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# Spatial Inequality in Social Progress in Bangladesh

by

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The paper tracks spatial inequality in social progress in Bangladesh as evidenced from the district-level data. It uses a multivariate framework to explore the differential pace of social progress at the spatial level. The "instructive" outliers and deviants are identified in terms of under-achievers and over-achievers compared with the benchmark predicted by the level of aggregate affluence. The paper then draws upon discussions to coalesce a local contextual story about the possible reasons for such unexpected deviations from the general pattern. The paper concludes that the extent of spatial inequality in social development has decreased over the second half of the nineties although the overall level of inequality remains considerable. Policy implications are drawn for attacking spatial chronic poverty.

#### I. INTRODUCTION

Persistent spatial inequality has been long recognised both as the cause and as the effect of underdevelopment. Two lines of inquiry can be noted. The structuralist school of "dualism" (of different shades and inclinations) emphasizes that coexistence of different sets of conditions, of which some are "favoured" and others "disfavoured," is chronic and not merely transitional. The interrelations between the favoured and the disfavoured elements are such that the existence of the favoured elements does little or nothing to pull up the disfavoured elements, let alone "trickle down" to it. In fact, it may actually serve to push it down—to "develop its underdevelopment." One influential approach in this trend is represented by *geographic dualism* that dates back to Myrdal's (1957) hypothesis of "cumulative causation," which was advanced to account for the persistence of differences in a

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wide variety of development indices across nations and regions within nations. At the heart of such model lies the idea of increasing returns in the favoured region. Instead of leading to equality, forces of supply and demand interact with each other to produce cumulative movements away from spatial equilibrium. The emergence of multiple equilibria explains the persistence of spatial inequality and points to the need of "big push" type deep interventions for overcoming dualism.

The other line of inquiry sees dualism as a function of time, of stage of development, largely to be overcome in the process of development (modernisation) itself. According to this line of reasoning, higher wage in the favoured sector will attract surplus labour from the disfavoured region while falling rate of profit in the favoured region will be invested in the disfavoured region, leading to greater equalisation, as envisaged by the Lewis process. In this view, spatial inequality need not be chronic. Williamson (1965), for instance, shows that inter-regional inequality may actually follow an inverted-U curve, with 'pull' effects emanating from the favoured region being weak in the early stage of development and stronger in the later stages. Which of these processes will actually hold out at the end as the central tendency would depend on the relative strength of what Myrdal called 'backwash' as opposed to 'spread' effects, or Hirschman (1958) termed as 'polarisation' as against 'trickling down' effects. The actual outcome would depend on the variety of political, economic and social circumstances and is likely to exhibit considerable cross-country and cross-regional variation. Which of these effects dominates the dynamics of spatial inequality in the Bangladesh context? This is the central question addressed in the present paper.

The recent resurgence in the theme of spatial inequality needs to be viewed in the light of above consideration. Bangladesh is no exception to this. Though the country is fairly small in terms of area coverage and relatively homogeneous in terms of ethnic composition, language and landscape, presence of geographic effects cannot be ignored. Persistence of geographical effects on income poverty has been noted previously in the Bangladesh context (GoB 1991, Ravallion and Wodon 1997, BIDS 2001). The present paper looks at the spatial inequality that exists in the country with regard to the key non-income dimensions of poverty and related social indicators. It attempts to explain the differentiation in the pace of social progress across regions and also identifies the "outliers" in this respect as well as possible causes underlying such deviant behaviour. The analysis of spatial inequality is based on the district level data for 1995 and 2000.<sup>1</sup>

<sup>&</sup>lt;sup>1</sup> There are 64 administrative districts in the country at the moment.

#### Structure of the paper

The paper is organised into six sections. After brief introductory remarks on "dulaist" framework that inform the persistence of spatial inequality in social progress, the second section describes the extent of spatial differences in social development (focusing on non-income dimensions of poverty and related social indicators) using district and division level data. The third section analyses the factors influencing the cross-district variation in social progress by pooling the 1995 and 2000 district level data. The fourth section identifies the districts which stand out among the rest as "over-achievers" and "under-achievers" (compared to the levels predicted by the level of their average affluence). The fifth section conjectures on possible triggers in terms of "deeper interventions" which may explain such deviant performance. The sixth section summarises the main results.

#### **II. SPATIAL VARIATIONS IN SOCIAL PROGRESS**

#### **Spatial Trends in Human Poverty Index**

Consistent with the theme of spatial inequality in "social progress," the focus of the paper is on deprivations in the non-income dimensions of well-being.<sup>2</sup> Among the indictors of the latter, the favoured candidate is the UNDP-proposed human poverty index (HPI), which has been supplemented by the analysis of some key social indicators such as under-five mortality rate, total fertility rate (TFR), net enrollment rate at the primary level. Human poverty focuses on three aspects of human deprivations: deprivation in longevity, deprivation in knowledge, and deprivation in economic provisioning.<sup>3</sup> These dimensions are given equal weights in the construction of HPI. Conceptually, the approach represented a step forward in capturing deprivations with respect to the key non-income dimensions of welfare. HPI focuses of the deprived segments of the population. This is consistent with the standard practice of confining poverty measures exclusively to the deprived segments. The methodology for constructing the HPI is provided in Table I along with the trends in human poverty in Bangladesh. The results show that the country has achieved notable progress in reducing human poverty over the past two decades.

