of these dimensions are not available. Data from a series of consumption surveys conducted by the National Sample Survey Organisation (NSS), are available, and these data have been used in most of the studies of rural poverty in India. In this paper, I use NSS data on the distribution of consumption expenditure in nominal terms, combined with poverty lines in current prices, to compute two indices of poverty, the percentage of the rural population in poverty (the traditional head-count measure) and the Sen Index, which takes account of extent of poverty within the population below the poverty line (table 7.1). The poverty line for each year corresponds to a constant-price poverty line of 15 rupees per capita in 1960/61 prices adjusted using the consumer price index for agricultural laborers (CPIAL). The numerous deficiencies in these estimates have been well documented.<sup>1</sup> Nevertheless, they present a unique picture of changes in rural poverty over more than 20 years (fig. 7.1). No comparable time series for such a long period are available for any other developing country.

Table 7.1. Rural Poverty and Agricultural Income

	Percentage of population in Poverty (Head-Count Measure)	Sen Index	Rural Population (Million)	NDP Agriculture (Rs. Crores, 1970/71 Prices)
1936/57	54.1	0.23	329.47	11,953
1937/58	50.2	0.22	335.63	11,321
1958/59	46.5	0.19	341.80	12,604
1959/60	44.4	0.17	347.96	12,364
1960/61	38.9	0.14	354.13	13,143
1961/62	39.4	0.14	360.29	13,234
1963/64	44.5	0.16	376.04	13,204
1964/65	46.8	0.17	383.92	14,429
1965/66	53.9	0.21	391.79	12,279
1966/67	56.6	0.24	399.67	12,084
1967/68	56.5	0.24	407.55	14,043
1968/69	51.0	0.20	415.42	14,121
1970/71	47.5	0.18	431.17	16,354
1971/72	41.2	--	439.05	16,209
1972/73	43.1	--	445.34	15,118
1973/74	46.1	0.17	451.63	16,298
1977/78	39.1	0.14	476.79	19,045

Note: Estimates of the percentage of the population in poverty (col.1) for the years 1971/72 and 1972/73 are from data provided in Government of India, Department of Statistics, National Sample Survey Organisation (1981a) and Rao (1979). All other estimates are based on fitting a Lorenz curve to the data, as described in Ahluwalia (1978a). Sen index for 1971/72 and 1972/73 could not be computed because the sources cited for these years do not provide the full information needed.

The movements in rural poverty over two decades are shown in figure 7.1. The expanded data set bears out my (1978a) conclusion that there is no underlying time trend in poverty for the period as a whole. The percentage of the population in poverty declined through the fifties, rose to a peak in 1967/68, and then declined substantially, though unevenly, through the seventies. The Sen Index shows an almost identical pattern. The absence of any time trend is confirmed by the following results (figures in parentheses are t ratios)



$$\begin{aligned} \text{POV} &= 48.97 - 0.19t & R^2 &= 0.04 \\ & \quad (0.8) \\ \text{SI} &= 1.63 - 0.0007t & R^2 &= 0.04 \\ & \quad (0.8) \end{aligned}$$

Both indices show great variation in the extent of poverty. This could have been expected with the head-count measure, which takes no account of the intensity of poverty. When there is a substantial concentration of the population at the poverty line, as in India, small changes in the level of consumption can shift large numbers of people above or below it. This would show up as large changes in the measured incidence of poverty even though the changes in real consumption levels were marginal. This problem does not arise with the Sen Index, which gives due weight to the extent to which the consumption of individuals falls below the poverty line. It is therefore significant that the Sen Index also shows a coefficient of variation of 0.18 compared with that of only 0.12 for the head-count measure. Clearly, the variations in the measured degree of poverty over time reflect substantial variation in the measured levels of real consumption. It is important to explain these changes and to study their implications for policy.

The addition of data for the seventies materially affects some assessments of the underlying trends in rural poverty in India. For example, Griffin and Ghose (1979), in their critique of Ahluwalia (1978a), argued against the use of data from the fifties. They argued that the impact of the green revolution on rural poverty could be assessed only by focusing on the period after 1960/61. Using data for 1960/61 to 1973/74, they concluded that there was a significant trend increase in rural poverty in the period despite the downtrend from the 1967/68 peak. However, as shown in figure 7.1, the trend completely reversed in the 10 years following 1967/68. There is no basis whatsoever for asserting that the incidence of rural poverty in India has been rising from the sixties onwards.

