Addressing Regional Inequality Issues in Bangladesh Public Expenditure

Paper 71

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The present paper titled *Addressing Regional Inequality Issues in Bangladesh Public Expenditure* has been prepared under the CPD-UNDP collaboration programme on *Pro-Poor Macroeconomic Policies* which is aimed at developing pro-poor macroeconomic policies in the context of Bangladesh through research and dissemination. The research papers under the current programme attempt to examine the impact of various macroeconomic policies on poverty alleviation and to establish benchmarks for poverty reduction strategies. The outputs of the programme have been made available to all stakeholder groups including the government and policymakers, entrepreneurs and business leaders, and trade and development partners.

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Acronyms

ADP	Annual Development Programme
BBS	Bangladesh Bureau of Statistics
BRDB	Bangladesh Rural Development Board
CHT	Chittagong Hill Tracts
CHTDB	Chittagong Hill Tracts Development Board
FPMU	Food Planning and Monitoring Unit
FY	Fiscal Year
GDP	Gross Domestic Product
HPSP	Health and Population Sector Programme
LGD	Local Government Division
LGED	Local Government Engineering Department
MP	Member of Parliament
PRSP	Poverty Reduction Strategy Paper
RDA, Bogra	Rural Development Academy, Bogra
RDI	Rural Development and Institution
UNICEF	United Nations Children Fund

1. INTRODUCTION

Traditionally development effort of Bangladesh government have aimed at achieving "equitable economic growth." The concept is an overriding factor in formulating national policy strategies of poverty alleviation. In this context, the objectives of poverty alleviation are mostly designed with social development factors, particularly improvements in health and education indicators. One of the most important policy documents "Unlocking the potential: National Strategy for Accelerated Poverty Reduction" (the PRSP paper which was extended till June 2008), and other government documents embody such with great importance (Medium Term Budget Framework 2007-2010 documents on website of the Ministry of Finance. Since returning to democracy in 1991, Bangladesh's economy has achieved a steady growth rate with concomitant fall of poverty incidences at an accelerated pace. In fact, the country experienced more than 10 percentage point fall in poverty rate between 2000 and 2005 (Table 1), which is indeed a commendable achievement aligned to other better performances that Bangladesh has been experiencing for the last three decades since independence. One feature of this development is, however, less assuring. Regional analysis of poverty incidences shows that reduction rate is not equal across the country, rather the situation is worsening in some cases. Such picture reflects an unequal progress in overall economic activity throughout the country.

TABLE 1: INCIDENCE OF POVERTY (HEAD COUNT RATE) BY COST OF BASIC NEEDS METHOD AND BY DIVISION

Poverty line and division	2005			2000		
	National	Rural	Urban	National	Rural	Urban
1. Using the Lower Poverty Line						
National	**25.1**	**28.6**	**14.6**	**34.3**	**37.9**	**20.0**
Barisal	35.6*	37.2*	26.4*	34.7	35.9	21.7
Chittagong	16.1	18.7	8.1	27.5	30.1	17.1
Dhaka	19.9	26.1	9.6	34.5	43.6	15.8
Khulna	31.6	32.7	27.8*	32.3	34.0	23.0
Rajshahi	34.5	35.6	28.4	42.7	43.9	34.5
Sylhet	20.8	22.3	11.0	26.7	26.1	35.2
2. Using the Upper Poverty Line						
National	**40.0**	**43.8**	**28.4**	**48.9**	**52.3**	**35.2**
Barisal	52.0	54.1	40.4*	53.1	55.1	32.0
Chittagong	34.0	36.0	27.8	45.7	46.3	44.2
Dhaka	32.0	39.0	20.2	46.7	55.9	28.2
Khulna	45.7*	46.5*	43.2*	45.1	46.4	38.5
Rajshahi	51.2	52.3	45.2*	56.7	58.5	44.5
Sylhet	33.8	36.1	18.6	42.4	41.9	49.6

*indicates that the number is higher than the corresponding number in 2000.
Source: HIES (2005).

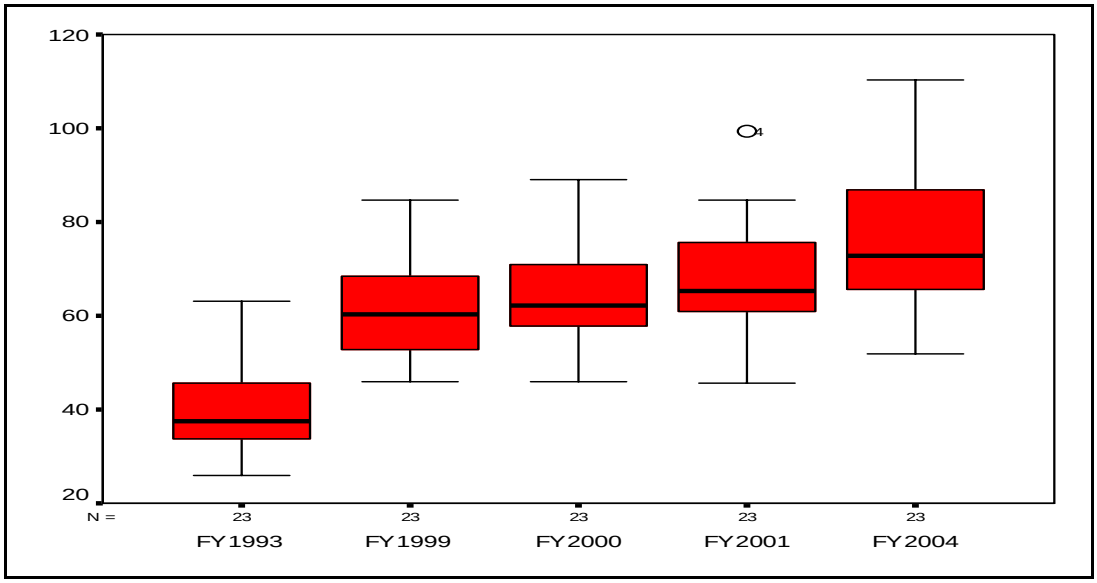
1.1 Regional Economic Disparity in Bangladesh

Is this feature of disparate reduction of poverty across regions persistent over time? How are these regions compared when viewed with other relevant indicators?

Figure 1 has been drawn with the agricultural male wages (non-food) across 64 districts in a given year; here, wage has been taken as a proxy variable for income for districts. Each box plot reflects the disparity in agricultural male wages across districts for a specific year.[1] Agricultural wage is expected to embody the opportunity cost within a district determined by the overall economic activity in it. Therefore, higher the level of agricultural wage, greater is the level of economic activity and income enjoyed by a district.

In Figure 1, the jump in median values between the fiscal year (FY) 1994 and 1999 reflects the fact that nominal agricultural wage including the minimum increased over time. The relevant factor here is the disparity captured by the box plots here. In the case of absolute parity, a box plot collapses to a single point or level and higher the differences in wages, greater would be the deviations of different levels from each other. In FY2000, FY2001 and FY2004, the median wage is observed to be closer to first quartile than third quartile. Comparing the changes in agricultural male wages between FY2004 and FY2001, it is clear that the nominal wage differences of maximum and third quartile wages with the median wage have increased during this time period.

