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WHY HAVE SOME INDIAN STATES PERFORMED BETTER THAN OTHERS AT REDUCING RURAL POVERTY?

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ABSTRACT

Rural poverty rankings of Indian states in 1990 were very different from 1960. This unevenness in progress allows us to study the causes of poverty in a developing rural economy. We model the evolution of various poverty measures, using pooled state-level data for the period 1957-91. Differences in trend rates of poverty reduction are attributed to differing growth rates of farm yield per acre, and differing initial conditions; states starting with better infrastructure and human resources saw significantly higher long-term rates of poverty reduction. Deviations from the trend are attributed to inflation (which hurt the poor in the short term) and shocks to farm and nonfarm output.

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1. INTRODUCTION

A key to sound development policymaking may lie in understanding why some economies have performed so much better than others in escaping absolute poverty. One can postulate a number of explanatory factors, including differences in technical progress, public spending, macroeconomic stability, and initial endowments of physical and human wealth.[1] A large literature has emerged aiming to test such explanations for cross-country and interregional differences in the rate of economic growth.[2] Though it has not, to our knowledge, been done yet, the same approach could also be applied to cross-country differences in (say) the rates of change in poverty relative to some agreed international poverty line.

There are, however, problems in using cross-country data for this purpose, not least of which is the lack of comparable survey data for tracking progress in raising household living standards and reducing absolute poverty. Changes over time in survey methods and differences between countries in survey data and sources for both the indicators of living standards and the variables determining their evolution have been a long-standing concern in applied work. But for India, one can assemble a long time series of reasonably

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[1] Recent theories of economic growth have suggested a potentially rich menu of such factors. For a review of the theory of growth, see Barro and Sala-I-Martin (1995) and Hammond and Rodriguez-Clare (1993).

[2] For a survey, see Barro and Sala-I-Martin (1995).

comparable household surveys for its composite states (some of which are larger than most countries) as well as reasonably comparable explanatory variables.

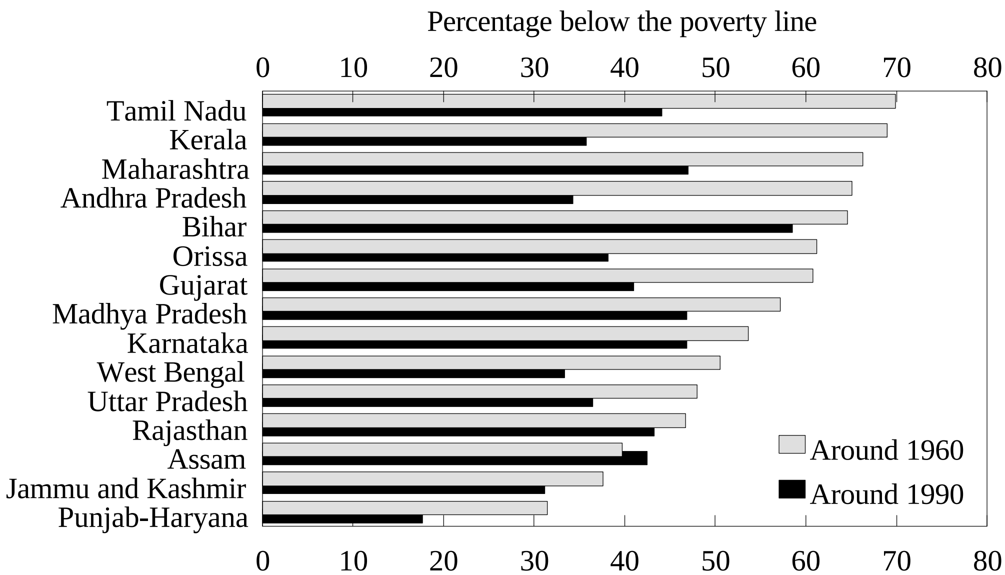
The regional disparities in levels of living in India are well-known.[3] For instance, the proportion of the northeastern state of Bihar's rural population living in poverty around 1990 was about 58 percent, more than three times higher than the proportion (18 percent) in rural northwestern Punjab and Haryana. (We describe how we have estimated these numbers later.) Some of these differences have persisted historically; for example, Punjab-Haryana also had the lowest incidence of rural poverty around 1960. However, looking back over time, the more striking—though often ignored—feature of the Indian experience has been the markedly different rates of progress between states; indeed, the ranking around 1990 looks very different to that 30 years earlier, as can be seen in Figure 1.[4] For example, the southern state of Kerala moved from having the second highest incidence of rural poverty around 1960 to having the fifth lowest around 1990.

This paper tries to explain the relative successes and failures at poverty reduction evident in Figure 1. We focus on the rural sector because that is where three-quarters of India's poor live. Much discussion, and debate, has centered on a number of questions concerning the determinants of poverty in this setting, including the extent to

[3] See Nayyar 1991; Choudhry 1993; Datt and Ravallion 1993.

[4] Kendall's tau gives a rank correlation of 0.30, but this is not significant at the 10-percent level.

Figure 1 Poverty rates by states of India, 1960-90



Averages are for first three survey rounds and last three.

which agricultural growth "trickles down" to the rural poor (many of whom have little or no land of their own), the poverty impact of growth in the nonfarm sector, and the extent to which economy-wide variables (such as the rate of inflation and the level of public spending) matter to the rural poor.[5] Questions have also been raised about the extent to which initial investments in infrastructure and human resources pay off in terms of welfare in the longer term, and what "handicap" regions with initially poor infrastructure face in catching up. We aim to throw new light on these and related questions.

The following section outlines our methodology. Section 3 describes our data, and the trends in overall progress in raising rural living standards across states of India.

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[5] For a review of the literature on these and related topics, see Lipton and Ravallion (1995).

Section 4 presents the models we have estimated for explaining both the differing trends and the fluctuations over time. Section 5 concludes.

2. MODELING PROGRESS IN REDUCING POVERTY

For each state, we estimate a time series of measures of rural poverty, P_{it} for state $i=1,..,N$ over dates $t=1,..,T$. (The precise measures are described later.) We assume that each state has a deterministic trend value of the (log) poverty measure given by

$$\ln P^*_{it} = \gamma' X_i t + \eta_i , \qquad \textbf{(1)}$$

where X_i is a vector of regional characteristics, comprising initial conditions and trends in exogenous time-dependent explanatory variables, and η_i is a state-specific effect. Note that $\gamma' X_i$ is interpretable as state i's trend rate of progress in reducing poverty. A first difference of equation (1) can be thought of as the "growth regression" for the poverty measures.