My own assessment that there were movements in both directions, with no underlying trend, needs to be qualified in the light of two observations by Tyagi (1982). The first relates to Tyagi's argument that CPIAL, which is used to compute the poverty line in various years, exaggerates the extent of the rise in prices because it is based on 1956/57 weights. Tyagi points out that prices of wheat, production of which has increased rapidly, rose somewhat less than prices of items such as barley and gram (chickpeas), whose production growth has been more modest. Consumption patterns have changed in favor of items whose prices rose less. Tyagi does not present an alternative price series for rural consumption, but he shows that a composite index of cereal prices for 1973/74 using CPIAL weights is 2.6 percent higher than one using weights derived from the 1973/74 consumption pattern.<sup>2</sup> However, cereals account for only about 50 percent of total consumption expenditure in the rural expenditure classes, and unless there is a similar weighting problem for other food items, the overstatement of the rise in overall prices would be less than for cereals. Thus, this particular bias may well be small. However, any upward bias in the price index would lead to some overstatement in the extent of poverty in the seventies.

Tyagi also questions the accuracy of the NSS consumption estimates for 1960/61 and 1961/62. He shows that NSS estimates for these years show much higher levels of foodgrain consumption by households than do the official estimates of total foodgrain availability, a discrepancy that narrows considerably in the seventies. Tyagi argues that the most plausible explanation is that the NSS overestimated foodgrain consumption in 1960/61 and 1961/62. If this is indeed the case, the NSS consumption estimates for 1960/61 and 1961/62 may need to be revised downwards, which would raise the estimates of poverty in these years. An upward adjustment in the estimates of rural poverty in 1960/61 and 1961/62, combined with a downward adjustment in the seventies to correct for the exaggeration of the rise in prices by the base weighted price index, would have the effect of showing a modest trend improvement in rural poverty. It is not possible to resolve these questions satisfactorily with the data available. We can only note that even when there is a prolusion of apparently comparable data, our assessment of trends can only be tentative. This also qualifies any attempt to explain observed trends.

### **The Narain Equation and Some Alternatives**

Dharm Narain's analysis of the determinants of rural poverty was based on an equation that both expands and restricts the equation used in Ahluwalia (1978a), in which rural poverty is shown as a function of agricultural income per head of the rural population  $y$  and time  $t$ . Dharm Narain expanded this specification to include  $p$ , the consumer price index for agricultural laborers, as an explanatory variable reflecting the prices faced by the rural poor as consumers. He restricted the Ahluwalia formulation by using current agricultural income per head, while the Ahluwalia equation used income not only in the current year but also with a one-year lag.<sup>3</sup> A further difference is that in Dharm Narain's formulation all variables (including time) are entered in logarithmic form.

Table 7.2 presents the Narain equation as estimated from the expanded data set and compares it with the Ahluwalia equation, which includes lagged income but not prices. It also presents results from a composite specification which includes both prices and lagged agricultural income. All equations are in logarithmic form.

The effect of extending the period under study on the estimated coefficients of the Narain equation can be seen by comparing equations (3) and (4) in the table, which relate to the full period, with equations (1) and (2), which relate to the shorter period covered by Dharm Narain.<sup>4</sup> The explanatory power of the equation is considerably less for the full period than for the shorter period, but the results are qualitatively similar and statistically impressive. The coefficient on the agricultural income variable is negative, and on price positive, and both are highly significant. The coefficient on time is also negative and significant. These conclusions hold whether we use the head-count measure of poverty or the Sen Index as the dependent variable.

An interesting aspect of the comparison is that the coefficient on prices for the shorter period is reduced by half in the full period. On the other hand, the income coefficient doubles in the full period. Clearly, in the Narain equation the role of prices is substantially reduced when data for the seventies are included, while variations in income per head become much more

important. One possible reason for this could be that the vulnerability of the poor to sharp increases in prices declined in the seventies owing to the expansion and extension of public distribution into rural areas, which helped the poor protect their consumption in periods of rising prices.