FIGURE 1: BOX PLOT OF AGRICULTURAL MALE WAGES (NON-FOOD) ACROSS DISTRICTS FOR SELECTED YEARS

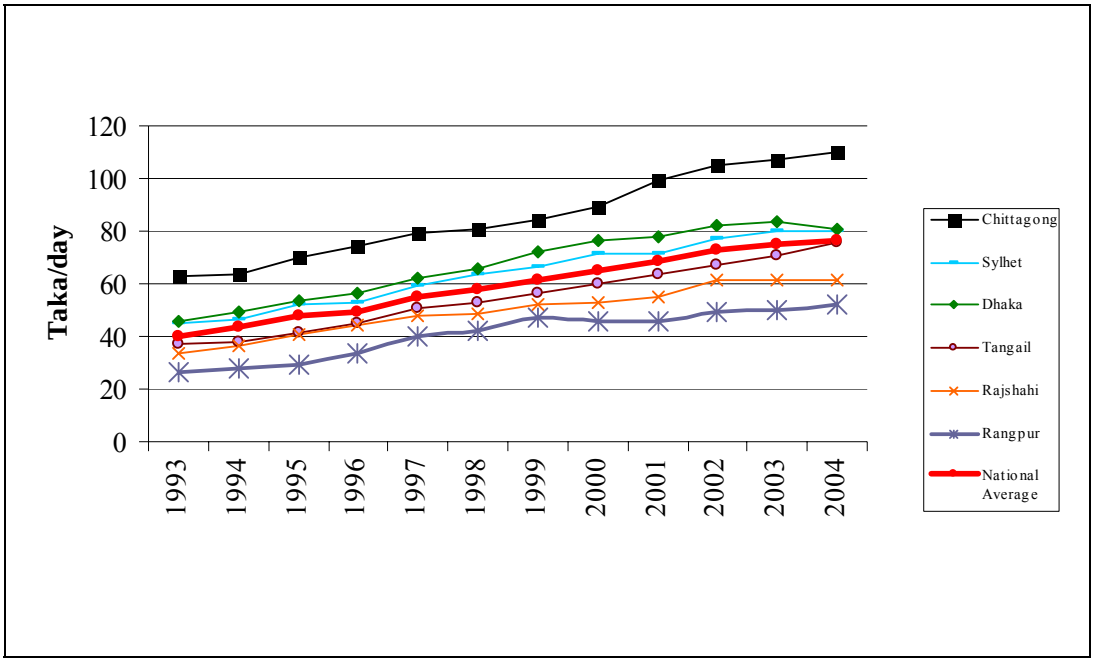


Source: FPMU, Ministry of Food and Disaster Management, GOB.

[1] Available data on Agricultural Male Wage (non-food), collected by Food Planning and Monitoring Unit (FPMU), Ministry of Food and Disaster Management, extends till 2004.

Figure 2 the depicts nominal values of the agricultural male wages for few selected districts together with their national average across time. Although few districts are selectively used for the sake of exposition, inclusion of other districts do not change the story that one reads in Figure 2. It shows that the districts for which the agricultural male wage were below national average remained so throughout the period; the districts that had their wages above national average also remained above for the entire time period shown. Therefore, compared to the national averages, a number of districts have been particularly vibrant in terms of the labour market wage returns (e.g. Chittagong), while a number of other districts have been lagging behind consistently during the same reference period (e.g. Rangpur). If the assertion that agricultural wages reflect the opportunity cost of agricultural activity, determined by the extent of other economic opportunities within the districts, then this finding is suggestive of the fact that income disparity prevails and is persistent across the districts or regions.

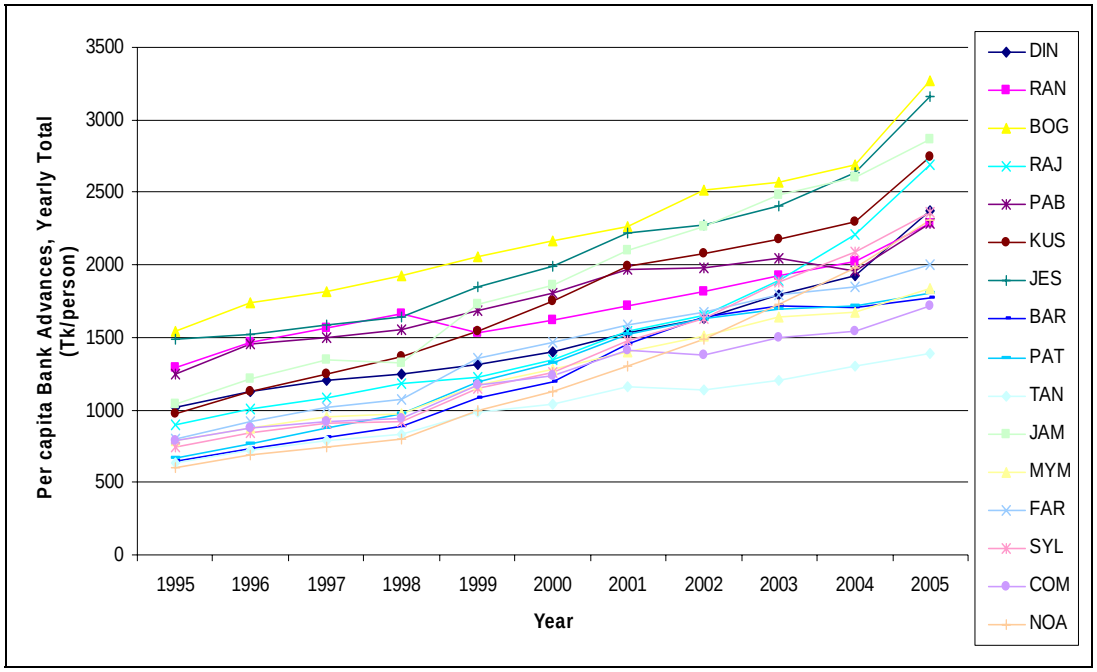
FIGURE 2: AGRICULTURAL MALE WAGE RATE FOR SOME SELECTED DISTRICTS (1993/94 - 2003/04)



Source: FPMU, Ministry of Food and Disaster Management, GOB.

In Figure 3 bank advances in the greater districts are examined, as this variable reflects the economic activity in the districts during the reference period of 1995/96–2005/06. The data provides consistent rankings of the greater districts in terms of per capita total yearly bank advances, information as forwarded by the Bangladesh Bank and documented in the BBS Yearbooks (Annex Table 2 provides detailed breakdown of purposes of bank advances). We could not exhibit data for Dhaka, Chittagong and Khulna as they were outlier cases with rapid expansion trajectories all throughout the reference period.

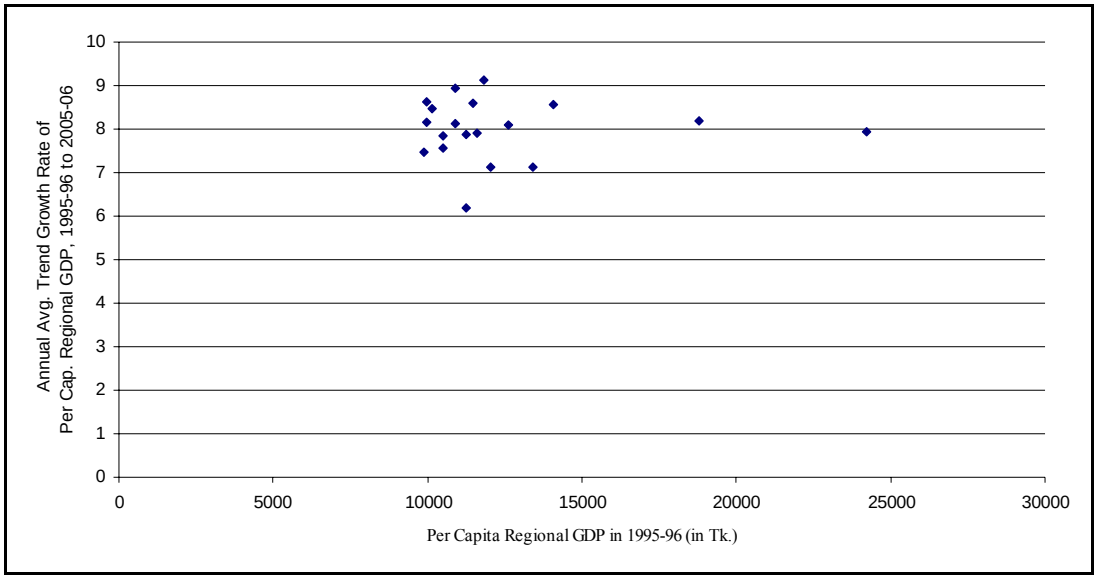
FIGURE 3: PER CAPITA BANK ADVANCES IN THE GREATER DISTRICTS, 1995/96–2005/06, YEARLY TOTAL



Source: Statistical Yearbook of Bangladesh (Various Years), B,B,S,
Note: Dhaka, Chittagong and Khulna are not shown.