What variables should be included in X_i? India's rural poor derive consumption from their own landholdings, employment on other farms, self-employment in rural nonfarm activities, and savings and transfers, including from outside the rural economy. We assume that the determinants of the trend rate of rural poverty reduction in any state are as follows:

- *The state s rate of technological progress in agriculture*, measured by the trend rate of growth in farm output per acre. This may matter both directly, through gains in smallholder productivity, and indirectly via demand for farm labor. There has been much debate on how much India's poor have shared in agricultural growth.[6]
- *Initial conditions related to the state s physical and human infrastructure in rural areas*. Better infrastructure (irrigation, roads, schools, and health clinics) could increase the rates of return to investment. It could also matter to the growth rate in employment opportunities, including the ability to export reasonably skilled labor and derive consumption from the subsequent remittances. It has been argued that prospects of escaping poverty in India are severely constrained (inter alia) by inequalities in basic health and education (Drèze and Sen 1995). All these effects would presumably exist independently of any effects of better initial conditions on farm yields.
- *The long-run rate of economic growth in the state s nonagricultural economy*. This may put upward pressure on agricultural wages by absorbing underemployed rural labor in the nonagricultural sector. It may also increase

[6] Contrast, for example, the views of Saith (1981) and Ahluwalia (1985). See Ravallion and Datt (1994) for references and further discussion. One difference with this literature is that we use farm yield (output per acre) rather than average agricultural income or output per person. Yield is likely to be a better indicator of technological progress in agriculture, which is what we are trying to measure here. We did test the homogeneity restriction implied by the use of per capita agricultural output, by including (log) output per acre and land acreage per person as separate variables; the latter was insignificant, while output per acre continued to have a significant effect.

remittances from the urban sector to the rural sector. Against these arguments, Ravallion and Datt (1996) found very weak effects of urban economic growth on rural poverty in India at the all-India level; it can be argued that the nature of India's capital intensive industrialization process (largely in urban areas) has absorbed relatively little labor from rural areas and hence brought few benefits to the rural poor (Eswaran and Kotwal 1994).

- *The trend in the state s public spending on economic and social services*. This may matter directly by increasing the productivity of investment in the rural economy, or by redistribution in favor of the poor; there may also be indirect effects on aggregate demand in the rural economy.[7]

The assumption that these variables are all exogenous to the trend in rural poverty reduction could be questioned. This is a matter of judgment, recognizing that dropping a variable because of a fear of possible endogeneity could create an even bigger problem of omitted variable bias. While we think this is a defensible set of exogenous variables, we will offer tests of exogeneity.

There are also deviations from the state-specific trends in measured poverty. The deviations are assumed to be determined by the deviations from trends in a set of

[7] It has been argued that the rate of growth in public spending by the states has influenced progress in reducing rural poverty in India (Sen and Ghosh 1993). Under India's constitution, the states are responsible for the bulk of the public services that are likely to matter most to the poor (such as agriculture and rural development, social safety nets, and basic health and education spending).

exogenous variables, roughly interpretable as the "shocks" to the poor. The deviation from the trend level of poverty in state *i* at date *t* is thus given by

$$\ln P_{it} - \ln P^{*}_{it} = \pi'(Y_{it} - Y^{*}_{it}) + \epsilon_{it} \qquad (2)$$

where Y_{it} is a vector of time-varying exogenous variables with trends Y^{*}_{it} and ϵ_{it} is an error term that we assume follows an AR(1) process:

$$\epsilon_{it} = \rho^{\tau_t}\epsilon_{it-\tau_t} + u_{it}, \qquad (3)$$

in which u_{it} is a standard (white noise) innovation error and τ_t is the time interval between the successive household surveys. Since the surveys are unevenly spaced, the autocorrelation parameter ρ is raised to the power of the time-interval τ_t so as to consistently define an AR(1) process.[8]

The deviations from the trends in the poverty measures are assumed to be determined by the deviations from the trend of the same variables described above. We also include the rate of inflation; adverse impacts of inflation on India's rural poor has been identified in past research (including Saith 1981; Ahluwalia 1985; Bell and Rich

[8] We estimate the model in the levels form, rather than the "growth regression" obtained by taking the first difference of equation (4), so as to allow direct estimation of the η_i's and to avoid the complex ARMA error structure of a "growth regression" induced by our unevenly spaced data.

1994). Elsewhere, we argue that inflation has a short-term real effect because of sluggishness in the adjustment of nominal wages (Ravallion and Datt 1994).[9]

Equations (1), (2), and (3) imply the following econometric model for the levels of poverty measured across states and dates:

$$\ln P_{it} = \pi' \nabla Y_{it} + \gamma' X_i t + \eta_i + \epsilon_{it}, \tag{4}$$

where, for brevity, we define $\nabla Y_{it} \equiv Y_{it} - Y^*_{it}$, the deviations of the time-dependent variables from their trend levels. (The vector X_i includes the initial conditions as well as the trend rates of change in the time-dependent variables.)

Equation (4) is not the most general dynamic model one could write down. The AR(1) specification for the error term imposes the common factor restriction on a more general dynamic model with lags on all variables (Sargan 1980). However, we are unable to estimate the more general dynamic panel-data model, given the form of our data set. The main problem has to do with the unevenly spaced NSS consumption surveys. Starting from an AD(1,1) type model in annual time units, as we reexpress the model for the observed NSS survey time periods, we end up not only with a nonlinear dynamic panel data model, but also one with a nonuniform dimension of the vector of right-hand-side (RHS) variables. For different time-observations, the RHS variables have lags of

[9] We have elsewhere estimated an agricultural wage model of this type using all-India data (Ravallion and Datt 1994). Our results indicate that a once-and-for-all increase in the price level has only a short-term negative effect on real wages (nominal wages subsequently catch up with the price change). However, a continuing higher rate of inflation erodes real wages over time. We tested the homogeneity restriction implied by the use of the inflation rate by using, instead, the logs of the current and lagged price level; the restriction passed comfortably.

different order, depending upon the gap between the successive NSS rounds. We do not know of an appropriate estimator for such models.

To estimate equation (4), we use a nonlinear least squares dummy variable (LSDV) estimator. This is the standard covariance estimator for static panel data models, adapted to deal with the nonlinearity due to the autoregressive error term and the uneven spacing of our survey data.[10] The estimator is consistent whether or not the state-specific effects are orthogonal to the other explanatory variables in the model, though, under orthogonality, there may be more efficient estimates.

3. DATA AND TRENDS

THE CONSUMPTION DATA AND POVERTY MEASURES

We shall use a new and consistent set of measures of absolute poverty and mean consumption per person for the rural areas of India's 15 major states, spanning the period 1957-58 to 1990-91. The measures are based on consumption distributions from 21 rounds of the National Sample Survey (NSS) spanning this period. However, not all 21

[10] The estimator thus belongs to the class of nonlinear generalized least squares estimators (Hsiao 1986).

rounds of the survey can be covered for each of the 15 states.[11] Altogether, we use 310 distributions, forming a panel data set that is unbalanced in its temporal coverage for different states. The NSS rounds are also unevenly spaced; the time interval between the midpoints of the survey periods ranges from 0.9 to 5.5 years.[12]

We follow common practice for India of using the Consumer Price Index for Agricultural Laborers (CPIAL) as the deflator. State-level monthly CPIAL indices for the 15 states were collated for the entire period beginning August 1956.[13] We have incorporated interstate cost of living differentials, using the Fisher price indices of

[11] For 12 states (Andira Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Punjab and Haryana, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal), all 21 rounds are covered. (Only from 1964-65 does Haryana appear as a separate state in the NSS data. To maintain comparability, the poverty measures for this and subsequent rounds have thus been aggregated using rural population weights derived from the decennial censuses). For Gujarat and Maharashtra, 20 rounds are included, beginning with the 14th round for 1958-59 (prior to 1958-59, separate distributions are not available for Maharashtra and Gujarat, which were merged under the state of Bombay). For Jammu and Kashmir, only 18 rounds can be included, beginning with the 16th round for 1960-61. For Jammu and Kashmir, while the NSS consumption distributions are available prior to Round 16, we are constrained by the availability of data on the rural cost-of-living index. The earliest available data on CPIAL indices for Jammu and Kashmir are for 1964-65. For the period 1960-61 to 1964-65, we have used the rate of inflation implied by the consumer price index (for industrial workers) in Srinagar as a proxy, which enabled us to make use of the NSS distributions for Rounds 16, 17, and 18. However, for the period before 1960-61, even the Srinagar consumer price index is not available.