**Table 7.2 Determinants of Rural Poverty**

	Constant	Log y	Log y (-1)	Log p	Log t	R <sup>1</sup>	Number of Observations
<b>A Narain Equation</b>							
<b>1956/57 to 1970/71</b>							
1) log POV	3.42 (4.4)	-0.58 (3.7)		0.58 (9.1)	-0.18 (8.0)	0.94	13
2) log SI	-2.19 (2.6)	0.91 (4.4)		0.88 (10.6)	-0.31 (10.6)	0.96	13
<b>1956/57 to 1977/78</b>							
3) log POV	7.27 (4.7)	-1.22 (4.0)		0.23 (2.2)	-0.12 (2.4)	0.62	17
4) log SI	3.24 (2.0)	-1.85 (4.5)		0.42 (3.0)	0.22 (3.3)	0.74	15
<b>B. Ahluwalia (1977) Equation</b>							
5) log POV	10.75 (5.9)	-0.99 (3.4)	-0.93 (2.7)		-0.03 (1.4)	0.68	17
6) log SI	8.80 (3.4)	-1.46 (3.2)	-1.45 (2.5)		-0.08 (2.0)	0.70	15
<b>C Composite Equation</b>							
7) log POV	9.63 (5.3)	-1.04 (3.8)	-0.76	0.17 (1.7)	0.10 (2.2)	0.74	17
8) log SI	6.39 (2.7)	1.60 (4.2)	-1.01 (2.2)	0.32 (2.4)	-0.20 (2.3)	0.81	15

*Note: Figures in parentheses are t statistics. The variables are defined as: POV, head-count measure of poverty. SI, Sen Index, y, NDP in agriculture in constant prices per head of the rural population; y (-1), the one-year lagged value of y, p, the consumer price index for agricultural laborers, and t, time.*

The explanatory power of the Narain and Ahluwalia equations is broadly comparable. The explanatory power of the Narain equation is lower when the head-count measure is the dependent variable but higher when the Sen Index is used.<sup>5</sup> These comparisons suggest that the effect of lagged agricultural income on rural poverty is at least as important as prices if we are concerned with explaining variation in poverty. What is more, this is not, as might be supposed, a case where lagged income per head acts as a proxy for prices. The correlation between  $y_{-1}$  and  $p$  is only 0.17, and the correlation between the logarithms of these variables is only 0.20. The low correlation may appear counter intuitive, but it is not surprising when one considers that  $p$  is heavily time-trended, whereas  $y_{-1}$  is not. The significance of  $y_{-1}$ , as an explanatory variable is therefore clearly independent of prices and is much more plausibly explained in terms of the cushioning effect through borrowing or sale of assets mentioned in note 3. The effect on consumption, and therefore poverty, of a fall in income in one year can be cushioned by borrowing or sale of assets, a cushion that is exhausted if there are two successive bad years. For this reason, a decline in income in one year does not lead to as large an increase in poverty as when there are two bad years in

succession Equally, a rise in income levels immediately following a bad year does not reduce poverty as much as might be expected, since consumption loans undertaken in the previous year would have to be repaid, and assets sold replaced, before consumption levels could recover fully. Lagged agricultural income is therefore an important explanatory variable in its own right.

The composite equation in table 7.2 includes both  $y_{-1}$ , and  $p$  as explanatory variables. The composite equations (7) and (8) have a higher explanatory power than either the Ahluwalia or the Narain equation. They explain three fourths or more of the variation in rural poverty, depending upon the measure used. The coefficient on  $p$  is positive, but the significance level declines. It is below acceptable levels when the dependent variable is the head-count measure of poverty but remains highly significant when the Sen Index is used.<sup>6</sup>

In summarize the expanded data base for 1956/57 to 1977/78 confirms that rural poverty agricultural income, prices and time are related broadly as indicated in Dharm Narain's results, but with important differences. Rural poverty appears inversely related to income per head in the rural areas, and the relation is considerably strengthened if agricultural income is also lagged. The addition of lagged agricultural income somewhat weakens the significance of the coefficient on prices but does not negate entirely. However, the absolute size of the coefficient on prices is considerably reduced in the extended period and is further reduced if lagged agricultural income is included.

### Problems of Interpretation

Interpretation of the estimated equations reported above is not as it may seem at first. Aggregate relationship of this type are often consistent with more than one underlying causal mechanism, and it is important to subject them to close scrutiny before accepting them as evidence for one or another point of view. This applies to both the observed positive relationship with prices and also the inverse relationship with agricultural income.