<sup>&</sup>lt;sup>2</sup> The term "non-income" is, however, not synonymous to "non-economic." Thus, the human poverty index (HPI) considers "economic provisioning" (including public and private provisioning) as its constitutive element, which is not reducible to income. See Sen (1992) for the importance of distinguishing income inequality from economic inequality. Social indicators, however, can have important economic (as well as income growth) implications (as with basic education and reproductive health).

<sup>&</sup>lt;sup>3</sup> For discussion of the underlying concept, see Anand and Sen (1996).

Thus, the incidence of human poverty has declined from 61.3 in 1981/83 to 47.2 in 1993/94, and dropped further to 41.8 in 1995/97 and 35.5 in 2000 according to the latest available data.

Variables	1981-83	1993-94	1995-96	1997-98	2000
Deprivation in Longevity (P <sub>1</sub> )	28.0	20.0	18.0	14.3	13.6
Probability of dying before age 40	28.0 (1983)	20.0 18.0 (1993) (1996)		14.3 (1997)	13.3 (2000)
Deprivation in Knowledge (P <sub>2</sub> )	62.6	46.4	42.7	38.7	35.4
Adult illiteracy (weight: 2/3)	70.8 (1981)	58.0 (1994)	54.4 (1996)	49.0 (1997)	44.0 (2000)
Child aged 6-10 years not attending school (weight: 1/3)	46.3 (1982/83)	23.1 (1995/96)	18.9 (1996)	18.0 (1997)	18.0 (2000)
Deprivation in Economic Provisioning (P <sub>3</sub> )	75.1	59.3	51.4	50.2	44.4
Public Provisioning	78.7	54.4	45.4	44.1	41.2
Share of population without access to health services proxied by a composite indicator of:	97.8	65.8	56.9	57.3	50.9
children not fully immunised	98.0 (1981/82)	41.1 (1993)	23.7 (1995)	32.5 (1998)	25.6 (2000)
% of deliveries not in the institutions	97.6 (1983)	90.5 (1993)	90.1 (1995)	82.1 (1998)	76.3 (2000)
Percentage of population without access to safe (tubewell) water	43.3 (1981)	20.0 (1991)	7.0 (1995)	5.0 (1998/99)	2.5 (2000)
Percentage of population not living in electrified houses	95.0 (1981)	77.3 (1994)	72.4 (1995)	70.0 (1998/99)	70.0 (1998/99)

TABLE 1 TRENDS IN HUMAN POVERTY INDEX, 1981-2000

(Table I Contd.)

Variables	1981-83	1993-94	1995-96	1997-98	2000
Private Provisioning	71.5	64.2	57.4	56.3	47.7
Percentage of children under 5 years of age who were malnourished	(1985)	(1995)	(1996)	(1996/97)	(1999/00)
Human Poverty Index	61.3	47.2	41.8	39.7	35.5

Notes: - HPI Index is calculated as follows:

- HPI =  $[1/3 (P_1^3 + P_2^3 + P_3^3)]^{1/3}$ 

Probability of dying before age 40 was derived as follows:

IMR in 1993 was 84 when probability of dying before age 40 was 20. Using this ratio and given IMR for 1996 as 67, we get probability of dying before age 40 for 1996 = 16.0 Child aged 6-10 years not attending school is considered only.

- Deliveries not by trained workers are considered

(a) 1981-83 and 1993-94 estimates are taken from South Asia Poverty Monitor Report 1999/00 (SAPM) by Sen and Rahman (2000). (b) 1995/97 figures are taken from the following sources. The estimate of "Probability of dying before 40" is based on Statistical Pocket Book 1997 of BBS, p. 151. Adult literacy figure is taken from FFYP. Data on non-enrolment, immunisation, non-institutional delivery, and access to safe water figure are taken from Progotir Pathay (various issues) published by UNICEF. Information on access to electricity is from HDS of BBS, while that for child malnutrition is from BDHS 1996/97. (c) 1997/98 figures are taken from the following sources. The estimate of Probability of dying before 40," adult literacy and non-enrolment figures are based on Statistical Pocket Book 1999 of BBS. Data on immunisation is taken from Progotir Pathay 1998. Information on child malnutrition is from BDHS 1999/00. (d) 2000 figures are taken from the following sources. The estimate of Probability of dying before 40," adult literacy and non-enrolment figures are taken from the following sources. The estimate of Probability of dying sources. The estimate of Probability of dying before 40," adult literacy and non-enrolment figures are based on Statistical Pocket Book 1999 of BBS. Data on immunisation is taken from Progotir Pathay 1998. Information on child malnutrition is from BDHS 1999/00. (d) 2000 figures are taken from the following sources. The estimate of Probability of dying before 40," adult literacy and non-enrolment figures are based on Statistical Pocket Book 2000 of BBS. Data on immunisation, deliveries not in the institutions and access to safe water are taken from Progotir Pathay 2000. Information on child malnutrition is from BDHS 1999/00.

#### Source: BIDS (2001) and PRCPB Data Base.

A significant variation has, however, been observed in terms of the value of HPI at the district level for both 1995 and 2000 (Appendix Map 1). While the value of national HPI was 41.8 in 1995/97, it ranged between 26.87 and 51.6 at the district level. Similarly, in 2000, it ranged between 25.40 and 42.98. It is noteworthy that <u>all</u> the districts have been able to improve its human poverty situation during the same period, but the rate of annual progress varies significantly (ranging from a negligible 0.1 per cent for Cox's Bazar to 4.6 per cent for Bandarban).