[12] There is also considerable variation in the sample sizes over the NSS rounds; for all states, the rural samples range from 3,762 households for the 16th round (July 1959-June 1960) to 99,766 households for the 32nd round (July 1977-June 1978), with a median sample size of 15,467 households for the 28th round (October 1973-June 1974). The smallest sample size for any state is 140 households for rural Gujarat for the 16th round. Assuming a simple random sample for the rural sector within the state, this implies a maximum standard error, for a head-count index of 50 percent, of 4.2 percentage points. However, more than 85 percent of the 310 distributions have sample sizes upwards of 400 households and, hence, a maximum standard error for the head-count index of 2.5 percentage points.

[13] For some states, the published data from the Labour Bureau had to be supplemented with the CPIAL estimates reported in Jose (1974). The states (and years) for which we used this source were Gujarat and Maharashtra (1956/57 to 1959/60); Jammu and Kashmir, and Uttar Pradesh (1956/57 to 1963/64); and Tamil Nadu (1956/57 to 1966/67).

Chatterjee and Bhattacharya (1974).[14,15] The final indices are averages of monthly indices corresponding to the exact survey period of each NSS round. Since this is a fixed-weight index, utility-compensated substitution effects are ignored.[16]

For the poverty measures, we use the poverty line originally defined by the Planning Commission (India 1979), and recently endorsed by Planning Commission (India 1993). This is based on a nutritional norm of 2,400 calories per person per day, and is defined as the level of average per capita total expenditure at which this norm is typically attained. The poverty line was thus determined at a per capita monthly expenditure of Rs 49 at October 1973-June 1974 all-India rural prices.

The three poverty measures we consider are the head-count index (H), the poverty-gap index (PG), and the squared poverty-gap index (SPG) proposed by Foster, Greer, and Thorbecke (1984). H is simply the proportion of the population living below the poverty line. PG is the average distance below the line expressed as a proportion of the poverty

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[14] These estimates are based on the 18th round of the NSS, for the period February 1963 to January 1964. Minhas and Jain (1989) and Planning Commission (India 1993) assumed that these differentials for 1993-64 also apply to 1960-61, which is the base period for the CPIAL series. We do not make this unnecessary assumption, which implies the same rate of rural inflation in all states between 1960-61 and 1963-64. The interstate cost-of-living differentials for 1960-61 are easily derived, using the price relatives for 1963-64 from Chatterjee and Bhattacharya (1974), and the state and all-India CPIAL indices for 1960-61 and 1963-64.

[15] We also adjusted the state CPIAL series to correct for the constant price of firewood used by the Labour Bureau in its published series since 1960-61 (see Datt [1997] for further details on this adjustment). However, since we do not have data on actual firewood prices for individual states, we assume that the price of firewood increased at the all-India rate in all states. The necessary adjustment to the state indices was then worked out, using the state-level weights for firewood in the state CPIALs (ranging from 4.99 percent in Punjab and Haryana to 8.79 percent in Madhya Pradesh).

[16] Using a flexible (rank three) demand system, Ravallion and Subramanian (1996) test the effects of ignoring substitution on the all-India time series of poverty measures used here. The time-series properties of the rural poverty measures are affected little by ignoring substitution effects.

line, where the average is formed over the entire population (counting the nonpoor as having zero distance below the line). SPG is defined the same way as PG, except that the proportionate distances below the poverty line are squared, so that the measure will penalize inequality among the poor. The poverty measures are estimated from the published grouped distributions of per capita expenditure, using parameterized Lorenz curves; for details on the methodology, see Datt and Ravallion (1992).

A complete description of the data set assembled for this study (including sources of all variables) can be found in Özler, Datt, and Ravallion (1996). The data set is available on discs.

TRENDS BY STATE

For descriptive purposes, we isolate the unconditional long-run trends, correcting only for the serial correlation in the errors. They are estimated by regressing the log of the poverty measures on time, allowing a different slope and intercept for each state, and a (common) AR1 error term. While the slope parameters provide our estimates of the unconditional trend rates of consumption growth and progress in reducing poverty over 1957-91, the intercept coefficients are interpretable as the initial levels of mean consumption and poverty measures. These unconditional trend rates of growth are given in Table 1. (The trend coefficients and standard errors have been multiplied by 100 to give percentages.)

The trend rates of progress are diverse across the states. The trend rate of per capita consumption growth ranged from -0.3 percent to 1.6 percent per year. The variance in trends is even higher for the poverty measures. There was a trend decrease in poverty for all three measures (significant at the 5-percent level or better) in 9 of the 15 states, namely, Andhra Pradesh, Gujarat, Kerala, Maharashtra, Orissa, Punjab and Haryana, Tamil Nadu, Uttar Pradesh, and West Bengal. The trend was not significantly different from zero at the 5-percent level in the other 6 states of Assam, Bihar, Jammu and Kashmir, Karnataka, Madhya Pradesh, and Rajasthan; there was not a significant positive trend for any state for any poverty measure. We found no evidence of an accelerating trend decline in poverty for any state or any measure.[17] There is a strong indication of serial correlation in both mean consumption and the poverty measures (Table 1, last row). There is also a tendency for the absolute size of the trend to be higher for PG than H, and for SPG than PG.

In terms of the progress in both raising average household consumption and reducing rural poverty, the state of Kerala turns out to be the best performer over this period. The second, third, and fourth highest trend rates of consumption growth were observed for Andhra Pradesh, Tamil Nadu, and Maharashtra, respectively. In terms of

[17] We also tried a quadratic form of the state time trends. But for none of the states and none of the poverty measures did we find both the linear and the quadratic terms to be negative and significant.

Table 1 Trend rates of change in rural living standards, 1957-58 to 1990-91

		Poverty Measures		
	Mean Consumption [0.37]	Head-Count Index (H) [0.57]	Poverty-Gap Index (PG) [0.85]	Squared Poverty-Gap Index (SPG) [1.13]
		(percent per year)		
Andhra Pradesh	1.23	-2.23	-3.56	-4.53
Assam	-0.30	0.35	0.22	0.20
Bihar	0.06	-0.14	-1.15	-2.00
Gujarat	0.84	-1.69	-3.14	-4.28
Jammu and Kashmir	0.29	-0.64	-1.00	-1.23
Karnataka	0.14	-0.67	-1.21	-1.20
Kerala	1.61	-2.26	-3.93	-5.17
Madhya Pradesh	0.21	-0.46	-1.21	-1.82
Maharashtra	0.96	-1.21	-1.91	-2.41
Orissa	0.73	-1.57	-2.70	-3.70
Punjab and Haryana	0.46	-2.17	-3.36	-4.35
Rajasthan	0.33	-0.80	-1.16	-1.48
Tamil Nadu	1.05	-1.44	-2.34	-3.05
Uttar Pradesh	0.60	-1.18	-1.88	-2.49
West Bengal	0.74	-1.49	-2.17	-2.75
Lagged error	0.695	0.670	0.644	0.640
	(16.19)	(13.89)	(12.73)	(12.45)