### The Role of Prices

The positive coefficient on the price variable in the Narain equation has been interpreted as confirming the hypothesis that inflation tends to accentuate rural poverty independent of the level of agricultural output per head. The hypothesis is entirely plausible on a priori grounds, but this does not mean that the equation as specified is appropriate to test it.

The a priori case is easily established. Sen's (1981b) model of a rural economy illustrates the plight of wage earners when there is a sharp rise in food prices. Such a rise could take place without any change in production per head in the rural economy because of a general inflation in which food prices move up with other commodity prices. Food prices also could rise owing to developments outside the rural economy, such as a rise in export demand or reduced imports of food. In either case, if rural money wages do not rise sufficiently to offset the increase in prices, the real incomes of the poor decline.<sup>7</sup> Such real wage effects are not the only mechanism through which price changes may affect rural poverty. Even if the rural poor are self-employed peasant producers who produce goods other than those they consume, a rise in food prices could accentuate rural poverty if it is not matched by a rise in the prices they receive.<sup>8</sup>

The specification used by Dharm Narain is not appropriate to test for such price effects, because the explanatory variable used is the level of prices, whereas it should be a relative price variable. The vulnerability of the poor arises from the fact that the prices they pay as consumers may rise more than those they receive as wage earners or producers. The misspecification leads to considerable difficulties in interpretation. If the price variable in the Narain equation should have been a relative price variable  $p/p^*$ , where  $p^*$  is some appropriate index of prices received by the poor, then the underlying relationship is of the following form:

$$\text{Log POV} = \alpha + \beta \log Y + \delta \log p^* + c \log t + u$$

Inclusion of  $p^*$  in the equation is necessary because an increase in  $p$  increases poverty only if  $p^*$  does not rise *pari passu*. In many situations, a sharp upsurge in inflation may mean a rise in  $p$ , the prices paid by the poor, without an immediate corresponding rise in  $p^*$  (especially when  $p^*$  refers to money wages). This, of course, can be expected to have an

adverse effect on poverty. However, as  $p^*$  catches up, the initial adverse effect is presumably overcome.<sup>9</sup> The Narain equation does not allow for any catching up—a higher level of  $p$  has a perpetually adverse effect on poverty, which is clearly misleading.

This misspecification also introduces a bias in the estimated equation. Since the excluded variable  $p^*$  is bound to be highly correlated with time (because of the inevitable trend element in prices), its exclusion from the estimated equation biases the estimated coefficient on  $t$ . In effect, the expected negative coefficient on  $p^*$  will be reflected in the estimated coefficient on  $t$ , which is biased downwards. It is because of this bias that in spite of the high  $t$  ratio, we cannot take the estimated negative coefficient on  $t$  at face value. This brings into question Guntant Desai's interpretation, in chapter 1 of this volume, of the negative coefficient on time in the Narain equation as indicative of the operation of other processes. We conduct a separate analysis for the incidence of poverty in each group. This is beyond the scope of this chapter.

**Table 7.3. Alternative Price Specifications**

<b>A. Logarithmic Form. Dependent Variable: log POV</b>								
	Constant	log $y$	log $y(-1)$	log ( $p/p_d$ )	log $p$	log $p_d$	log $t$	R <sup>2</sup>
	8.48	-1.0	-0.87	0.45			-0.01	0.69
		(3.4)	(2.5)	(0.8)			(0.3)	
	7.85	-1.01	-0.85	0.57				0.69
		(3.5)	(2.6)	(1.6)				
	9.50	-1.05	-0.72		0.54	-0.38	-0.08	0.75
		(3.7)	(2.1)		(1.0)	(0.7)	(1.5)	
	10.02	-1.04	-0.77		0.88	0.82		0.70
		(3.6)	(2.2)		(1.6)	(1.7)		
<b>B. Linear Form. Dependent Variable : POV</b>								
	Constant	log $y$	log $y(-1)$	log ( $p/p_d$ )	$\bar{p}$	$\bar{p}(-1)$	$t$	R <sup>2</sup>
5	111.5	-1.39	-1.24	0.29				0.72
		(3.8)	(2.9)	(1.8)				
	95.6	-1.48	-1.17	0.43			0.18	0.73
		(3.8)	(2.6)	(1.8)			(0.8)	
	139.4	-1.32	-1.27		0.04		-0.13	0.67
		(3.0)	(2.5)		(0.3)		(0.8)	
	117.6	-0.90	-1.08			0.22	-0.16	0.70
		(1.7)	(2.2)			(1.2)	(1.0)	
	116.4	-0.89	-1.06		0.03	0.22	-0.17	0.70
		(1.6)	(2.0)		(0.2)	(1.1)	(1.0)	