Exclusive focus on the aggregate index alone is, however, inadequate for at least two reasons. *First*, an aggregate index may not be a reliable guide to judge the change in the individual constituents of the index. For instance, there may be considerable improvements in the aggregate human poverty index while registering little progress in the nutritional status of under-five children which is but only one

of the variables that enter HPI. *Second*, some dimensions of the well-being may not be reflected in the aggregate index because of their non-inclusion in the index itself (either because they are perceived as less important than the competing others, or simply because there is not adequate quantitative data on that particular indicator). Thus, some of the important social indicators of human poverty such as TFR and access to sanitation are not directly included in the HPI, though they clearly deserve separate attention.

TABLE II VALUE OF HUMAN POVERTY INDEX (HPI) BY DISTRICT

District Nome			Average Appuel % Change in
District Marine	HFI 1993	HP1 2000	HPI During 1995-2000
Bandarban	51.6	39.77	-4.59
Rangamati	46.24	35.74	-4.54
Jhalokathi	31.54	25.4	-3.89
Jamalpur	51.06	41.87	-3.6
Nilphamari	46.86	38.5	-3.57
Tangail	39.33	32.48	-3.48
Pirojpur	31.16	25.82	-3.42
Comilla	31.88	26.72	-3.24
Barguna	33.79	28.43	-3.17
Patuakhali	35.76	30.56	-2.91
Khagrachari	43.86	37.58	-2.87
Khulna	32.51	27.95	-2.81
Mymensingh	40.3	34.7	-2.78
Moulvibazar	37.77	32.69	-2.69
Bogra	37.72	32.75	-2.64
Rajbari	43.75	38.03	-2.61
Shariatpur	42.28	36.76	-2.61
Naogaon	36.91	32.32	-2.48
Lalmonirhat	40.67	35.63	-2.48
Gaibandha	39.95	35.08	-2.44
Thakurgaon	40.32	35.87	-2.21
Satkhira	35.53	31.74	-2.13
Chandpur	33.28	29.76	-2.11
Pabna	40.36	36.11	-2.11
Sylhet	39.11	35.08	-2.06
Madaripur	38.59	34.64	-2.05
Narayanganj	31.58	28.45	-1.98
Kishoreganj	39.35	35.59	-1.91

(Table II Contd.)

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District Name	HPI 1995	HPI 2000	Average Annual % Change in HPI During 1995-2000
Chittagong	32.29	29.21	-1.91
Panchagarh	38.71	35.03	-1.9
Jhenaidaha	35.74	32.37	-1.89
Magura	36.34	33.04	-1.81
Noakhali	36.33	33.05	-1.8
Manikganj	38.93	35.44	-1.79
Sirajganj	42.59	38.83	-1.77
Bagerhat	32.58	29.72	-1.76
Barisal	31.8	29.03	-1.74
Feni	30.83	28.15	-1.74
Kurigram	43.14	39.42	-1.73
Gopalganj	32.51	29.77	-1.69
Jessore	30.77	28.2	-1.67
Sunamganj	43.01	39.44	-1.66
Rangpur	41.7	38.26	-1.65
Dinajpur	36.24	33.31	-1.62
Habiganj	37.23	34.45	-1.49
Narsinghdi	37.93	35.25	-1.42
Gazipur	34.93	32.49	-1.4
Lakshmipur	34.8	32.39	-1.39
Rajshahi	35.98	33.57	-1.34
Chuadanga	34.02	32.11	-1.12
Netrokona	39.04	37.06	-1.01
Nawabganj	41.68	39.66	-0.97
Sherpur	45.15	42.98	-0.96
Natore	36.02	34.42	-0.89
Joypurhat	37.23	35.7	-0.82
Brahmanbaria	39.26	37.65	-0.82
Narail	32.41	31.26	-0.71
Bhola	37.48	36.32	-0.62
Kushtia	36.79	35.78	-0.55
Meherpur	36.91	36.01	-0.49
Munshiganj	29.68	29.07	-0.41
Faridpur	35.26	34.59	-0.38
Dhaka	26.87	26.51	-0.27
Cox's Bazar	38.68	38.44	-0.13
National	41.8	35.5	-3.01
Coefficient of Variation	13.16	11.98	-

Analysis of the aggregate measures, therefore, needs to supplement an approach that takes a more disaggregated look at the individual poverty and social indicators. In the following sections, we shall focus on those dimensions of well-being (or illbeing) which deserve separate analytical focus in their own right.

#### **Spatial Trends in Social Indicators**

Table III presents the disaggregated profile of other social indicators by administrative divisions and sectors. Evidence available at division level confirms considerable differentiation of human development across regions. Three aspects are noteworthy. First, there is some correspondence between the level of income and non-income poverty, suggesting the role of private income in human development. As of mid-1990s, Rajshahi division had the highest incidence of income-poverty. Predictably, it had also the lowest level of adult literacy (35 vis-àvis the peak point of 56 per cent in Barisal), life expectancy at birth (56.5 vis-à-vis 58.4 in Khulna) and child immunization rate (54.5 vis-à-vis 72.2 in Chittagong). Rajshahi also had the second highest level of infant mortality rate (79.9 vis-à-vis 72.4 in Khulna). Second, there is no one to one matching however. Chittagong division had the lowest income poverty (45 per cent as against the peak point of 62 per cent in Rajshahi), but still displayed the second highest level of infant mortality, second lowest level of adult literacy, and the second lowest level of life expectancy. This suggests that the level of income alone cannot account for the entire variation in social progress. Third, there is also considerable diversity in the ranking of various social indicators, implying a complex pattern of linkages between economic affluence income poverty and social indicators.