If one explores the issue of regional inequality further, it would be found that not only that it exists; but it can even be argued that this would persist for the immediate future, as some information would indicate. Figure 4 plots the per capita regional GDP in 1995-96 as against the annual trend growth rate of per capita regional GDP of the greater districts during 1995/96-2005/06. A distinct downward-sloping line would imply that a higher per capita regional GDP in a particular greater district is associated with a lower annual trend growth rate of the regional per capita GDP in that district during the reference period, and similarly a lower per capita regional GDP is associated with a higher annual trend growth rate of per capita regional GDP. Therefore, a distinct downward-sloping pattern in the scatter plot would have implied that the economically backward regions would "catch up" with the economically advanced regions as time progresses. In Figure 4, a scatter plot of 19 greater districts (excluding the Chittagong Hill Tracts) fails to exhibit any clear-cut pattern rather than a formation of a cluster with a few outlier cases. This implies that data for the reference period does not provide support for the hypothesis of "regional convergence" in the country.

FIGURE 4: PER CAPITA REGIONAL INCOME CONVERGENCE ACROSS GREATER DISTRICTS, 1995/96-2005/06



Source: Regional income data from the CPD.

1.2 Public Expenditure and Regional Inequality

It can be argued that the rapid rise in government spending, particularly in the areas of infrastructure development, health and education, acted as a major force behind the progress made in the Bangladesh economy (the total public expenditure, which includes revenue expenditure as well as the ADP expenditure, has been in between 12.93 and 14.52 percents of the country's GDP at current market prices in the period of 1995/96-2004/05 (Annex Table 1).

It is commonly acknowledged that public expenditure can play a significant role in reducing poverty. If spent unequally public expenditure can exacerbate the existing imbalance in growth and poverty reduction. Therefore, it is a reasonable concern among the development practitioners to investigate the issue of regional distribution of public spending. It has been alleged that inequality in the distribution of political power has often led to some extent to a disproportionate public spending, which in turn may hinder prospects of poverty reduction. This study aims to examine whether regional inequality issues are properly addressed and if not, whether the cited allegation has any factual basis.

With this objective; this paper examines whether government policies have somehow contributed to aggravating regional inequality or not. Another issue relevant to be studied is the motivations behind government policies, particularly issues related to the "political market" in a parliamentary democracy. The issues of "political market" are about "sharing arrangements of the public fund pie" among competing political constituencies--

a common phenomenon within a democratic setup (see Atlas et al. 1995, Keefer and Khemani 2005).

This paper examines the declared public investments made under the Annual Development Program (ADP), and endeavours to answer the following question: *has public expenditure in Bangladesh successfully addressed the regional income inequality problem and if not, has it been influenced by some other considerations which are mainly political by nature?*

1.3 Research Questions

The study examines the published ADP documents. After controlling for all the "year" and "greater district" effects and observed characteristics, it is hypothesised that economically better-off regions would have a higher ADP allocation. If this line of argument were supported, this would imply that the ADP allocations are not properly addressing the regional inequality issue. An additional line of argument is that the districts with a higher proportion of constituencies belonging to the political party (or alliances) in power would have a tendency to receive a higher ADP allocation (because of alleged "bias" created in the system of ADP allocation by the culture of democratically elected Members of Parliament (MPs) pursuing in favour of their own respective constituencies and it is also alleged that the ruling party MPs find it easier to distort the share of the public fund pie in their favor). Therefore, two particular points are of interest:

Hypothesis 1: economically advanced districts receive higher ADP allocations.
Hypothesis 2: districts with higher percentage of constituencies belonging to the party in power receive higher ADP allocations.

1.4 Organisation of the Paper

The paper has been organised as follows: Section 2 lays out the econometric modeling, methodology and data analysis issues. Section 3 analyses a number of important sectors in terms of pro-poor growth aspects of the economy in the ADP allocation. Section 4 presents the conclusion of the study.

2. ECONOMETRIC MODEL AND METHODOLOGY

The data for this study is a panel data. The study requires investigation of the ADP allocation declarations of the Bangladesh government over a substantial period of time, and distribution of this allocation among the greater districts. Therefore, the study needs which will be a panel data, a series of ADP allocation lists for all the greater districts over a number of years.

Since the ADP data records the ADP allocations over time, we have a problem of dealing with the "unobserved effects." The cause of concern with regard to the "unobserved effects" is that, if this "effect" is uncorrelated with each of the explanatory variables, then it can be treated as just another unobserved factor affecting the dependent variable in a way that is not systematically related to the observable explanatory variables, the principle area of interest for the regression analysis. On the other hand, if the "unobserved effect" is correlated with some of the explanatory variables, putting this "effect" in the error term would lead to serious flaws in estimating the regression coefficients. Hence, the panel data framework provides ways to deal with the issue of this "unobserved effect," and this is considered the biggest advantage of a panel data over either a cross section or a time series data. The crucial assumption implied in the panel data framework is that this "unobserved effect" is constant over time (Wooldridge 2000, 2002, Greene 2000). For example, in the case that the unit of observation is the "greater district"-- this "unobserved effect" may contain unobserved characteristics of a particular greater district. There are a number of idiosyncratic features of this particular region that the researchers cannot observe such as higher motivation level of the district stakeholders or higher skill levels, technical abilities and management structure of the local agencies, or a reputation of a particular greater district for successful implementation of ADP. These factors can be viewed as very close to constant over the period in question. In the panel data framework, there are two ways to view the "unobserved effects": one is the "random effects," and the other is the "fixed effects." The "random effects" implies a zero correlation between the observed explanatory variables and the unobserved effect. On the other hand, the "fixed effects" allows for arbitrary correlation between the unobserved effect and the observed explanatory variables (Wooldridge 2002). Whether a fixed effects or a random effects specification is appropriate in a particular application, this mostly depends on results from some econometric tests, such as the Hausman test and the Breusch and Pagan test.

We can propose the following framework of "unobserved effects" for this analysis. This framework will take into account effects from one dimension, namely in this case, the "greater district." This may take a form such as:

$$pcADP_{it} = \alpha_0 + \alpha_i + \beta_1 X_{it} + \beta_2 MP_{it} + \varepsilon_{it} \quad (1)$$

--here, $pcADP_{it}$ is the per capita ADP allocation to district i at year t
α_0 is the intercept
α_i is the "greater district" effect for greater district i
X_{it} are explanatory variables of the greater district i at year t
MP_{it} is a set of variables designed to examine alleged political inclinations of parties in power,
ε_{it} is the error term, and,
β_1 and β_2 are parameters to be estimated, along with fixed or random effects estimates for "greater districts." We may have to depend on the abovementioned tests to decide on the issue of whether the "fixed effects" or "random effects" framework is an appropriate approach here.

According to the motivation behind this examination, both β_1 and β_2 are expected to be of positive signs. The argument is that, after controlling for all the unobserved effects and the "MP" variables, it is hypothesised that economically better-off regions would have a higher ADP allocation. Again, the districts with a higher proportion of constituencies belonging to the political party or alliances in power would have a tendency to receive a higher ADP allocation, controlling for the income indicator, the observed and the unobserved characteristics.