**Note: Figures in parentheses are  $t$  statistics**

A crude alternative, though perhaps the only feasible one, is to treat  $p_d$ , the national accounts deflator for agricultural gross domestic product (GDP), as a proxy for prices received by the rural poor and then use the relative price variable  $p/p_d$  as an explanatory variable. The results are presented in table 7.3. The coefficient on the relative price variable  $p/p_d$  is positive but not significant in the logarithmic form, especially when  $t$  is included. However, it is positive and significant in the linear form. When  $p$  and  $p_d$  are separately entered in the logarithmic equations (equations [3] and [4] in table 7.3), we obtain the expected positive coefficient on  $p$  and the negative coefficient on  $p_d$ , but the significance levels are low. Removing the time term improves the significance level of these coefficients,

but they still remain below the conventional limits.

A second way around the specification problem is to test for the impact of prices by using the rate of inflation, rather than the level of prices, as the explanatory variable. There is considerable a priori justification for this. If the problem arises because of the stickiness of money wages, then we can expect poverty to increase in periods when prices rise, but once prices stabilize, money wages can be expected to catch up, so that in time the initial adverse effect of inflation would be corrected, even though the level of prices remained high. Thus it is not the level of prices but the fact of rising prices that is important. This hypothesis is tested in equations (7), (8), and (9) in table 7.3, in which the current year's rate of inflation,  $p$ , and the previous year's rate of inflation,  $p_{-1}$ , are used as explanatory variables, first separately and then jointly. It is somewhat surprising that there is no significant coefficient on these variables in any of these cases.

### **Agricultural Production and Poverty**

The rationale for using agricultural income per head of the rural population as an explanatory variable affecting rural poverty is self-evident. If the distribution of income remained constant and there were no adverse terms-of-trade effects, then an increase in agricultural production should raise income levels for all sections of the rural population, thus pushing some individuals above the poverty line. We cannot, of course, assume that the distribution of income would remain constant or that terms-of-trade effects would not occur. Nevertheless, a significant negative coefficient on the agricultural income variable tests whether the net effect of rising income per head after allowing for these other considerations is a reduction in poverty to some extent. This is the so called trickle-down mechanism, about which much has been written. The existence and strength of such mechanisms is clearly important for policy. They hold out the hope that strategies for raising agricultural production would tend to reduce poverty even if they were not accompanied by radical institutional changes such as land reforms, which, desirable though they are, have proved extremely difficult to implement in practice.

The equations in tables 7.3 and 7.4 confirm that rural poverty is inversely related to income levels per head. This is so whether we look at Dharm Narain's or Ahluwalia's formulations or the composite equation, all of which show negative and significant coefficients on the income variables. Can we interpret this inverse relationship as some sort of confirmation of trickle-down mechanisms?

To begin with, we must recognize the difference between saying that trickle-down mechanisms exist and saying that trickle-down has worked. To assert that trickle-down mechanisms exist is only to say that the rural economy works in such a way that a rise in agricultural production and income levels per head would lead to some decline in rural poverty. This is quite different from saying that trickle-down has worked in the sense that it has actually led to a decline in poverty over time. Such an outcome would require not only that trickle-down mechanisms exist but also that agricultural growth has been sufficiently rapid for income levels per head to rise over time. The estimated inverse relationship does indeed suggest that trickle-down mechanisms do exist. But it is also true that growth was not fast enough to achieve the desired reduction in poverty over the period as a whole. Real agricultural income, measured in terms of net domestic product (NDP) in agriculture, grew about 2 percent per year from 1956/57 to 1977/78, which was only slightly faster than rural population.<sup>10</sup> As a result, agricultural NDP per head of the rural population showed no significant growth trend. Year-to-year fluctuations reflect the effect of weather on total agricultural production, but these variations are around a near-stationary level.

$$\text{Log } y = 5.85 + 0.0026 t \quad R^2 = 0.08$$

(1.4)

As Srinivasan points out in chapter 5 in this volume, there simply was not enough growth for trickle-down mechanisms to have a significant trend impact on poverty.