Aroo	Adult	IMP (per	Lifa	Immunisation	Child Death	Head Count
Alea	Auun		Life	minumsation		Head-Coulit
	Literacy	1000 live	Expectancy	(12-23	Rate 1-4	Index of
	Rate	births)	at Birth	months)	Years	Poverty
	1995	1995	1995	1995	1995	1995/96
Division						
Barisal	56.4	76.6	57.2	64.6	10.8	59.9
Chittagong	41.2	81.9	57.0	72.2	8.9	44.9
Dhaka	43.0	78.3	58.3	52.7	10.8	52.0
Khulna	47.2	72.4	58.4	81.3	9.5	51.7
Rajshahi	35.2	79.9	56.5	54.5	8.6	62.2
Sector						
Rural	36.6	83.3	57.1	61.3	10.2	56.7
Urban	60.0	60.8	60.6	76.3	7.7	35.0
National	42.6	77.7	57.9	65.4	9.7	53.1

 TABLE III

 HUMAN DEVELOPMENT PROFILE AT DISAGGREGATED LEVEL IN BANGLADESH

Source: BIDS (2001).

Table IV brings out a few additional aspects. The regional variability appears considerably higher for some human development indicators than others. The variability, as captured by the coefficient of variation, appears to be higher for access to sanitation and child malnutrition compared with child mortality and net enrollment at the primary level. A very high degree of variability is observed with respect to arsenic contamination of the drinking water. This suggests that there is a greater need for developing a spatial focus in designing policies when it comes to tackling the issues of public health (with focus on primary health and nutrition) and poverty reduction.

TABLE IV HUMAN DEVELOPMENT PROFILE AT DISAGGREGATE LEVEL IN BANGLADESH, 2000 (BY DIVISIONS AND SECTORS)

Area	Under 5	Mortality	Rat	Rate of Immunisation			Malnutrition (12-59 months)		
	1005	2000	10	1005		1994	<u> </u>	2000	
1	2	3	1,	1)))		5 6		7	
Division	2	5		-	5	0		,	
Barisal	106	92	8	0.5	71.2	9.1		7.75	
Chittagong	149	92	6	6.5	78.7	8.95		4.60	
Dhaka	137	91	6	9.3	71.7	10.0		4.35	
Khulna	108	91	9	2.1	82.3	4.05		4.25	
Rajshahi	129	94	8	4.1	74.2	6.8		4.20	
Sylhet	-	93		-	64.9	-		4.50	
Coefficient of	27.44	5.78	21	.90	16.83	60.8	7 4	17.37	
Variation (Dist.									
Level Data)									
Sector									
Rural	-	-	7	6.0	73.5	8.15		4.75	
Urban	-	-	8	0.0	82.7	6.15		3.95	
National	125	92	7	6.4	74.4	7.75		4.65	
Area	Net En	olment	Access	to Safe	Δ	rsenic	Acce	ess to	
nea	(6-10	vears)	Dri	nking	Contar	nination in	Sanitary	Latrine	
	(0.10	jeurs)	W	ater	Drink	Drinking Water		But me	
					Re	ported			
	1995	2000	1995	2000	1995	2000	1995	2000	
8	9	10	11	12	13	14	15	16	
Division									
Barisal	86.65	84.95	93.2	95.4	-	0.2	51.7	50.1	
Chittagong	84.3	81	93.79	96.3	-	5.1	41.1	41.9	
Dhaka	76.85	79.35	99.8	99.6	-	3.1	35.0	38.0	
Khulna	87.65	87.2	91.3	91.4	-	5.3	41.8	63.2	
Rajshahi	77.4	82.6	99.2	99.9	-	2.4	27.0	39.6	
Sylhet	-	79.25	-	95.0	-	0.0	-	47.0	

(Table IV Contd.)

Coefficient of	10.60	7.13	18.09	9.07	-	220.89	40.57	41.93
Variation (Dist.								
Level Data)								
Sector								
Rural	80.85	81.85	96.7	97.3	-	3.4	36.4	41.3
Urban	86.0	80.75	99.3	99.5	-	1.1	79.1	61.2
National	81.4	81.75	96.9	96.7	-	3.1	40.7	43.4

Source: PRCPB Database.

Divisional picture, however, conceals deeper regional variations. Thus, a significant differentiation in poverty may be observed even within the Rajshahi division.<sup>4</sup> This explains why in the remaining sections of the paper we primarily look at the district level performance for various poverty and social indicators. However, it should be explicitly noted that even district based poverty mapping is *not adequate* to locate the most vulnerable pockets, one needs to go beyond division or district to identify the pockets of severe distress, i.e., areas which are more vulnerable to widespread starvation and intensified destitution during bad agricultural year and/or during the routine lean period even during a normal agricultural year. This is especially true in case of Bangladesh characterised by the highest population density (excluding the city-states) in the world, implying that even the small thana or union in the pockets of severe distress can affect a large number of population.

#### **Trends in Spatial Inequality**

The extent of spatial inequality measured at the divisional as well as district level shows modest improvement over the recent years. Two measures of inequality are used here. One relates to the coefficient of variation capturing the degree of spatial variability here. The other relates to the polarisation index comparing the rich-poor ratio over time. Both the measures show improvement. Thus, the spatial variability of HPI estimated at the district level has decreased from 13.16 to 11.98 between 1995 and 2000 (Table II). The similar progress has been noted in respect of social indicators measured at the divisional level (Table IV) and at the district level.