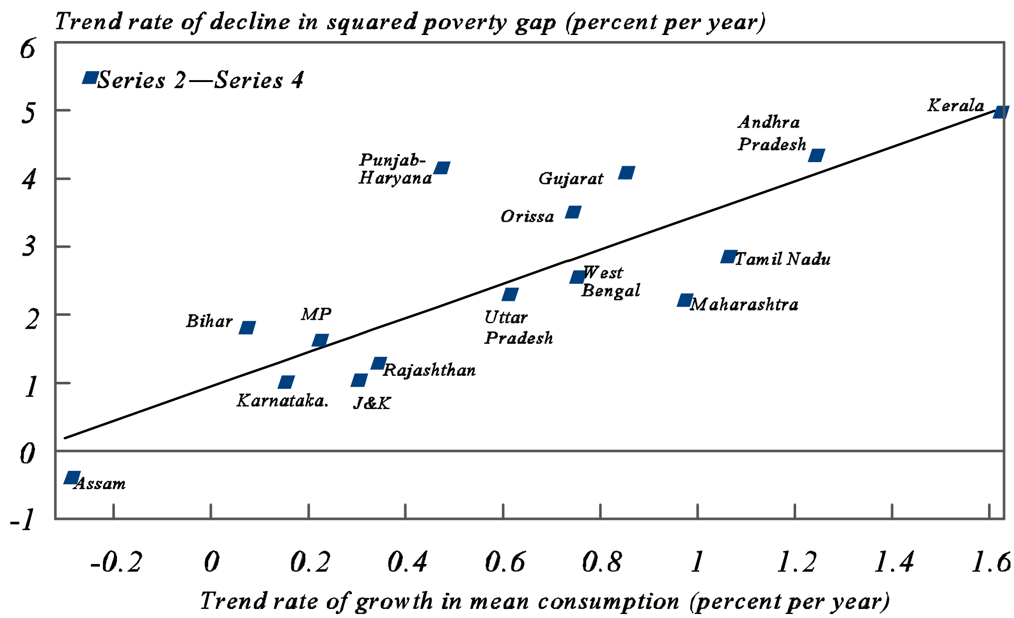
Note: The above estimates of the trend rates of change control for state-specific fixed effects and serial correlation in the error term. Approximate standard errors of the trend rates of change are in square brackets [ ]; approximate t-ratios of the lagged error parameter are in parentheses ( ). The number of observations used in the estimation is 310.

the rates of poverty reduction, the second, third, and fourth states were Andhra Pradesh, Punjab and Haryana, and Gujarat; the ranking is invariant to the choice of poverty measure, though differences in their rates of poverty reduction are not large. The worst performer was Assam by all measures. The other poor performers were Bihar, Jammu and Kashmir, Karnataka, Madhya Pradesh, and Rajasthan; the exact ranking varies by the measure used.

There is clearly a high correlation between the trend rates of consumption growth and poverty reduction. Figure 2 plots the trend in the squared poverty gap against that in mean consumption (the picture looks similar for the other two poverty measures). Some states performed better than others in reducing poverty, *given* their trend rate of growth in average consumption. The best performer in terms of distance from the least squares regression line (indicated in Figure 2) was Punjab-Haryana; in this region, the growth process was unusually pro-poor. The worst performer was Maharashtra, with the largest distance below the regression line; here, the growth process was associated with less favorable distributional impacts from the point of view of the poor. Kerala performed best on both counts, and is quite close to the regression line.

Are the initial consumption and poverty levels correlated with their own time trends? The correlations between the slope and intercept coefficients across the 15 states are −0.658 for mean consumption (significant at the 1-percent level), −0.377 for the head-count index (not significant even at the 10-percent level), −0.532 for the poverty gap index (significant at 4 percent), and −0.588 for the squared poverty gap

Figure 2 Rates of poverty reduction and rates of growth in mean consumption



index (significant at 2 percent).[18] These correlations are suggestive of a trend towards unconditional convergence for mean consumption, PG and SPG over this period, but not H.

EXPLANATORY VARIABLES

In attempting to explain the trends and fluctuations, we shall use the following time-dependent variables:[19]

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[18] These are correlation coefficients between the natural log of the poverty measure (or mean consumption) in 1957 and its trend rate of growth over the period 1957-58 to 1990-91.

[19] All real values were calculated using the (adjusted) state-specific CPIAL as the deflator.

- Real agricultural state domestic product (SDP) per hectare of net sown area in the state (denoted YPH).[20]
- Real nonagricultural state domestic product per person (YNA)—it is not possible to split this between urban and rural sectors.
- The rate of inflation in the rural sector measured as the change per year in the natural log of the (adjusted) CPIAL.[21]
- Real state development expenditure per capita (DEVEX); development expenditure includes expenditure on economic and social services. The economic services include agriculture and allied activities, rural development, special area programs, irrigation and flood control, energy, industry and minerals, transport and communications, science, technology, and environment. The social services include education, medical and public health, family welfare, water supply and sanitation, housing, urban development, labor and labor welfare, social security and welfare, nutrition, and relief on account of natural calamities.

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[20] Two alternative sets of estimates are available on the State Domestic Product (SDP): (1) the estimates prepared by the state governments, though published by the Central Statistical Organization (CSO), and (2) the "comparable estimates" of SDP compiled and published by the CSO. The latter set of estimates, though methodologically superior in ensuring comparability across states, are only available for a shorter period, 1962/63 to 1985/86. Hence, we have used the SDP data from the former source; the comparability across states may be less of a concern for tracking *growth* in SDP and its agricultural component over time. See Choudhry (1993) for further discussion.

[21] This is state-specific. However, the bulk of the effect is clearly through intertemporal variation in the rate of inflation.

From a range of data sources, we can identify a number of social- and economic-sector variables around 1960 that can be hypothesized to influence the trend rates of poverty reduction by determining the initial human and physical capital stocks, or by influencing intersectoral migration.[22] We opted for the following variables (all are measured in natural logs) for describing initial conditions.

Infrastructure	Here, we used three variables: the proportion of villages reporting the use of electricity in 1963-64 (ELCT), the rural road density in 1961 defined as the length of rural roads per 100 square kilometers of the state's geographical area (ROAD), and the percentage of operated area which was irrigated in 1957-60 (IRR).
Landlessness	We used the percentage of landless rural households in 1961-62 (NOLAND).
Education	We used the rural male and female literacy rates in 1961 (LITM and LITF), defined as the number of literate males (females) per thousand males (females) in the rural population.

[22] The sources include the 1961 Census, the Statistical Abstract (Central Statistical Organization) for various years, and reports from a number of NSS surveys dealing with village statistics, landholdings and utilization, fertility, and infant mortality.

Health/Demography We used the infant mortality rate per thousand live births in rural areas, 1963-64 (IMR), and the rural general fertility rate during 1958-60 (GFR). The GFR is defined as the number of children born alive per thousand females in the age group 15-44 years.

Urban-Rural Disparity Initial intersectoral disparity in average living standards may be an important determinant of migration across sectors and hence of the subsequent evolution of rural poverty. We include the ratio of the initial urban real mean consumption to that in the rural sector, where the initial real mean consumption in each sector is formed as an average over the first three NSS rounds available for that state.