**Table 7.4. Agricultural Production and Rural Poverty**

<i>Logarithmic Form</i>							
	<i>Constant</i>	<i>log y</i>	<i>log y(-1)</i>	<i>d</i>	<i>d. log y</i>	<i>d. log y(-1)</i>	<i>R</i> <sup>2</sup>
log POV	10.49	-1.07 (8.9)	0.77 (6.2)	1.25 (1.0)	0.18 (0.8)	-0.61 (2.0)	0.97
log SI	7.87	-1.51 (1.7)	-1.21 (1.3)	-10.68 (0.5)	-1.15 (0.4)	4.30 (0.6)	0.36
<i>Linear Form</i>							
	<i>Constant</i>	<i>y</i>	<i>y(-1)</i>	<i>d</i>	<i>d.y</i>	<i>d.y(-1)</i>	<i>R</i> <sup>2</sup>
POV	142.25	1.17 (2.8)	-1.12 (2.0)	0.16 (0.003)	0.59 (0.6)	-0.62 (0.5)	0.67
SI	0.74	-0.009 (2.4)	-0.007 (1.9)	-0.68 (0.8)	-0.005 (0.4)	0.02 (0.8)	0.64

**Note:** Figures in parentheses are *t* statistics.

Even this interpretation of the estimated equations as indicating a limited *potential* for trickle-down has been challenged. Some believe that while agricultural expansion may have had strong links with income generation for the poor in the first half of the period, this linkage weakened considerably in the second half. It has been argued that agricultural growth up to the mid-sixties resulted principally from area expansion, which favored increased use of labor and therefore benefited the poor. Growth in the second period was mainly the result of higher yields, which resulted from the new technology. It is argued that adoption of this technology was associated with changes in the rural economy that limited the downward flow of benefits. The concentration of increased yields in certain regions is relevant in this context. Equally important is the fact that the new technology depends heavily upon intermediate inputs such as pump sets and tractors, which may have reduced the use of labor in agriculture. In addition, the high credit requirement may have limited benefits to smaller and marginal farmers.

The hypothesis that the linkage between higher agricultural production and the alleviation of rural poverty weakened after the mid-sixties needs to be studied intensively. The case for it is certainly not established a priori. While some technological changes, such as combine harvesters, probably were labor-displacing, others were not necessarily so. The spread of irrigation, high-yield varieties, and application of fertilizers calls for a more labor-intensive production. Even the use of tractors, insofar as it permits more effective multiple cropping, is not necessarily a net displacer of labor. Similarly, while it may well have been more difficult for small and marginal farmers to benefit from the new technology, there was a conscious shift of policy in the seventies aimed at overcoming these difficulties. There was a considerable expansion in rural development programs and employment-generating schemes aimed at supporting productive activity and income levels in precisely these "weaker groups."

Table 7.4 presents a crude test of whether the relationship between agricultural production and rural poverty weakened in the second half of the period. A dummy variable *d* is specified which takes the value zero for 1967/68 and is set at unity for 1968/69 and thereafter. Using this variable in conjunction with *y*, we can introduce the product term *dy* as an additional explanatory variable into the equation along with *y*. A significant positive coefficient on the new variable would indicate that the inverse relationship between rural poverty and income per head dampened in the second period. In no case is there a significant positive coefficient on either *d* or *dy*, which we would expect if the trickle down mechanism had become weaker. Similar equations have been estimated using slightly different cutoff points from the dummy variable but with essentially the same results.