The "unobserved effects regression" specification provides estimates for "unobserved effects" itself (either "random" or "fixed"). The latter will provide a particular value for a greater district in such a way that the sum of all the values over all the districts is exactly zero. This implies that this estimate of random effects will be positive for some districts and those will be negative for some other districts, expressed in the form of a tendency of deviation from the overall national average (which is exactly placed at zero). A hypothetical district with exactly the national average would receive the model predicted value amount of allocation. A greater district with an unobserved effects estimation of positive sign implies that this district would have a tendency to receive higher allocations compared to the national average; similarly, a greater district with an unobserved effects estimation of negative sign implies that this district would have a tendency to receive lower allocations compared to the national average (over the relevant time period) (Wooldridge 2000).

An additional point is this study includes the Hausman test to check the appropriateness of fixed effects estimation in comparison to a random effects specification. A non-acceptance of the null hypothesis in the Hausman test is considered to be a support for a fixed effects specification (Greene 2000). On the other hand, a Breusch and Pagan test implemented after the random effects regression would lend support for the random

effects specification if the null hypothesis of variance of unobserved effects being zero were rejected.

2.1 Data Analysis

The source of information for ADP allocation declarations is the yearly publications of Annual Development Program Reports by the Planning Commission, the Government of the People's Republic of Bangladesh. One feature of this data is that in a large number of cases, this data includes project name, initial estimated cost, expected timeframe of the project, funding sources, declaration of ADP allocation, etc. The projects are not listed according to the greater districts, which is this study's point of interest. Therefore, after classifying the projects in terms of greater districts, from their respective titles, a large portion of projects could not be disaggregated in terms of the greater districts (also the level of disaggregation varied over time and across sectors, see Tables 3, 8 and 13).

A cross-section time-series of regional income (for example, "Regional Gross Domestic Product") is the most appropriate information to be used in this study. Data is not currently available regarding recent years' regional GDP data since the series of information that is available in the official documents in this regard is up to the year 1999-2000. On the other hand, the Household Income and Expenditure (HIES) Surveys are of 1995-96, 2000 and 2005 (the three most recent ones), they were not panel series; in addition, the HIES information is available up to the level of divisions, not up to the level of all the greater districts. Since the ADP declarations are available in the official documents up to as recent as 2007-08, it was felt that regional income data needed to be as much up dated as possible. The Centre for Policy Dialogue (CPD) has provided us with a data on regional income for the period of 1995/96-2005/06, which turned out to be particularly useful in solving the data issue.

It was decided not to include the Chittagong Hill Tracts (CHT) region in our regression analysis, as the CHT region has some political and security issues as well as a different topographical setting compared to all other greater districts-this requires a separate discussion.

One problem of data collection was the difficulty to gathering information on the greater districts on a yearly basis over the entire years of the data analysis section. Another problem was that there were statistically significant correlations among a number of variables on which data were available, so they could not be included in the final regression for issues with multicollinearity, such as "road density," "head count ratio (of poverty)," "bank advances," etc. The estimation results do not alter significantly if these alternative variables are used.

District-level information on child education and health related issues are recorded in the "*Progotir Pathey*" publications by the UNICEF and the BBS to a large extent. But these were not incorporated as we concentrated only on the "economic" aspects of the regional inequality issue, principally because of a lack of consensus among the development practitioners with regard to the weights to be given to the social and health indicators vis-à-vis the economic ones.

The results of the National Parliament Elections (1991, 1996 and 2001) are available on the Bangladesh Election Commission website.

3. SECTORAL ANALYSES

3.1 Rural Development and Institution (RDI)

The major portion of the Rural Development and Institutions (RDI) sector allocation of the ADP is allocated to the Local Government Engineering Department (LGED). The LGED has been involved in constructing rural and urban road infrastructure and networks throughout the country (see Table 2 for the tasks implemented by the LGED). Over the last decade, other recipient agencies of the RDI ADP have been the Bangladesh Rural Development Board (BRDB), Chittagong Hill Tracts Development Board (CHTDB), Local Government Division (LGD), Rural Development Academy, Bogra (RDA, Bogra) and others. While the overall objective is rural development, the recipient departments differ in terms of assignments and objectives.

The transport sector has expanded rapidly over the last decade in government allocations (PER 2003). As documented by the PER, the LGED itself received 0.47, 0.52, 0.64 and 0.78 per cent of the respective GDPs of the years 1997-98, 1998-99, 1999-2000 and 2000-01. Around 90 per cent of the total funds received by the LGED are allocated for construction, upgrading and rehabilitation and the remaining fund is allocated for maintenance (PER 2003), this implies that the major portion is allocated for construction and upgrading, and a small portion is for maintenance.

Level of Disaggregation

The extent of disaggregation found in the RDI ADP was higher than most other sectors reported in the ADP documents. Table 3 depicts the year wise disaggregation found in the published ADP data. The table shows that the level of disaggregation in the fiscal year 1995/96 was about 40 per cent that increased to about 48 per cent for the year 2000/01. For the year 2004/05, however, it declined to 27 per cent. The average district wise disaggregation is about 35 per cent of the total RDI ADP allocation (Table 3).

TABLE 2: ACTIVITIES BY THE LOCAL GOVERNMENT ENGINEERING DEPARTMENT, 2001/02-2006/07

Activity	Cumulative till June 2001	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07 (till February 2007)	Cumulative till February 2007
Unpaved Road (Km)	36,459	4,555	4,770	6,252	6,040	6,573	35	64,684
Paved Road (Km)	19,855	3,255	3,829	4,804	5,237	5,872	3,576	46,428
Bridge/Culvert (M.)	2,88,531	50,882	42,937	49405	60,908	39,728	29,747	5,62,138

Source: LGED, from Samikkha, Ministry of Finance, GoB (2007).

TABLE 3: DISAGGREGATION OF DECLARED ADP RURAL DEVELOPMENT & INSTITUTIONS SECTOR DATA BY GREATER DISTRICTS, 1995/96-2007/08

ADP Year	Total ADP in RDI (in Lakh Taka)	Total Amount of ADP Disaggregated by Greater District (in Lakh Taka)	Percentage of Sectoral ADP Disaggregated
1995/96	83,224	32,574	39.14
1996/97	96,793	40,267	41.60
1997/98	93,894	36,864	39.26
1998/99	1,06,179	49,479	46.60
1999/00	1,55,952	73,744	47.29
2000/01	1,77,350	84,753	47.79
2001/02	1,61,212	63,611	39.46
2002/03	1,65,906	59,436	35.83
2003/04	1,88,741	57,767	30.61
2004/05	2,24,289	60,382	26.92
2005/06	2,86,129	83,115	29.05
2006/07	2,95,280	99,543	33.71
2007/08	3,41,306	85,431	25.03
Total	**23,76,255**	**8,26,966**	**34.80**

Source: Authors' calculation.

A considerable regional disparity exists in ADP allocation in the Rural Development and Institutions (RDI) sector in Bangladesh. Table 4 lists the ranking of different districts according to the amount of ADP received in this sector in a descending order. Based on the district-wise disaggregation, among the greater districts Faridpur enjoyed the largest amount of cumulative ADP, Tk. 73,107.5 lakh in total, from year 1995/96 through 2007/08. It is followed by Noakhali and Sylhet with ADP amounting to Tk. 57,407 and Tk. 55,622 lakh respectively. On the other hand, the two lowest ranking greater districts, Jamalpur and Tangail, received ADP allocations of Tk. 31,993 and Tk. 31,354 lakh respectively. One important fact in this list is that one politically important district, namely Faridpur, is at the top of the greater districts in terms of RDI ADP allocation. If we take into account the differences in population in these districts and express the RDI ADP allocation in terms of per capita, then still this district ranks as the third largest RDI ADP recipient. However, as can be seen from the last column in Table 4, expressing RDI ADP in terms of per capita results in a bit of reshuffle in the original ranking in which Patuakhali replaced Faridpur as the largest recipient, placed Kushtia few levels up and brings down Dhaka to a much lower rank (see Figures 2 and 3 for ADP allocations in RDI sector in selected greater districts, the first one is in total cumulative figures and the second one is in total cumulative per capita figures).