Table 2 gives the data on the initial conditions and trends in YPH, YNA, and DEVEX by state. Even a cursory look at these data suggests that initial conditions have played a role. Compare Kerala with Andhra Pradesh and Punjab-Haryana. All three were good performers in reducing poverty. Andhra Pradesh and Punjab-Haryana also had high trend rates of growth in agricultural yields, per capita nonagricultural output and development spending. Kerala did not. Kerala did, however, start with excellent education and health indicators (health being proxied by IMR).

Table 2 Variables used for explaining the trend rates of progress

State	Initial Conditions Around 1960									Trend Growth Rates		
	Percent of Villages with Electricity	Km. of Rural Roads per 100 sq. km. of Area	Percent of Operated Area Irrigated	Percent of Households Owning No Land	Female Literacy Rate (per '000 Population)	Male Literacy Rate (per '000 Population)	Infant Mortality Rate (per '000 Live Births)	Ratio of Urban-to-Rural Mean Consumption	General Fertility Rate (per '000 Females Aged 15-44)	Real per Capita State Development Expenditure	Real SDP in Agriculture per Hectare	Real Non-Agricultural SDP per Capita
								(percent)		(percent per year)		
Andhra Pradesh	11.99	9.93	23.79	6.84	84	251	98.9	124.0	154.6	6.34	2.26	3.98
Assam	1.88	21.21	4.40	27.77	138	348	74.3	124.4	177.5	6.61	1.58	3.51
Bihar	5.65	26.18	16.76	8.63	52	272	90.6	109.7	158.6	5.80	2.74	1.85
Gujarat	5.95	3.68	6.32	14.74	132	345	73.0	109.2	203.9	6.79	3.21	3.36
Jammu and Kashmir	5.51	3.29	26.41	10.93	16	129	68.0	108.3	105.1	5.88	2.83	4.10
Karnataka	12.11	19.18	7.00	18.64	92	305	97.1	99.4	192.7	5.47	1.66	3.70
Kerala	64.39	28.31	12.40	30.90	375	535	69.8	119.3	178.0	4.32	1.02	3.41
Madhya Pradesh	2.67	43.40	4.21	9.14	34	218	134.2	114.2	191.9	5.65	1.82	2.96
Maharashtra	4.06	7.16	4.77	16.03	93	335	106.8	146.8	176.6	6.53	2.55	3.35
Orissa	2.42	10.96	14.96	7.84	75	330	95.1	102.4	167.8	4.53	2.59	2.46
Punjab and Haryana	20.65	12.99	41.02	12.33	87	269	87.7	96.5	214.3	7.57	3.28	4.50
Rajasthan	0.59	5.56	10.75	11.84	27	183	119.1	95.8	210.7	5.08	2.13	2.01
Tamil Nadu	49.67	16.63	38.35	24.20	116	378	104.5	148.6	160.1	5.49	0.84	3.70
Uttar Pradesh	2.74	23.64	34.76	2.78	42	237	187.7	94.9	211.3	6.11	2.01	2.92
West Bengal	3.60	48.06	18.80	12.56	97	329	70.4	145.5	151.5	5.28	2.24	1.99

Note: See text for more details on the initial condition variables.

Our ability to disentangle the effects of various initial conditions will depend on their correlations with each other. Table 3 gives the correlation matrix. While there are a few strong correlations, many of these indicators are only weakly correlated with each other. The infrastructure variables show little pair-wise correlation among themselves or with the other variables. And IMR is only correlated with landlessness, though the correlation is negative; this appears to be due, in large part, to Kerala, which simultaneously had the lowest IMR and highest landlessness in rural areas.

It should be noted that the interpretation of the initial conditions will depend on which trends in time-varying variables are also included in the model. At one extreme, if there were no trended variables, then the initial conditions would be explaining the entire trend in the poverty measures. More generally, the initial conditions are explaining all omitted trended variables in the model. We shall return to this point when discussing the results.

The following further points should be noted about our data on the explanatory variables.

1. There are gaps in the data on some of the time-dependent variables of interest. The SDP data are available only from 1960-61 onward, while the latest year for which data on the net sown area by state were available (at the time of writing this paper) is 1989-90. As a result, we have had to exclude NSS rounds 13 (for 1957-58), 14 (for 1958-59), 15 (for 1959-60), and 46 (for 1990-91) from the

Table 3 Correlation matrix of initial conditions

	ELCT	ROAD	IRR	NOLAND	LITM	LITF	IMR	GFR
Log of percent of villages using electricity (ELCT)	1.000							
Log of rural road density (ROAD)	0.152	1.000						
Log of percent area irrigated (IRR)	0.388	-0.020	1.000					
Log of percent of households landless (NOLAND)	0.410	0.003	-0.373	1.000				
Log of male literacy rate (LITM)	0.500	0.398	-0.191	0.533*	1.000			
Log of female literacy rate (LITF)	0.586*	0.298	-0.158	-0.597*	0.958*	1.000		
Log of infant mortality rate (IMR)	-0.306	0.182	0.081	-0.637*	-0.259	-0.392	1.000	
Log of general fertility rate (GFR)	-0.134	0.184	-0.260	-0.060	0.314	0.273	0.482	1.000
Log of urban-to-rural mean consumption ratio (MCR)	0.276	0.214	-0.122	0.449	0.433	0.403	-0.286	-0.378

Note: * indicates significant at 5-percent level.

estimation. The number of NSS rounds covered in this shorter panel is 17, and these rounds span the 30-year period 1960-61 to 1989-90.

2. In addition to being evenly spaced, the NSS rounds do not all cover a full 12-month period. To match the annual data with those by the NSS rounds, we have log-linearly interpolated the annual data to the midpoint of the survey period of each NSS round.

3. We do not include variation over time in our initial economic and human resource development indicators as explanatory variables in the model. First, time series data on these variables for the period covered by our analysis are just not available. But, also, including these indicators in time-varying form would raise concerns about their potential endogeneity. Note also that *DEVEX* includes social-sector spending.

4. The timing of the observed decline in poverty levels differs across states; in many states, this process did not start till the late 1970s. However, given the nature of data available to us, it is not possible for us to explain differential trends for subperiods.

4. MODELS OF THE POVERTY MEASURES

SPECIFICATION CHOICES

Motivated by the argument in Section 2, the vector of time-dependent variables, Y_{it}, comprised the current and lagged values of the log YPH, log YNA, log CPIAL, and log DEVEX.[23] (The vector X_i also included the trend growth rates of each of the time-dependent variables.) However, we found several restrictions on the specification of the

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[23] The lagged values refer to values a year before the midpoint of the current survey period, and are estimated by interpolation using

$$lnY_{it-1} = (1-(1/\tau_t))\,lnY_{it} + (1/\tau_t)\,lnY_{it-\tau_t}\,.$$

We resort to interpolation because the NSS survey periods do not coincide with the annual periodicity of the time-dependent variables, which are thus not centered at the midpoint of the survey periods.

time-dependent variables to be acceptable. In particular, we found that the coefficients on current and lagged log YPH are the same;[24] the coefficients on current and lagged log YNA are also the same; the coefficients on current and lagged log CPIAL add up to zero (so the variable becomes the rate of inflation); and the coefficient on current DEVEX is zero (so that only the lagged value matters). In pruning the model to a more parsimonious specification, we only deleted those variables that had absolute t-ratios of less than unity.