<sup>&</sup>lt;sup>4</sup> Variations in male labour wage across districts for both 1995 and 2000 are depicted in Appendix Maps 2 and 3 respectively. The maps indicate that while there are variations in wage rate in both 1995 and 2000, the situation with regard to changes in real wage has improved between these two periods. Some of the districts have been able to improve their situation from low to medium or medium to high wage categories.

### **III. FACTORS INFLUENCING SOCIAL PROGRESS**

Earlier we have noted that a considerable variation exists for both poverty and other social indicators across districts. This section attempts to determine the factors that are responsible for the observed variation. This requires establishing an analytical link between human poverty (other social indicators as well) and economic development.<sup>5</sup>

#### **Bi-variate Regression with District Level Data for 2000**

Five sets of regression analyses have therefore been carried out in order to establish these links. The explanatory variable here is the per capita expenditure. The dependent variables represent the value of human poverty index, total fertility rate, under-five mortality rate, proportion of households having access to sanitary toilet and proportion of children (aged 12-59 months) under severe malnutrition (MUAC<12.5 cm) respectively. Both linear and log-linear specifications have been taken into consideration in this regard.

A bi-variate regression of all the poverty and social indicators with per capita expenditure, as presented in Table V, reveals that the level of aggregate affluence matters (but not always) for social development.

Explanatory	Types of	Dependent Variables								
Variable	Model	HPI	TFR	U5MR	Sanitary	Severe				
					Toilet	Malnutrition				
Per capita	Linear	29**	14	26**	.16	17				
expenditure	t-ratio	-2.38	-1.08	-2.09	1.25	-1.35				
	Adj. R <sup>2</sup>	.07	.003	.05	.01	.01				
	F-ratio	5.67	1.16	4.35	1.57	1.81				
	Ν	63	63	63	63	63				
Per capita	Log-Linear	30**	13	27**	.17	17				
expenditure	t-ratio	-2.50	99	-2.17	1.32	-1.31				
	Adj. R <sup>2</sup>	.08	.00	.06	.01	.01				
	F-ratio	6.23	.97	4.69	1.73	1.71				
	Ν	63	63	63	63	63				

TABLE V SUMMARY TABLE OF BI-VARIATE REGRESSION FOR SELECTED POVERTY AND SOCIAL INDICATORS FOR 2000

\*\* Significant at 5% level.

<sup>&</sup>lt;sup>5</sup> In this section, only the results carried out for the pooled 1995 and 2000 district level data have been presented.

There is a significant inverse relationship at the district level between the incidence of human poverty and the level of per capita income (expenditure).<sup>6</sup> There is also a significant inverse relationship between under-five mortality and per capita expenditure. However, the matched relationships with "total fertility," "severe child malnutrition" and access to sanitation are not statistically significant. This suggests that economic affluence matters for social development only in some respects, leaving considerable room for the non-affluence factors as important factors of social progress.

#### Multivariate Regression with Pooled District Level Data for 1995 and 2000

Even in case of those social indicators where economic affluence matters, it is often the *indirect* effects of affluence (such as via income-poverty reduction and public spending on social and physical infrastructure) that eventually turn out to be the factors making the ultimate difference.<sup>7</sup> This may be tested in a multivariate framework, which represents a set of explanatory variables including the following: per capita expenditure, male wage rate (average daily), population per school, paved road as percentage of total (paved and unpaved) length of road, share of agriculture to GDP, dummies for hilly (CHT) and flood-prone districts.<sup>8</sup> In this model, "wage rate" is considered as a proxy measure for the incidence of income-poverty,<sup>9</sup> while "population per school" and "paved road as proportion of total road" capture the indirect economic affluence effects percolating through the public expenditure channel. In this regression, the dependent variables represent the value of human poverty index, total fertility rate, under-five mortality rate, proportion of households having access to sanitary toilet, proportion of children (aged 12-59 months) under severe malnutrition (MUAC<12.5 cm) and secondary enrollment rate respectively. Both linear and log-linear specifications have attempted, however, given the better fit of the regressions models, only the results obtained from the log-linear

<sup>&</sup>lt;sup>6</sup> Per capita expenditure as estimated from HES data has been used as a proxy for per capita income of a district as no direct estimate of per capita GDP is currently available at the district level.

<sup>&</sup>lt;sup>7</sup> See, Anand and Ravallion (1993) for the pioneering results on this score.

<sup>&</sup>lt;sup>8</sup> In separate estimations, we also included "madrasa students as proportion of total school aged students in the district" to see whether religious orthodoxy has any bearing on the variability in social progress or not. Results, however, do not represent any significant relationship, and thus, they are not reported here.

<sup>&</sup>lt;sup>9</sup> A bi-variate linear regression using district level data for 1995 (district level income poverty data for 2000 is now available) with "incidence of poverty" as dependent and "male labour wage rate" as independent variable indicates a highly significant inverse relationship between the two (Appendix Table A1).

specification have been taken into consideration. Several results of this statistical exercise are noteworthy (Table VI).