Estimation Procedure

Following the model detailed in the methodology section, district level disaggregated ADP allocation for different years was regressed on income levels for the greater districts and proxy variables for political clout, named, MP ratio, and the vulnerability indicator (expressed as the proportion of the constituencies within the greater districts won by the

ruling party with a margin of votes less than 10 per cent with the second placed candidate). District-wise need for ADP allocation may vary due to differences in need. To address this, the district-wise disaggregated ADP allocation (the dependent variable) has been used in per capita terms. Also, the regression includes variables, such as "population density" (persons per square kilometers) and "area" (square kilometers), to control for these variables.

TABLE 4: RANKING OF DISTRICTS IN TERMS OF RURAL DEVELOPMENT & INSTITUTIONS ADP (PORTION DISAGGREGATED), 1995-96 TO 2007-08, DECLARED (TOTAL, CUMULATIVE)

Ranking	District	Adproad (Lakh Taka)	District	Adproadpc (Taka per capita)
1	Faridpur	73,107.50	Patuakhali	2259.47
2	Noakhali	57,407.33	Jamalpur	1518.81
3	Sylhet	55,622.49	Faridpur	1190.70
4	Patuakhali	52,931.86	Kushtia	1134.58
5	Dhaka	50,991.16	Noakhali	1056.97
6	Rajshahi	50,265.07	Bogra	970.79
7	Khulna	45,768.03	Tangail	951.43
8	Jessore	41,980.87	Pabna	801.78
9	Rangpur	40,446.25	Khulna	784.18
10	Comilla	40,349.00	Jessore	746.01
11	Barisal	38,951.70	Dinajpur	737.71
12	Pabna	38,484.66	Sylhet	685.80
13	Kushtia	38,478.87	Rajshahi	662.62
14	Bogra	37,024.66	Barisal	658.61
15	Dinajpur	34,726.00	Rangpur	445.46
16	Chittagong	33,639.49	Comilla	428.01
17	Mymensingh	33,442.66	Chittagong	377.34
18	Jamalpur	31,993.66	Mymensingh	319.43
19	Tangail	31,354.66	Dhaka	300.21

Source: Authors' calculation.

The basic idea that was intended to be checked in the regressions was to find out whether the greater district-wise ADP allocation decision is affected by political clout and income level, controlling for some observable variables and unobservable variables (through the panel data regression settings). Disparity in ADP allocation may exist due to the fact that political parties view it as a way out to succeed in the next election. Even if the situation is less pessimistic, the disparity may be caused simply by the fact that party in power controls the flow overwhelmingly. The "MP ratio" and the "vulnerability" indicator have been used to take this feature into account.

Correlation Coefficient Results

A simple correlation coefficient was pooled across the greater districts over all the years and the result is provided in Table 5. The results do not exhibit much correlation among

the variables of interest-- therefore a more rigorous analysis in the form of panel data regression was conducted, which controls for a large amount of variables.

TABLE 5: CORRELATION COEFFICIENT RESULTS

	Per capita ADP investment allocation in a greater district in a year in the Rural Development & Institutions sector (in Taka per person) (portion disaggregated by greater district)
Per capita regional GDP	−0.032 *(0.643)*
Percentage of constituencies within greater district with ruling party MP	0.064 *(0.354)*
Percentage of constituencies won by the ruling party within greater district with winning margin being less than 10%	−0.127**(0.068)*

Source: Calculated from ADP of various years and from the Election Commission information (N=209). Data on regional GDP is collected from the CPD. Data on 19 greater districts from 1995/96-2005/06.
(p-values of two-tailed tests of in parenthesis).

Regression Results

Given the general model structure shown in the methodology section, additional considerations were involved in selecting specific model and estimation procedure. A simple pooled OLS procedure was discarded in favour of fixed or random effect estimation due to panel data characteristics of the dataset.

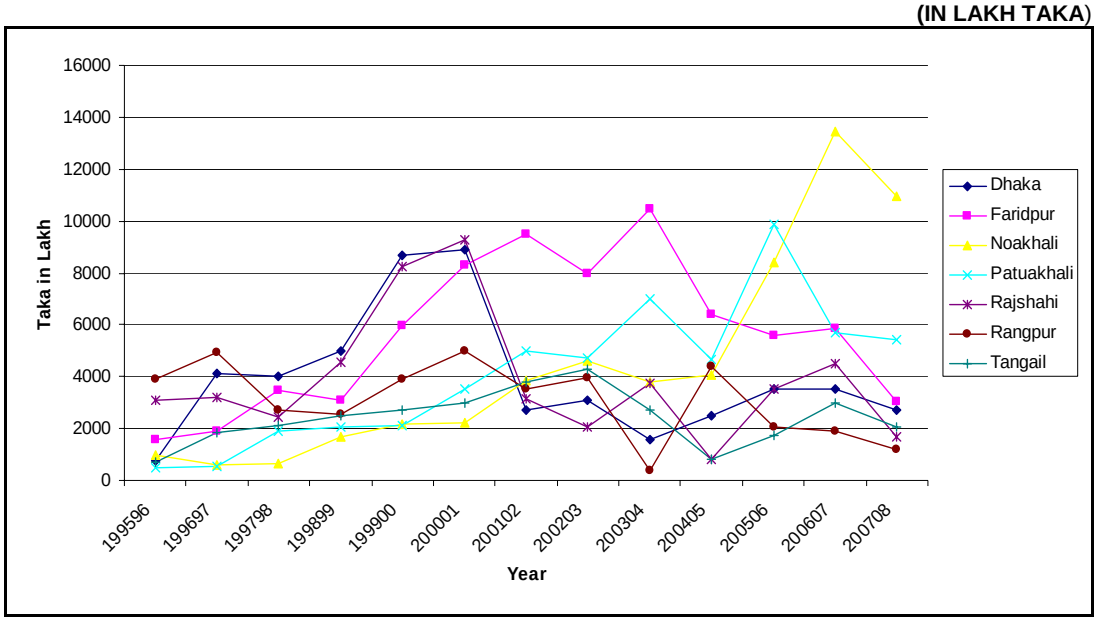
The sign for the natural log of per capita district GDP variable is statistically significant and positive. This suggests that as far as the disaggregated ADP allocation in the rural development is concerned higher allocation went to the more advanced regions, controlling for population density and area as well as variables related to political influences: “mpratio” and “vulnerability.”

Referring to Table 6, we have the random effects estimation results. The model significance of the random effects regression is a value of Wald chi-squared test as 90.6. The MP ratio and the vulnerability indicator turn out to be statistically insignificant. The random effects estimations for greater districts shows a tendency over the reference period, compared to the national average. Patuakhali district has a tendency for the highest per capita RDI allocation of 57.70-higher value compared to the national average. Jamalpur and Faridpur also show higher level of ADP investment in this sector above the national average. Barisal, Dhaka, Noakhali and Chittagong have the tendencies to receive low levels of RDI allocation per capita, with random effects estimations at −19.149, −7.744, −10.566 and −50.430 respectively, as compared to the national average (model predicted value is 61.316). The R-squared value (within) is 0.083, (between) 0.346 and

(overall) 0.18. The fraction of variance that is due to the unobserved greater district characteristics is estimated at 0.263. Both the Hausman test and the Breusch and Pagan test lend support for random effects specification for the panel regression rather than a fixed effects specification.