We tested the exogeneity of the current values of YPH, YNA, CPIAL, and DEVEX.[25] This was acceptable for all poverty measures. It was rejected for mean consumption, where significant endogeneity is indicated for log CPIAL. Hence, we retained the residuals for log CPIAL (from the instrumenting equation) as an additional variable in subsequent estimation of the mean consumption model, which ensures consistent estimates. However, when the other data-consistent parameter restrictions were imposed, the residual of log CPIAL became insignificant and was dropped thereafter.

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[24] This is consistent with our findings for the determinants of rural poverty at the all-India level (Ravallion and Datt 1995).

[25] Our exogeneity test is an F-test for the joint significance of residuals of the four variables included as additional regressors in the models for mean consumption and the poverty measures. The residuals are obtained from instrumenting equations for each of the four variables, where the instrument set included lagged values of all time-dependent variables, current and lagged log rainfall (state-average for the monsoon months, June-September), lagged log urban price index, lagged (log) urban and rural population, state-specific fixed effects, and state-specific time trends. We did not conduct an exogeneity test for the net sown area per capita, which had turned out to be highly insignificant.

For the time-dependent variables, we found mixed evidence on whether the coefficients on the deviation from trend differ significantly from those on the corresponding trends. The equality of the two effects was rejected for both per capita nonagricultural output and state development expenditures. For agricultural yields, the point estimates indicated larger (absolute) effects of the trend component of yield than that of the deviation from trend. However, the difference between relevant π and γ coefficients was not statistically significant. We find this somewhat surprising. Though it is unlikely that poor households are well insured against the vagaries of the weather (and the point estimates are consistent with this), we would still have expected that some limited insurance and consumption smoothing would have ensured a larger trend impact. We decided not to impose the restriction of equal impact of the trend and deviation-from-trend components for any of the time-varying variables.

More striking, however, is the fact that we could find no evidence that differences between states in the trend rate of growth in nonagricultural incomes had any independent effect on the rate of poverty reduction. It should be recalled that nonagricultural income here includes income originating in both rural and urban sectors of the state. In previous work, we found no significant effect of urban economic growth on rural poverty in India (Ravallion and Datt 1996). Possibly, if we could split the nonagricultural incomes into "urban" and "rural," we would find an effect of the trend of *rural* nonfarm income growth. As it is, our measured trend in the state's nonagricultural incomes is likely to be a very noisy indicator of rural nonfarm income growth. At the same time, we do find that fluctuations around the trend in nonagricultural incomes did matter to the rural poor. We would conjecture that the deviation from the trend in the state's nonagricultural output may well be better at picking up effects of changes in nonfarm rural demand, while the trends are dominated more by the urban economy, with negligible spillover effect to the rural poor.

The correlation of the trend in nonagricultural incomes with the initial conditions appears also to be making it difficult to identify any effect of nonfarm income growth on rural poverty. When we dropped all initial conditions, the trend in nonfarm income became very significant. We conjecture that the encompassing model is telling us that the initial conditions and the farm-yield trend are adequately accounting for the trend in nonfarm rural income, but that they also have additional explanatory power in determining the (consumption-based) poverty measures; given the "urban noise" in the nonagricultural income series, it may not be surprising that this variable is “knocked out” of the model as an independent explanatory variable.

Like nonagricultural incomes, we found that the trend component of state development spending was insignificant. The deviations from the trend did contribute to a lower overall, mean-squared error, but were only weakly significant at best. Consistently with our other specification choices, we deleted the trend in DEVEX but kept the deviations from trend.

The other set of variables in the vector X_i comprised the initial conditions, as described in the previous section. With the cross-sectional dimension of our data restricted to 15 states, there are obvious limits to how far we can go in investigating the potential influence of the initial conditions in determining the evolution of living standards. Our initial specification included all the variables described in Section 3. However, while the full set of variables had joint explanatory power (one could safely reject the null that their coefficients were jointly zero for all three poverty measures), many of the parameters were individually insignificant. Multicollinearity is clearly part of the problem. For instance, when both male and female literacy variables were included, they came out with opposite signs, negative for *LITF* and positive for *LITM*; but when either one of them was used in the model, it had a negative sign. The two variables are highly correlated (r=0.96). Since LITF had slightly more explanatory power than LITM, we decided to retain LITF in the model. But many other variables, including ELCT, ROAD, NOLAND, and the initial urban-to-rural mean consumption ratio, were highly insignificant, and they could be safely dropped. On doing so, we found that the restricted model with IRR, LITF, and IMR as the measures of initial conditions entailed only a small loss of fit. None of the variables we had dropped were significant if added to the final regression.[26] The F-tests (which are asymptotically justified for our class of models) reported at the bottom of Table 4 indicate that the

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[26] We also tried adding the initial female-male literacy differential (log of the ratio of female literacy rate to male literacy rate) to the model, which turned out to be insignificant itself, and also rendered the female literacy variable insignificant, though they were jointly significant.

Table 4 Determinants of rural poverty

	Mean Consumption	Head-Count Index (H)	Poverty-Gap Index (PG)	Squared Poverty-Gap Index (SPG)
Determinants of deviation from trend				
Current plus lagged real agricultural output per hectare: deviation from trend	0.075 (4.22)	-0.108 (-3.61)	-0.194 (-4.30)	-0.263 (-4.35)
Current plus lagged real nonagricultural output per capita: deviation from trend	0.208 (8.02)	-0.330 (-8.40)	-0.527 (-9.00)	-0.686 (-8.81)
Rate of inflation	-0.227 (-4.10)	0.321 (3.62)	0.453 (3.32)	0.512 (2.79)
Lagged real state development spending per capita: deviation from trend	0.056 (1.31)	-0.113 (-1.67)	-0.152 (-1.49)	-0.175 (-1.29)
Determinants of trend				
Real agricultural output per hectare: trend	0.152 (4.22)	-0.375 (-2.46)	-0.554 (-2.53)	-0.699 (-2.44)
Initial irrigation rate (IRR)	0.155 (1.58)	-0.541 (-3.76)	-0.744 (-3.59)	-0.914 (-3.38)
Initial female literacy rate (LIFT)	0.341 (4.02)	-0.561 (-4.49)	-0.844 (-4.71)	-1.075 (-4.60)
Initial infant mortality rate (IMR)	-0.310 (-3.09)	0.688 (4.14)	0.941 (3.94)	1.147 (3.68)
AR(1)	0.611 (9.17)	0.542 (7.10)	0.486 (5.85)	0.457 (5.24)
R-squared	0.861	0.895	0.906	0.902
Exogeneity test for 1n YPH, 1n YNA, 1n DEVEX, 1n CPIAL: F(4, 189)	3.51	1.00	0.87	0.96
Test of parameter restrictions: F(17,191)	1.817	1.750	1.337	1.070

Note: t-ratios are in parentheses. A positive (negative) sign indicates that the variable contributes to a higher (lower) rate of increase in the poverty measure or mean consumption. The estimated model also included individual state-specific effects, not reported in the table. The number of observations used in estimation is 247. The exogeneity test is the (Wu-Hausman) test for the joint significance of the residuals of the four potentially endogenous variables; the residuals are obtained from instrumenting equations, where the instrument set included lagged values of all time-dependent variables, current and lagged log rainfall (state-average for the monsoon months June-September), lagged log urban price index, lagged (log) urban and rural population, state-specific fixed effects, and state-specific time trends. The second F-statistic tests the restricted model (5) against the unrestricted model (4).