Explanatory	Dependent Variables								
Variables	HPI	TFR	U5MR	Sanitary	Severe	Secondary			
				Toilet	Malnutrition	Enrolment			
Average	35**	09	16	.21*	001	.05			
per capita									
expenditure	**	**	*	**					
Male labour	20	31	20**	.24	01	16			
wage	**	- **		**		**			
Population	.28	.36	.15	27	07	41			
per school	<b>~</b> 4**	10**	4.4**	40**	2.4**	10*			
Paved road	24	43	44	.42	34	.19			
as % OI									
Share of	10*	10	00	00	00	15			
Agri to	.19	.10	09	09	.09	15			
GDP									
Dummy for	.41**	.32**	19**	08	- 16	- 10			
CHT			,						
Dummy for	$.20^{**}$	08	04	12*	.11	.01			
flood-prone									
districts									
Adjusted R <sup>2</sup>	.48	.32	.29	.38	.13	.07			
F-ratio	20.12	11.06	9.97	13.34	4.33	2.41			
Ν	127	127	127	127	127	126			

TABLE VI SUMMARY OF THE RESULTS OBTAINED BASED ON LOG-LINEAR (DOUBLE LOG) POOLED REGRESSION WITH DISTRICT LEVEL DATA FOR 1995 & 2000

<sup>\*</sup> Significant at 5% level. <sup>\*</sup> Significant at 10% level.

*First*, the independent effect of aggregate affluence appears to be significant in two cases, observed with respect to the human poverty index and access to sanitary toilet. In respect of other chosen social indicators, it is the indirect effects of growth via the income-poverty reduction and public spending channels appear to be the more relevant immediate explanators of social progress. *Second*, the level of income-poverty appears to be a consistent important factor influencing social progress both when the aggregate measure such as HPI is taken into account and when specific aspects of social deprivations are considered. Districts, which have lower income poverty level, also tend to have lower human poverty index, reduced total fertility rate, lower child mortality, and higher access to sanitation. *Third*, various types of public expenditure impact differently on social development. Greater investments in schooling tend to reduce total fertility rate, decrease child

mortality and increase access to sanitation and secondary enrollment, but appear uncorrelated with severe child malnutrition. Building all-weather paved roads must be considered an important social investment, acting as it is favourably on child mortality, access to sanitation, prevalence of severe child malnutrition and secondary enrollment (but, note, appears uncorrelated with total fertility rate). Fourth, it also appears that agriculture dominated economic structure has significant direct relationship with the human poverty situation of the district. Fifth, even controlling for the possible differences attributable to economic affluence, incomepoverty, and public spending related indicators, there appears strong region-specific effects, captured by the significant presence of the politically long-neglected Chittagong Hill Tracts (CHT) and ecologically vulnerable river-erosion districts. Being in CHT enhances the likelihood of facing greater incidence of "human poverty" (as measured by HPI) as well as high total fertility rate and under-five mortality rate. Similarly, being located in the river-erosion districts can magnify the incidence of overall HPI-poverty, though this factor is not a barrier to the attainment of other social goals.

# Multivariate Regression with Male Wage Rate as the Dependent Variable with Pooled District Level Data for 1995 and 2000

As mentioned previously, "male wage rate" has been considered here as the proxy measure for the incidence of income poverty. An attempt has therefore been made here to analyse the variations of district level male wage rate by a set of explanatory variables in a multivariate framework (Table VII).

RESULTS OBTAINED BASED ON BOTH LINEAR AND LOG-LINEAR (DOUBLE LOG)
POOLED REGRESSION WITH MALE WAGE RATE AS THE DEPENDENT VARIABLE
WITH DISTRICT LEVEL DATA FOR 1995 & 2000

TABLE VII

Dependent	Model	Explanatory Variables						F-	Ν
Variables	Specif ication	Average per capita expendi ture	Popula tion per school	Paved road as % of total road	Dummy for CHT	Dummy for flood- prone districts	sted R <sup>2</sup>	Ratio	
Male	Linear	.52**	04	.31**	.15**	14**	.50	26.44	127
Rate	Log- linear	.55**	02	.26**	.15**	15**	.50	26.64	127

\* Significant at 5% level.

Results show that the effect of aggregate affluence is significant in reducing the income poverty at the district level. Investment on infrastructure also contributes significantly in reducing income poverty at the district level. Controlling for variations attributable to economic affluence and public spending, there appears region-specific effect of male labour wage. As it is observed, wages are higher in CHT, while it is lower in the flood-prone districts.

# Multivariate Regression with the Changes in Social Progress with District Level Data for the period 1991-2000

In the previous sub-sections, we have analysed the factors that are responsible for social progress at the district levels in the country. In this section, an attempt has been made to analyse which initial condition variables have influenced faster social progress during 1995-2000 at the district level. This has also been done in a multivariate framework with the changes in social progress during 1995-2000<sup>10</sup> as the dependent variables and the initial conditions of these variables as well as initial economic affluence at the district level as the explanatory variables (Table VIII). Thus, the dependent variables here include the changes of human poverty, total fertility, under-five mortality, access to sanitary toilet, severe malnutrition and secondary enrolment between 1995 and 2000. The set of explanatory variables here include the initial (1991) condition variables of the level of urbanisation (considered here as a proxy measure for economic affluence) and each of the dependent variables.<sup>11</sup> A double log specification has been used here to estimate the model.

Results show the following: First, the districts which had poor initial level of economic affluence have been able to progress faster with regard to human poverty and secondary enrollment. Second, the districts which had better initial condition of the same dependent variables have been able to progress faster than the others. Both these evidence suggest the presence of "social convergence," implying that poorer districts have made faster progress during the 1990s.

<sup>&</sup>lt;sup>10</sup> Changes here refer to the percentage changes and have been calculated by subtracting the value for 2000 from that of the value of 1995 for each of the variables. Hence, for HPI, TFR, U5MR and Severe Malnutrition, higher negative value of the difference refers to higher progress; and for sanitary toilet and secondary enrolment, higher positive value of the difference refers to higher progress.