FIGURE 5: ADP ALLOCATION IN RURAL DEVELOPMENT & INSTITUTIONS SECTOR (PORTION DISAGGREGATED) IN SELECTED DISTRICTS BY YEAR, 1995/96-2007/08

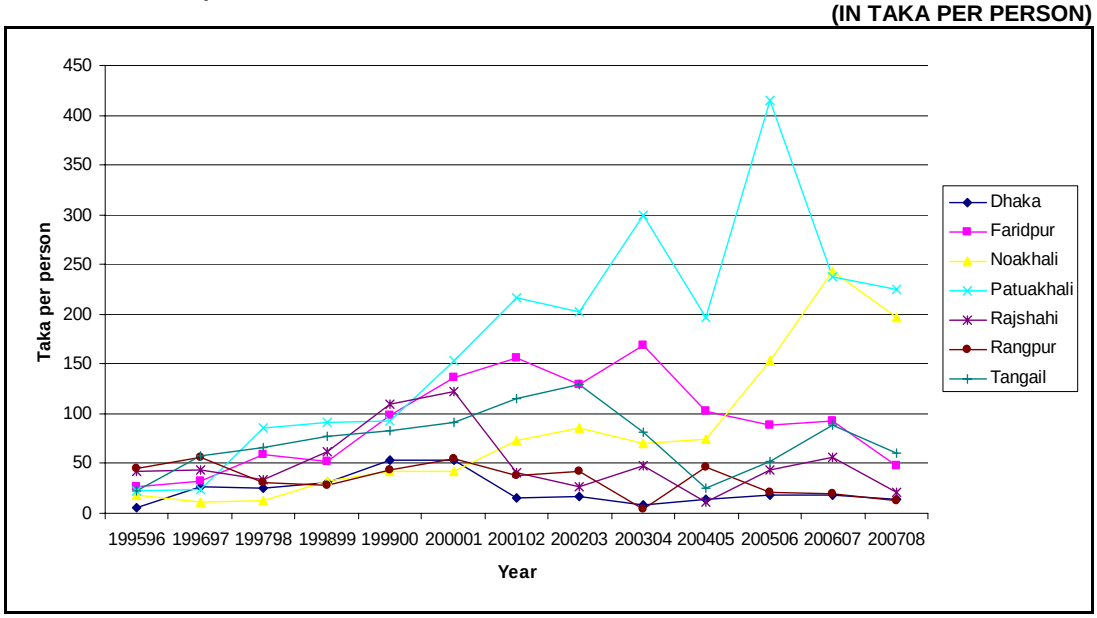
(IN LAKH TAKA)



Source: Authors' calculation.

FIGURE 6: ADP ALLOCATION IN RURAL DEVELOPMENT & INSTITUTIONS SECTOR (PORTION DISAGGREGATED) IN SELECTED DISTRICTS BY YEAR, 1995/96-2007/08

(IN TAKA PER PERSON)



Source: Authors' calculation.

TABLE 6: RANDOM EFFECTS REGRESSION RESULTS WITH ROBUST STANDARD ERRORS OF THE RURAL DEVELOPMENT AND INSTITUTIONS SECTOR (ADP DECLARED ALLOCATION, 1995/96-2005/06)

Dependent variable Per capita ADP investment allocation in a greater district in a year in the RDI sector (in Taka per person) (portion disaggregated by greater district)	Estimated Coefficients *(Heteroskedasticity-robust Standard Error)*	p-value
Independent variables		
Natural Log of Per capita District GDP (Tk.)	52.310*** *(18.424)*	0.005
Population Density (Person/Sq. Km.)	– 0.051*** *(0.014)*	0.000
Area (Sq. K.m.)	– 0.008** *(0.002)*	0.001
% of Constituencies within Greater District with Ruling Party MP	– 0.126 *(0.135)*	0.347
Vulnerability Indicator of Constituencies within Greater District	0.001 (0.135)	0.996
Constant	– 333.360** *(156.628)*	0.033
Estimates of Random Effects		
Dinajpur district	– 12.693	
Rangpur district	– 1.417	
Bogra district	– 2.559	
Rajshahi district	1.280	
Pabna district	– 7.835	
Kushtia district	– 19.915	
Jessore district	– 19.718	
Khulna district	– 10.367	
Barisal district	– 19.149	
Patuakhali district	57.699	
Tangail district	6.941	
Jamalpur district	32.311	
Mymensingh district	33.481	
Dhaka district	– 7.744	
Faridpur district	30.850	
Sylhet district	– 7.383	
Comilla district	7.203	
Noakhali district	– 10.566	
Chittagong district	– 50.430	
Model Predicted Value (at Mean)		
Predicted Value	61.316	
Hausman test for comparison between fixed effects and random effects	Chi-square= 5.91	Pr>chi-sq= 0.206
Breusch and Pagan Test	Chi-square= 46.04	Pr>chi-sq= 0.000

Source: Author's estimation based on BBS.

Note: Number of Observations= 209.
Model Utility: Wald Chi Sqr= 90.600 with Prob.>chi-sq= 0.000.
R^2 (within)= 0.083, (between)= 0.346, (overall)= 0.180.
correlation (u_i, Xb)= assumed zero; sigma(e)= 44.99; sigma(u)= 26.843
and rho (fraction of variance due to u_i)= 0.263.
***significant at 1% level, **significant at 5% level and *significant at 10% level.

3.2 ADP in Road Transport

Bangladesh currently has an extensive network of road transport. According to the World Bank website information, the total length of roads in the country is 239,226 kilometres, of which 22,378 kilometres are classified as "main" roads (including 3,723 kilometres of National Highways roads), an additional 81,670 kilometres are "classified rural roads" and the remaining 135,178 kilometres are "other rural roads". With regards to road

density, there are 2 kilometres of road per 1,000 people and 1,662 kilometres of road per 1,000 square kilometres of land (see Table 7 for overall national roads and highways figures).

The importance of the road transport sub-sector has been properly recognised in the government policy documents (see PRSP Draft Report 2005). The government's transport strategy has traditionally been to support economic development by expanding linkages in the internal transport system and to promote local market integration, particularly in the rural areas (PER 2003, p. 87). One success story of the road transport sub-sector is that this extensive rural road network system has contributed significantly to growth and poverty reduction by diffusing agricultural technology and raising agricultural productivity and enhancing economic activity (leading to higher wages and employment) and lowering transport costs; at the same time, road construction had had a direct employment creation effect as a large number of rural roads were constructed under the Food-for-Work and other labour-intensive rural development initiatives. On the other hand, the road transport system has faced challenges in the form of low level of repair and maintenance as well as poor overall conditions, resulting from

TABLE 7: LENGTH OF RHD ROAD NETWORK AS PER ROAD TYPE
(LENGTH IN KILOMETRES)

Survey Year	National	Regional	Feeder Type A	Total
1996	2,862	1,565	15,860	20,287
1997	3,144	1,746	15,964	20,854
1998	3,090	1,752	15,117	20,959
1999	3,086	1,751	15,962	20,799
2000	3,086	1,751	15,962	20,799
2001	3,086	1,751	15,962	20,799
2002	3,086	1,751	15,962	20,799
2003	3,086	1,751	15,962	20,799
2004	3,086	1,751	15,962	20,799
2005	3,529	4,127	13,125	20,782
2006	3,529	4,127	13,126	20,782

Source: BBS (2001, 2006).dependence on labor-intensive road construction technologies rather than more advanced engineering techniques (PER 2003.).

Note: (a) Roads constructed and maintained by municipalities, district councils and other local bodies not included. (b) width of different roads by category-- national 7.32 meter, regional 5.49 meter, and feeder type A 3.66 meter, (c) Roads and Highways Department data.

Level of Disaggregation

The ADP allocation in road transport is channeled through a number of government agencies, most prominently the Roads and Highways Department. The allocations in this department are mostly directed to expansion, and to some extent rehabilitation, of the existing roads. Maintenance expenditures are generally a small portion of the ADP

allocation. As with other sectors of the government, this sector also exhibits small amount of disaggregating by greater districts. The proportion of disaggregating that was possible varied from a meager 8.2% in the year 1995/96 up to a high 65.04% in the year 2003-04 (Table 8)- a total of 46% of the sectoral ADP was disaggregated over the reference period. Table 8. indicates that the overall level of disaggregating increased over the later years, particularly 2001-02 and onwards. The ADP reports of later years have been more elaborate in stating the name of the area and nature of work, which turned out to be particularly useful for disaggregating.