restrictions are accepted for our models for mean consumption, H, PG, and SPG measures at 2.8, 3.7, 17, and 39 percent levels of significance, respectively.[27]

THE ESTIMATED MODEL

On incorporating the parameter restrictions described above, our estimated model was

$$
\begin{aligned}
\ln P_{it} = {} & \pi_{\Theta}(\nabla \ln YPH_{it} + \nabla \ln YPH_{it\Theta}) + \pi_{\theta}(\nabla \ln YNA_{it} + \nabla \ln YNA_{it\Theta}) \\
& + \pi_{\mathrm{I}}(\ln CPIAL_{it} - \ln CPIAL_{it\tau_t})/\tau_t + \pi_{\iota} \nabla \ln DEVEX_{it\Theta} \\
& + (\gamma_{\Theta} r_i^{YPH} + \gamma_{\theta} IRR_i + \gamma_{\mathrm{I}} LITF_i + \gamma_{\iota} IMR_i)\, t + \eta_i + \epsilon_{it}
\end{aligned} \tag{5}
$$

We interpret this model as follows. The deviations from the trend are picking up the main "shocks" to real incomes, namely agricultural yields, nonfarm output, public spending, and inflation. All of these are transient effects on poverty. In addition, there is, of course, a trend. The model explains this in terms of the trend in agricultural yield per unit area and initial conditions. The latter can then be interpreted as the determinants of the trends in all other factors (besides average farm yield), notably nonfarm output, public spending, and remittances.

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[27] For mean consumption and the head-count index, the restrictions are accepted only at less than the 5-percent level of significance. A lower level of significance implies the usual trade-off between the size and power of the test, or between the type-I and type-II errors. However, since the restrictions were found individually acceptable at each stage of the pruning of the model, we opted for a common restricted model for all poverty measures and mean consumption.

Table 4 gives the nonlinear LSDV estimates of equation (5). The following points are notable.

Current and lagged agricultural output per hectare (YPH) had a significant positive effect on average consumption, and a negative impact on absolute poverty. The point estimates show that the trend component of yield has a larger impact (in absolute terms) than the deviation-from-trend component, though the difference is not significant statistically, which is suggestive of the poor being largely uninsured against yield shocks. The trend growth in yield itself has a strong impact: the estimated elasticity of mean consumption with respect to a steady-state increase in YPH is 0.15, while for H, PG, and SPG, the elasticities are −0.38, −0.55, and −0.70, respectively.

The restriction of equal coefficients on current and lagged values is also acceptable for nonagricultural output. A higher per capita real nonagricultural output is found to contribute to rural poverty reduction only insofar as it exceeds the trend level; the trend component has no effect on poverty, controlling for the other variables in the model. The deviations from trend are highly significant, though, and their quantitative impact is large, with absolute elasticities (over two periods) ranging from 0.41 for mean consumption to 0.66, 1.05, and 1.37 for H, PG, and SPG, respectively.

A higher rate of inflation has a significantly negative effect on mean real consumption (elasticity of -0.23), and also a poverty-increasing effect with the elasticities ranging from 0.32 for H, to 0.45 for PG, to 0.51 for SPG.

We find that the above-trend values of real state development expenditure per capita have a positive effect on the average living standards and a negative effect on levels of poverty. But these effects are generally insignificant; the closest to a statistically significant effect that we observe is the negative impact on the rural head-count index (significant at the 9-percent level).

We also find that differences in initial conditions matter to subsequent progress in poverty reduction. There is a significant favorable effect of the initial irrigation rate on the rate of consumption growth and the rate of progress in reducing poverty. For instance, a 20-percent higher initial irrigation rate would have augmented the annual rate of poverty reduction by 0.1 percentage points for H, by 0.14 percentage points for PG, and by 0.17 percentage points for SPG.

The rate of poverty decline was significantly lower in states that started with lower female literacy rates. The estimates indicate that a 20-percent higher female literacy rate is associated with increments in the rates of decline in H, PG, and SPG of 0.1, 0.15, and 0.2 percentage points per year, respectively.

There is a significant adverse impact of the initial level of infant mortality on the subsequent rate of gain in living standards; a 20-percent higher initial *IMR* is associated with lower rates of reduction in H, PG, and SPG of the order of 0.13, 0.17, and 0.21 percentage points, respectively.

We also tried excluding the state of Kerala to check if the initial condition effects were contingent on Kerala's unique experience. We found that with Kerala's exclusion, there was little change in the estimates of any parameters or their standard errors (for both the initial conditions and all other variables in the model). The same was true when we deleted Bihar.

In general, the point estimates of the impact of both the time-dependent and initial condition variables on the rates of poverty reduction are larger for SPG than PG, and lowest for H, which parallels the pattern for the unconditional rates of poverty reduction estimated in Section 3.

It is notable that all the initial conditions exhibit divergent effects, in that worse initial conditions (lower literacy rates, for example) are associated with lower subsequent rates of progress in reducing poverty. Yet (as shown in Section 3) there are signs of unconditional convergence, in that states with higher initial poverty measures (at least for PG and SPG) tended to have higher rates of poverty reduction. These two observations are not inconsistent. Depending on how the other variables in the model evolve over time, and how initial conditions are correlated with initial levels of living, one can simultaneously have conditional divergence with respect to some initial conditions, but unconditional convergence overall. For example, the trend increase in agricultural yields tended to be higher in initially poorer states.[28] Another contributing factor to the overall

[28] The correlation coefficient between the trend rate of growth in agricultural yields and the initial mean consumption is 0.37, while the correlation with initial head-count index is -0.32.

long-term convergence was that initial literacy rates tended to be *higher* in initially poorer states.[29]

The effects of both the initial conditions and the time-dependent variables on the trend growth in mean consumption are generally opposite in sign to their effects on the trends in the poverty measures (Table 4). For instance, the initial female literacy rate has a strong positive effect on mean consumption growth, while the initial infant mortality rate has a strong negative effect. Similarly, increases in agricultural yields and above-trend growth in nonagricultural output have significant positive effects on mean consumption, while a higher rate of inflation has a negative effect. Thus we find no sign of a trade-off between impacts on absolute poverty and impacts on average consumption.

ON DEVELOPMENT SPENDING

The insignificance of state-development spending in our estimates of equation (5) does not necessarily mean that such spending is irrelevant to progress in reducing rural poverty, since other (significant) variables in the model may themselves be affected strongly by development spending. The impact of initial conditions presumably reflects, in part, past spending on physical and human infrastructure. It can also be argued that agricultural and nonagricultural outputs are determined, in part, by public spending on (for example) physical infrastructure and public services.

[29] The correlation coefficient between (log) female literacy and the initial mean is -0.49, while the correlation with the initial head-count index is 0.48.

To investigate this further, we regressed the agricultural yield and nonagricultural output per capita on the other explanatory variables, including development spending. The latter had a significant positive impact; yield had an elasticity of 0.29 (t-ratio=3.18) to lagged development spending, while, for nonagricultural output per person, the elasticity was 0.34 (t-ratio=5.07). This suggests that state development spending has helped reduce rural poverty through its impact on average farm and nonfarm output. However, we were also unable to reject the hypothesis that growth in agricultural yields and nonagricultural output Granger-causes higher development spending; lagged agricultural yield and nonagricultural output had significant positive effects on state development spending.