<sup>&</sup>lt;sup>11</sup> Exception here is literacy rate which has been considered here as the initial condition variables for three dependent variables—human poverty, severe malnutrition and secondary enrolment.

Explanatory	Dependent Variables (Change between 1995 & 2000: 2000-1995)					
Variables (1991)	HPI	TFR	U5MR	Sanitary	Severe	Secondary
				Toilet	Malnutrition	Enrolment
Rate of urbanisation	.26**	03	06	14	.20	23*
Literacy rate	32**	-	-	-	.01	15
Total fertility rate	-	31**	21	-	-	-
Infant mortality rate	-	-	31**	-	-	-
Access to sanitary toilet	-	-	-	.01	-	-
Dummy for CHT	60**	14	35**	.27*	02	.22*
Dummy for flood- prone districts	20*	18	05	.07	07	.01
Adjusted R <sup>2</sup>	.29	.11	.27	.01	.00	.06
F-ratio	7.48	2.94	5.72	1.06	.73	1.95
Ν	64	64	64	64	64	63

#### TABLE VIII SUMMARY OF THE RESULTS OBTAINED BASED ON LOG-LINEAR (DOUBLE LOG) CHANGE REGRESSION WITH DISTRICT LEVEL DATA FOR 1991-2000

\*\* Significant at 5% level. \* Significant at 10% level.

#### IV. THE "INSTRUCTIVE" OUTLIERS AND DEVIANTS

The "determinants" of average social progress measured at the district level point to some important factors, having implications for economic and social policy. Districts of "over" and "under" achievers for various poverty and social indicators have been identified here by comparing the performance of the districts for each of the selected indicators to the predicted level of expenditure for 2000. Five indicators have been selected here in this regard. They are human poverty index, total fertility rate, under five mortality rate, access to sanitary latrine and prevalence of severe malnutrition. These indicators are considered to be the most important ones with regard to having influence on the overall poverty situation and social differentiation in the country.<sup>12</sup>

<sup>&</sup>lt;sup>12</sup> Due to lack of availability of district level income poverty data, indicators of income poverty, which are also considered to be among the important ones, are not taken into consideration here.

#### Human Poverty Index (HPI)

With regard to the achievement in human poverty situation, the districts that have emerged as the districts of over-achievers include Narail, Gopalganj, Jessore, Khulna, Barisal, Barguna, Jhalokathi and Pirojpur. Almost all of these districts belong to the south-western part of the country. On the other hand, the districts that have emerged as the districts of under-achievers belong to central-north, north-east and south-eastern (hill district) part of the country. They are Jamalpur, Sherpur, Narshingdi, Sunamganj, Sylhet and Rangamati (Appendix Table A2). Among these districts, Jamalpur, Sherpur and Rangamati have pockets of severe distress caused by either river erosion or presence of ethnic minorities. The results clearly show the relevance of adopting a more spatially disaggregated approach to human poverty reduction.

#### **Total Fertility Rate (TFR)**

The set of districts that have emerged as the districts of over-achievers for total fertility rate do not coincide with the previous set of the districts of over-achievers for human poverty except Narail. Other districts of the set include Gaibandha, Thakurgaon, Natore, Munshiganj and Gazipur. These districts belong to northern and central part of the country. Though the northern part of the country is known as relatively more poverty stricken region, some of the districts of this region have able to achieve more with regard to reducing the total fertility rate. It is therefore evident that TFR do not necessarily depend on the level of income of the region. On the other hand, two districts are found common in both the sets of under-achievers for HPI and TFR. They are Narshindi and Rangamati. Other districts of under achievers for TFR include Feni, Khagrachari and Chittagong–all of which belong to the south-eastern part of the country (Appendix Table A2).

#### **Under Five Mortality Rate (U5MR)**

Districts of over-achievers for U5MR belong to the central and northern part of the country. None of the districts of this set coincides with the previous two sets of over achievers. They are Tangail, Rajshahi and Manikganj. However, in the set of under achievers, some districts are found common to that of TFR. These include Feni and Chittagong, both of which belong to the southern part of the country. Others include Patuakhali, Moulvibazar and Chandpur which belong to south and north-eastern part of the country (Appendix Table A2).

#### Access to Sanitary Toilet (AST)

Districts of "over" and "under" achievers for AST belong largely to the same regions of over-and under-achievers noted earlier for human poverty index with few

exceptions. Districts of over-achievers in this case belong to the south-western part of the country except Lalmonirhat which belongs to northern part of the country.

Districts of under-achievers belong to central-north and north-eastern part of the country except Bhola, Cox's Bazar and Narayanganj which belong to central and southern part of the country (Appendix Table A2).

#### Prevalence of Severe Malnutrition (PSM)

Districts of over-achievers in this case belong largely to the central and northern part of the country except Satkhira which belong to the south-west. Districts of under-achievers belong to south-west, south and north-east. Surprisingly, Jhalokathi, which has emerged as the district of over-achiever for human poverty, has come out as under-achiever here in this case. There is, however, broad commonality of regions in terms of over-and under-achievers for PSM with that of TFR and U5MR with only a few exceptions. Exceptions include Satkhira for overachievers and Jhalokathi and Bhola for under-achievers (Appendix Table A2).