TABLE 8: DISAGGREGATION OF DECLARED ADP TRANSPORT (ROAD) SECTOR DATA BY GREATER DISTRICTS

(1995/96-2007/08)

ADP Year	Total ADP in Road Transport (in Lakh Taka)	Total Amount of ADP Disaggregated by Greater District (in Lakh Taka)	Percentage of Sectoral ADP Disaggregated
1995/96	1,96,705	16,157	8.21
1996/97	2,02,455	18,250	9.01
1997/98	1,56,205	34,150	21.86
1998/99	1,66,487	45,293	27.20
1999/00	1,82,210	78,109	42.87
2000/01	2,72,975	1,15,694	42.38
2001/02	2,48,870	1,69,550	68.13
2002/03	2,80,387	1,84,387	65.76
2003/04	2,59,956	1,69,065	65.04
2004/05	2,24,581	1,39,722	62.21
2005/06	2,11,379	1,13,790	53.83
2006/07	2,12,920	1,04,467	49.06
2007/08	2,27,382	1,19,007	52.34
Total	**28,42,512**	**13,07,641**	**46.00**

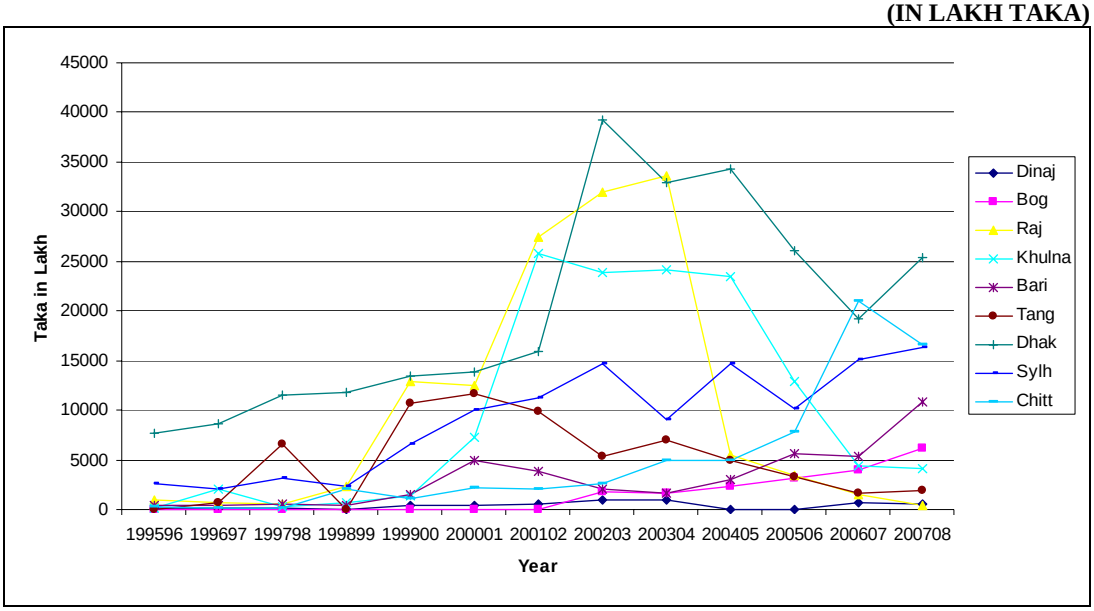
Source: Authors' calculation.

Total and Per Capita Allocations

The ADP allocations (only portion disaggregated) exhibit widespread fluctuations with regard to distribution among the greater districts (Table 9). Dhaka is the highest total cumulative road ADP allocation recipient over the reference period, while Dinajpur is the lowest cumulative road ADP allocation recipient. If we take into consideration the size of the population, Dhaka is replaced by Jamalpur in per capita terms. Dinajpur, Bogra, Jamalpur and Noakhali are the lowest road transport ADP recipient districts, both in absolute terms and in the per capita terms. The wide fluctuations of road transport ADP declarations to the greater districts are exhibited in Figure 7 and Figure 8 in total cumulative and per capita cumulative terms respectively. One interesting point is that a politically distinguishable greater district Bogra received very little amount in ADP road transport allocation disaggregations during the late 2000s, but has recovered moderately during the early 2000s.

FIGURE 7: ADP ALLOCATION IN ROAD TRANSPORT (ONLY PORTION DISAGGREGATED) IN SELECTED DISTRICTS BY YEAR, 1995/96-2007/08

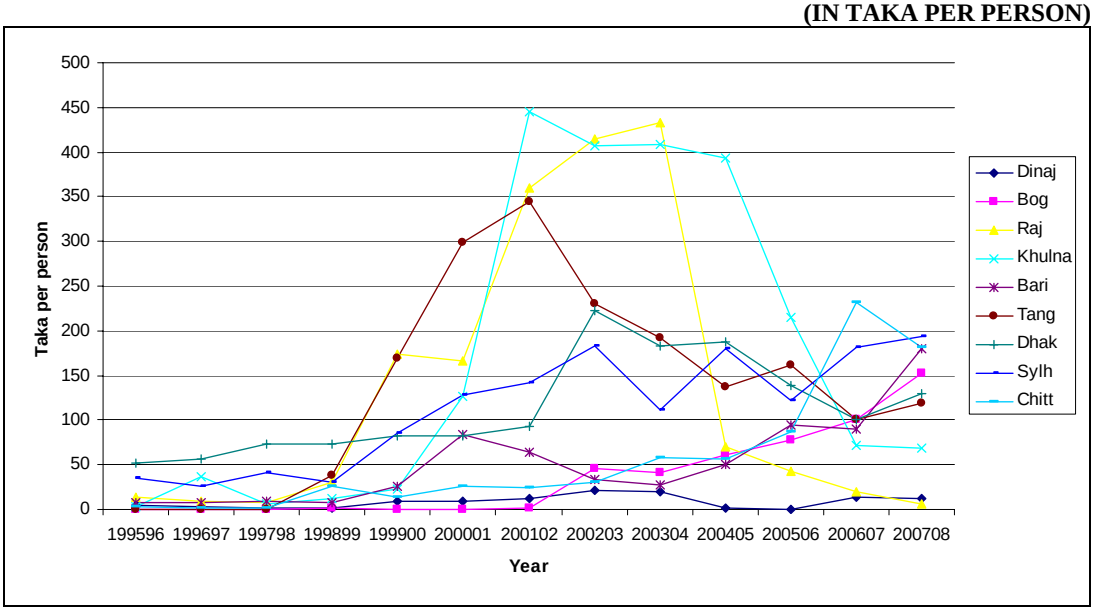
(IN LAKH TAKA)



Source: Authors' calculation.

FIGURE 8: PER CAPITA ADP ALLOCATION IN ROAD TRANSPORT (ONLY PORTION DISAGGREGATED) IN SELECTED DISTRICTS BY YEAR, 1995/96-2007/08

(IN TAKA PER PERSON)



Source: Authors' calculation.