IMPACTS OF DIFFERING INITIAL CONDITIONS ON RATES OF POVERTY REDUCTION

The initial conditions have a strong effect. To illustrate the magnitudes, consider Kerala, the state with the highest trend rate of decline in poverty, as the reference. We then ask: how much of the difference between a particular state's rate of poverty reduction and Kerala's rate is attributable to the differences in their initial conditions? Table 5 gives the results for H; the results were similar for PG and SPG. The

Table 5 Interstate differentials in the trend rates of change in the rural head-count index and the contribution of initial conditions

	Difference Between the State's Trend Rate of Change in H and that for Kerala	Differential in Trend Attributable to *All* Initial Conditions	Differential Due to Differences in the Initial Levels of		
			Irrigation Rate	Female Literacy Rate	Infant Mortality Rate
			(percent points per annum)		
Andhra Pradesh	0.03	0.73	-0.35	0.84	0.24
Assam	2.62	1.16	0.56	0.56	0.04
Bihar	2.13	1.12	-0.16	1.11	0.18
Gujarat	0.57	0.98	0.36	0.59	0.03
Jammu and Kashmir	1.62	1.34	-0.41	1.77	-0.02
Karnataka	1.59	1.32	0.31	0.79	0.23
Kerala	0.00	0.00	0.00	0.00	0.00
Madhya Pradesh	1.80	2.38	0.58	1.35	0.45
Maharashtra	1.05	1.59	0.52	0.78	0.29
Orissa	0.70	1.01	-0.10	0.90	0.21
Punjab and Haryana	0.09	0.33	-0.65	0.82	0.16
Rajasthan	1.47	1.92	0.08	1.48	0.37
Tamil Nadu	0.82	0.32	-0.61	0.66	0.28
Uttar Pradesh	1.09	1.35	-0.56	1.23	0.68
West Bengal	0.77	0.54	-0.23	0.76	0.01

contribution of the initial conditions to a state's deficit (relative to Kerala) in the rate of poverty reduction is derived from equation (4) as $\hat{\gamma}'(X_i - X_{Kerala})$ in obvious notation.

Consider Maharashtra, for example. Table 5 shows that the incidence of rural poverty declined at a slower pace in Maharashtra than Kerala, the difference being 1.05 percentage point per annum. On account of the relatively adverse initial conditions alone, the rate of poverty reduction in Maharashtra would be about 1.6 percentage points lower. Maharashtra made up some of the lost ground by way of more favorable progress in some of the time-dependent variables, which is borne out by its higher rates of growth (relative to Kerala) in the real agricultural output per hectare (Table 2). Among the initial conditions, Maharashtra's lower irrigation rate (5 percent against Kerala's 12 percent) contributed 0.52 percentage points to the state's deficit in the rate of poverty reduction; its lower female literacy rate (93 per thousand against Kerala's 375) contributed 0.78 points; and its higher infant mortality rate (107 per thousand against Kerala's 70) contributed another 0.29 points.

Of course, the differences in the initial conditions do not fully account for the observed differentials in the rates of poverty decline. For instance, the incidence of poverty in Bihar declined at an annual rate 2.1 percentage points below that in Kerala, but only about half of that differential is explained by the initial conditions (Table 5). Other factors, particularly the slow growth in agricultural output per hectare, have been important in explaining Bihar's unimpressive performance. It is nonetheless notable that if Bihar had started off with Kerala's level of human resource development in the 1960s, the differential in the rates of poverty reduction between the two states could have been narrowed to less than half their observed levels. Also, the implicit trade-offs can be large. For Bihar to overcome the adverse effects of its initially disadvantageous human resource development relative to Kerala would have required that its agricultural yields grew annually at a rate 3.4 percentage points higher than Kerala's. Our results also suggest that Kerala's low growth rate in farm yields inhibited its rate of poverty reduction. Suppose that Kerala had the same trend growth rates in farm yields as Punjab-Haryana (Table 2).

Our results indicate that Kerala's trend rate of reduction in H would have been 3.11 percent per year, rather than 2.26 percent.

Why do the initial conditions have such strong effects? If they mattered solely because of their impact on a single variable—rural nonfarm income growth, for example—then when we added that variable to the model, it would knock out the initial conditions. Clearly that variable is not among those we started with in the encompassing model. Income from remittances is one candidate; it is plausible that the high initial level of human resource development in Kerala, in particular, fostered the export of more skilled labor (even from poor households) and thus allowed a higher trend growth of remittances. Another candidate is agricultural employment. A higher initial density of irrigation will allow a higher density of multiple cropping and (hence) a higher trend rate of employment growth.

There are other possible explanations. Recall that our "nonfarm" output variable is the total for the state as a whole, combining both rural and urban areas. This is an unavoidable data limitation (since state-level accounts do not allow a separation along urban and rural lines). We suspect that a state's aggregate nonfarm output is a very noisy indicator of its rural nonfarm output, and our earlier work (at the all-India level) showed very little sign of spillover effects to the rural poor from urban economic growth in India (Ravallion and Datt 1996). So it is possible that if we could make the separation, rural nonfarm output growth would be able to knock out the effects of the initial conditions, even though the state-aggregate could not. That must remain a conjecture.

Another possible explanation is that the initial conditions are proxying for initial poverty levels, and there is conditional divergence, i.e., conditional on the time-dependent variables, states with higher initial poverty have lower rates of poverty reduction. We tested this by adding the initial poverty measures to each regression, but they were highly insignificant, and the initial conditions remained strong. Initial poverty measures remained insignificant even after eliminating other initial conditions. Thus, there is no evidence for either conditional divergence or convergence with respect to initial poverty.[30]

Finally, one may conjecture that the initial conditions are picking up distributional effects on the poverty measures; a higher initial literacy rate, for example, may entail a higher rate of poverty reduction at a given rate of growth in average incomes. For now, that must remain a conjecture. In future work, however, we intend to explore the determinants of distributional shifts in these data.

5. CONCLUSIONS

Long-term progress in raising rural living standards has been diverse across states of India. We have tried to explain why.

In explaining the deviations from the trend rates of progress in reducing rural poverty, we have found that the rural poor were adversely affected in the short-term by

[30] Note that our main purpose in this paper, however, is to explain the differential rates of poverty reduction across Indian states, and conditional convergence or divergence with respect to the initial poverty level will itself require explanation in terms of other initial conditions on which it depends.

inflation. They were also affected by fluctuations in average farm yields and in per capita nonfarm output.

In explaining the cross-state differences in the trend rates of poverty reduction, we found that differences in the trend growth rate of average farm yields (agricultural output per acre) were important. By contrast, differences in the state's historical trend growth rate of nonagricultural output (urban plus rural) were not. This probably reflects the weak connections between urban economic growth and rural poverty reduction in India.

But that is only part of the story. Without taking account of differences in initial conditions, it is hard to explain why some states have performed so much better than others in the longer term. Starting endowments of physical infrastructure and human resources appear to have played a major role in explaining the trends in poverty reduction; after controlling for the trend in farm yield, higher initial irrigation intensity, higher literacy, and lower initial infant mortality all contributed to higher long-term rates of poverty reduction in rural areas. A sizable share of the variance in the trend rates of progress are attributable to differences in initial conditions of physical and human resource development—differences that may well reflect past public spending priorities.

By and large, the same variables determining rates of progress in reducing poverty mattered to the growth in average consumption. There is no sign here of trade-offs between growth and pro-poor distributional outcomes.

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