#### V. "DEEPER INTERVENTIONS" FOR OVERCOMING SPATIAL TRAPS

The upshot of the preceding discussion is to point out that there are instructive deviants and outliers, which stand out from the rest. The North-Western (Rajshahi division) and South-Western (Khulna and part of Barisal) appear to have done better in terms of promoting social development than the North-Eastern (Sylhet division) and South-Eastern (Chittagong). The Central region (covering Dhaka division) has also fared well (Appendix Table A3).

Two factors appear to be associated with the better performance of the overachievers. *First*, construction of the Jamuna Bridge (representing a massive public investment) helped to integrate the long-neglected Northern and South-Western regions with the rest of the country. This has contributed to the strengthening of the "spread" effects emanating from the more advanced regions, especially in the Dhaka and Chittagong division.<sup>13</sup> *Second*, some districts in the greater Chittagong division which were historically backward showed considerable progress in terms of annual pace of change, though still lag behind others in terms of achieved attainment to date. These relate to regions in the Chittagong Hill Tracts, which seem

<sup>&</sup>lt;sup>13</sup> Geographical proximity to West Bengal may also partly explain superior performance in the Rajshahi and Khulna division in terms of reducing total fertility rate (see, Amin, Basu and Stephenson 2002). Such "diffusion" effects, however, can provide only part of the explanations for fertility decline. In any case, the strength of the diffusion effects may arguably have been increased following greater market integration signalled by the Jamuna Bridge.

to have benefited from the "peace process" unleashed during the period under consideration.

#### VI. SUMMARY AND CONCLUSION

Considerable regional and social variations in poverty exist in Bangladesh. Districts of over-and under-achievers for various poverty and social indicators do not necessarily coincide with each other. Some of the districts have achieved more compared to the others for some indicators, while the others have achieved more for other indicators. It is also true in the cases of under-achievers. This implies that there is diversity in terms of achievement for various poverty and social indicators for each of the districts.

The results show that spatial inequality in social development has been reduced by a modest extent over the second half of the 1990s. This is measured by the spatial trends in respect of human poverty index and key social indicators such as total fertility rate, child mortality, severe child malnutrition, net enrolment rate at primary level and access to sanitation. The South-Western and North-Western districts which were historically lagging behind have done better during this period, while the Nother-Eastern and South-Western districts could do more in accelerating the pace of social development compared to the predicted level implied by their level of average affluence. Market integration facilitated by the construction of the Jamuna bridge, the peace process in the Chittagong Hill Tracts, and, perhaps, fairly intense political competition for public allocations for social and physical infrastructures may have contributed to declining spatial inequality.<sup>14</sup>

There are, however, spatial pockets of severe social distress, which cannot be revealed by the district-level data. The results show the relevance of adopting a more spatially disaggregated, sub-district level approach to poverty reduction, having implications for targeted interventions for the spatially chronic poor areas as well as promoting "development from below" through community driven development, decentralisation and local government.

 $<sup>^{14}</sup>$  These factors need to be explored further through case studies and focus group discussions.

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## **APPENDIX**

#### TABLE A1 EXPLORING THE RELATIONSHIP BETWEEN THE INCIDENCE OF POVERTY AND WAGE RATE: A BI-VARIATE LINEAR REGRESSION USING DISTRICT LEVEL DATA FOR 1995

Dependent Variable	Explanatory Variable (Male Wage Rate)	Adjusted R <sup>2</sup>	F-Ratio	Ν
Head-count Index	63***	.39	41.31	64

\*\*\* Significant at less than 1% level.

#### TABLE A2 DISTRICTS OF OVER AND UNDER ACHIEVERS FOR VARIOUS SOCIAL AND POVERTY INDICATORS COMPARED TO THE PREDICTED LEVEL OF INCOME/EXPENDITURE, 2000

Indicators	Over-achievers	Under-achievers
Human Poverty Index (HPI)	Narail Gopalganj Jessore Khulna Barisal Barguna Jhalokathi Pirojpur	Jamalpur Sunamganj Sherpur Sylhet Narshingdi Rangamati
Total Fertility Rate (TFR)	Narail Gaibandha Thakurgaon Natore Munshiganj Gazipur	Feni Khagrachari Chittagong Narshingdi Rangamati
Under Five Mortality Rate (U5MR)	Tangail Rajshahi Manikganj	Patuakhali Feni Chittagong Moulvibazar Chandpur

(Table A1 Contd.)

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Indicators	Over-achievers	Under-achievers
Access to Sanitary Toilet	Narail	Netrokona
-	Kushtia	Jamalpur
	Magura	Sunamganj
	Lalmonirhat	Sherpur
	Meherpur	Bhola
	Satkhira	Cox's Bazar
	Pirojpur	Narayanganj
Prevalence of Severe	Tangail	Sunamganj
Malnutrition	Joypurhat	Noakhali
	Pabna	Jhalokathi
	Lalmonirhat	Bhola
	Manikganj	
	Munshiganj	
	Satkhira	

#### TABLE A3

# REGIONS OF OVER AND UNDER ACHIEVERS FOR VARIOUS SOCIAL AND POVERTY INDICATORS COMPARED TO THE PREDICTED LEVEL OF INC OME/EXPENDITURE, 2000

Indicators	Over-achievers	Under-achievers
Human Poverty Index (HPI)	South-West	Central-North North-East South-East
Total Fertility Rate (TFR)	North Central South-West	South-East
Under Five Mortality Rate (U5MR)	North Central	South South-East North-East
Access to Sanitary Toilet	South-West North	Central-North North-East South South-East
Prevalence of Severe Malnutrition	Central North South-West	North-East South (Exception: Jhalokathi)