These results suggest that trickle down mechanisms exist in the sense defined above and also that there is no evidence that they have weakened in the later period. However, this conclusion should not be interpreted as an endorsement of trickle-down strategies to the exclusion of other policies or strategies directly aimed at helping the poor. The need for devising strategies of growth to ensure adequate flows of benefits to the poor, or more modestly, for supplementing the general strategy of raising agricultural production with more target-oriented programs aimed at the weaker sections, remains urgent. Trickle-down processes alone would probably take an inordinately long time. The estimated equations certainly bear this out. Even if we take the elasticity of our bead-count measure of poverty with respect to income per head to be 1.2 (the highest level obtained in table 7.2), the objective of reducing the extent of rural poverty from 40 percent of the rural population to about 20 percent would require an increase in per capita income of about 42 percent. Since our ability to raise the rate of growth of agricultural NDP is limited, an increase of this order takes time. If agricultural NDP per head of the rural population were to rise by 1 percent per year—a modest improvement over past performance—it would take 35 years to reduce the percentage of the population in poverty to 20 percent by trickle-down alone. If the growth rate were raised to 2 percent—a very substantial improvement over observed rates of growth—it would take 18 years. Growth certainly makes a difference, but it must be conceded that even on optimistic assumptions, the process would be slow if we relied on growth alone.

### **Conclusions, Qualifications, and Speculations**

The implications of my results for the important issues addressed by Dharm Narain, with their limitations and qualifications, can now be summarized. To begin with, I must put things in perspective by emphasizing that a critical limitation of my analysis is the use of a unidimensional measure of poverty in terms of consumption levels. A comprehensive assessment of the living conditions of the poor, and changes over time, must encompass not only consumption levels but also health, longevity, security in both health and consumption levels, and, of course, access to public goods such as drinking water and education. Rural development policy in India has been shaped consciously to improve conditions in all these aspects, and we need to assess progress in terms of changes in these dimensions as well as changes in consumption per head. Time-series data on all of these dimensions are scarce, although the available evidence points to considerable improvement in health, longevity, and education. An interesting feature of recent experience is the establishment of institutions such as the public distribution system and rural employment programs, both of which add to the security of income and consumption by insulating the population to some extent from the worst effects of drought and inflation. Unfortunately, it is not possible to assess the impact of these developments on the living conditions of the rural population in a comprehensive manner. Therefore, the indices that we have used, although clearly inadequate, probably provide the best possible basis for studying the issues considered in this chapter.

The first issue that I have considered relates to the long-term trend in rural poverty. The NSS data permit the firm conclusion that there is no basis for the view that the incidence of rural poverty has increased over time, especially in the period after the green revolution. The data for 1956/57 to 1977/78 show no significant trend, and the data for the period after the green revolution show a more or less steady decline. The measured incidence of rural poverty in 1977/78 seems to be about the same as that observed in 1960/61 and 1961/62, but this may be misleading because of the biases pointed out by Tyagi (1982). These may result in understatement of the extent of poverty in 1960/61 and overstatement of it later. Whether these biases exist is far from definitely established, but if they do, the corrected long-term trend may well show a slight decline in rural poverty. What is more important, however, is whether the improvements observed in the seventies will continue. The NSS has switched from annual consumption surveys to 5-year surveys. The data for 1982/83, when they become available, will help to throw light on this all-important issue.

The second issue considered in this chapter is the relationship between rural poverty and agricultural income levels per head. Three conclusions have emerged: (1) There is fairly strong evidence of an inverse relationship between agricultural income per head and the incidence of rural poverty, especially if account is taken of lagged effects. (2) There is no

evidence that this relationship has weakened since the green revolution; and (3) reliance on growth alone will not bring about a large reduction in the incidence of poverty in the near future . These conclusions underscore the need for rural development programs aimed especially at the rural poor. Because of the highly aggregative nature of my analysis, these conclusions must be qualified. Differences among states may arise because of variations in agricultural conditions and patterns of growth. The analysis also assumes a common structure over time in the model to be estimated. Yet it could be argued that important changes have taken place that cannot be captured in the regression equations by using dummy variables. The effect of rising agricultural production on rural poverty depends upon a very wide variety of factors. Some of these are essentially exogenous, such as developments in the land-man ratio and the nature of the technology underlying the rise in production. Others depend upon policy towards agricultural development. For example, programs designed to increase the ability of small and marginal farms to benefit from available improvements in technology and irrigation help to widen the spread of production gains. Equally important are factors affecting the state of rural labor markets, which determine the ability of labor to command an appropriate wage. Labor organization can be particularly important in this context, as shown by the experience of Kerala. Also, rural employment programs—which add to labor demand in rural labor markets, to the advantage of landless laborers—have been an important element of rural development policy in the seventies. The state of urban labor markets