TABLE 9: RANKING OF DISTRICTS IN TERMS OF ROAD ADP (PORTION DISAGGREGATED), 1995/96-2007/08, DECLARED (TOTAL, CUMULATIVE)

Ranking	District	Adproad (Lakh Taka)	District	Adproadpc (Taka per capita)
1	Dhaka	260149.90	Jamalpur	3020.50
2	Rajshahi	133897.00	Khulna	2218.74
3	Khulna	130508.00	Tangail	1790.69
4	Sylhet	117997.00	Rajshahi	1745.45
5	Comilla	76640.00	Pabna	1496.26
6	Pabna	72359.50	Dhaka	1473.42
7	Chittagong	65629.50	Kushtia	1462.69
8	Jamalpur	63661.40	Sylhet	1458.02
9	Tangail	59337.40	Patuakhali	1420.72
10	Jessore	50505.67	Jessore	891.03
11	Kushtia	49889.67	Comilla	820.51
12	Rangpur	45759.00	Chittagong	740.89
13	Barisal	40357.00	Barisal	679.79
14	Patuakhali	33257.00	Faridpur	498.27
15	Faridpur	30522.90	Rangpur	492.67
16	Noakhali	19822.00	Bogra	481.41
17	Bogra	19131.00	Noakhali	365.49
18	Mymensingh	6667.40	Dinajpur	108.09
19	Dinajpur	5146.50	Mymensingh	62.90

Source: Authors' calculation.

Now, referring to Figure 9, we find that, while some districts have received fluctuating ADP allocations, other districts, most notably Dhaka, have always been receiving a substantial and yet stable ADP road allocation designated to it by name. Both per capita ADP figures and total ADP figures exhibited in the figure indicate that the ADP allocations in this highly important sub-sector have allocated resources among different districts in a disproportionate manner (assuming the character of allocation does not substantially alter in the portion of ADP that was not disaggregated).

Correlation Coefficients

Table 10 exhibits the correlation coefficient results. A simple correlation coefficient result may not have captured a number of factors; therefore, we concentrate more on the results of the panel regression analysis.

TABLE 10: REGRESSION RESULTS

	Per capita ADP investment allocation in a greater district in a year in the Road Transport sector (in Taka per person) (portion disaggregated by the greater districts)
Per capita regional GDP	0.313*** *(0.000)*
Percentage of constituencies within greater district with ruling party MP	0.270*** *(0.000)*
Percentage of constituencies won by the ruling party within greater district with winning margin being less than 10%	0.069 *(0.321)*

Source: Calculated from ADP of various years and from the Election Commission information (N=209). Data on regional GDP is collected from the CPD. Data on 19 greater districts for the period of 1995/96-2005/06.
(p-values of two-tailed tests of in parenthesis).

Estimation Procedure

With regard to the regression exercise, two regression techniques were tested. One technique is the "fixed effects specification." Another is the "random effects regression," with heteroskedasticity-robust standard errors in place of default standard errors is aimed at reducing probable problems of heteroskedasticity in the regressions. With results from the abovementioned tests lending support for the random effects specification, this specification was followed in the final regression.

Regression Results

In the "random effects" specification, we regress the per capita greater district ADP allocation declarations in the road transport sector on variables such as population density, area, the "mpratio" and the "vulnerability" indicators, and the natural log of per capita regional income. The per capita district income term turns out to be positive and statistically significant; this implies that, after controlling for observable variables such as the population density and the area, and the "unobserved effects," there has been a statistically significant coefficient estimate for the per capita income term. In other words, after controlling for all these effects, the ADP road transport allocation per capita has exhibited a tendency to be more directed towards greater districts whose per capita regional income is higher. In addition to this, the "mpratio" term has turned out to be positive and statistically significant at 10 per cent level. The estimates of "unobserved effects" show an overall tendency over the reference period. The estimates are in such a way that some of the districts are above the mean value of zero and some of the other districts are below the mean value such that the sum of all the "unobserved effects" reported would be zero. So a negative value of the unobserved effect implies a tendency for a particular district to receive a less than average allocation over time; similarly, a positive value implies a tendency for more allocations to move to the district. Road ADP allocations may have a tendency for regional inequality, as it is evident in the wide

variations in the estimates of "unobserved effects" across districts. At the same time, the road allocation may have been somewhat influenced by political considerations. In combination with the graphs exhibiting per capita road ADP allocations in some representative districts, there may be a systematic pattern that emerges-the pattern is that a number of greater districts may not be receiving due attentions with respect to ADP investments in roads.

With regard to alleged political clouts in distribution of road ADP allocations, the model has a variable called the "MP ratio" (percentage of MPs within a greater district that belongs to the ruling party during the reference period). A second political variable that was tested was the "vulnerability ratio" (percentage of seats that belongs to the ruling party MPs where the election result had been close, such as difference between the winning MP from ruling party has won the parliament election and a difference of votes below 10 per cent of the second-placed candidate)- but this variable did not turn out to be statistically significant.

The random effects results have provided both expected and statistically significant signs for the natural log of per capita regional GDP and *mpratio*. The coefficient of the log of per capita district GDP term is 124.741 (standard error is 21.866). Here the natural log of per capita regional GDP has been used rather than the simple per capita regional GDP to reduce fluctuations in the money figures. One explanation for the statistical significance of natural log of per capita regional GDP is that the economically advanced regions are often given higher allocation declarations, controlling for some observable variables and unobserved effects; simply stating, roads and bridges are typically assigned not in the remotest of places, but typically these are built in better off regions. A statistical significance for the "mpratio" variable can be interpreted as follows: the Members of Parliaments may have played a more prominent role in this road transport sector. A road or a bridge constructed with active "influences" by the incumbent MP is considered to be one of the key factors for the MP to be able to retain the constituency in the next election. The local MP is therefore much more concerned about a road or a bridge principally because this is a winning point in the next election; at the same time, given a typically large size of this road allocation, it is much more convenient for the MP to get involved in some rent-seeking or favouritism activities; this is actually more easier if the MP is from the ruling party or the alliance in power.

TABLE 11: RANDOM EFFECTS REGRESSION RESULTS WITH ROBUST STANDARD ERRORS OF THE ROAD TRANSPORT SECTOR

(ADP DECLARED ALLOCATION, 1995/96-2005/06)

Dependent variable Per capita ADP investment allocation in a greater district in a year in the Road Transport sector (in Taka per person) (portion disaggregated by greater district)	Estimated Coefficients *(Heteroskedasticity-robust Standard Error)*	p-value
Independent variables		
Natural Log of Per capita District GDP (Tk.)	124.741***(21.866)*	0.000
Population Density (Person/Sq. Km.)	– 0.006 *(0.017)*	0.746
Area (Sq. Km.)	– 0.002 *(0.005)*	0.644
% of Constituencies within Greater District with Ruling Party MP	0.317**(0.187)*	0.090
Vulnerability Indicator of Constituencies within Greater District	0.011 *(0.353)*	0.976
Constant	– 1136.127***(197.475)*	0.000
Estimates of Random Effects		
Dinajpur district	– 58.517	
Rangpur district	– 4.238	
Bogra district	– 46.545	
Rajshahi district	72.582	
Pabna district	30.186	
Kushtia district	40.560	
Jessore district	– 9.082	
Khulna district	72.644	
Barisal district	– 29.368	
Patuakhali district	23.202	
Tangail district	79.721	
Jamalpur district	– 41.998	
Mymensingh district	– 10.116	
Dhaka district	– 31.299	
Faridpur district	– 7.926	
Sylhet district	30.239	
Comilla district	5.511	
Noakhali district	– 34.313	
Chittagong district	– 81.244	
Model Predicted Value (at Mean)		
Predicted Value	78.036	
Hausman test for comparison between fixed effects and random effects	Chi-square= 4.82	Pr>chi-sq= 0.306
Breusch and Pagan Test	Chi-square= 60.07	Pr>chi-sq= 0.000

Source: Author's estimation based on BBS.

Note: Number of Observations= 209;
Model Utility: Wald Chi Sqr= 92.92 with Prob.>chi-sq= 0.000;
R^2 (within)= 0.195, (between)= 0.067, (overall)= 0.144
Correlation (u_i, Xb)= assumed zero; sigma(e)= 79.105; sigma(u)=50.286
and rho (fraction of variance due to u_i)= 0.288
***significant at 1% level, **significant at 5% level and *significant at 10% level

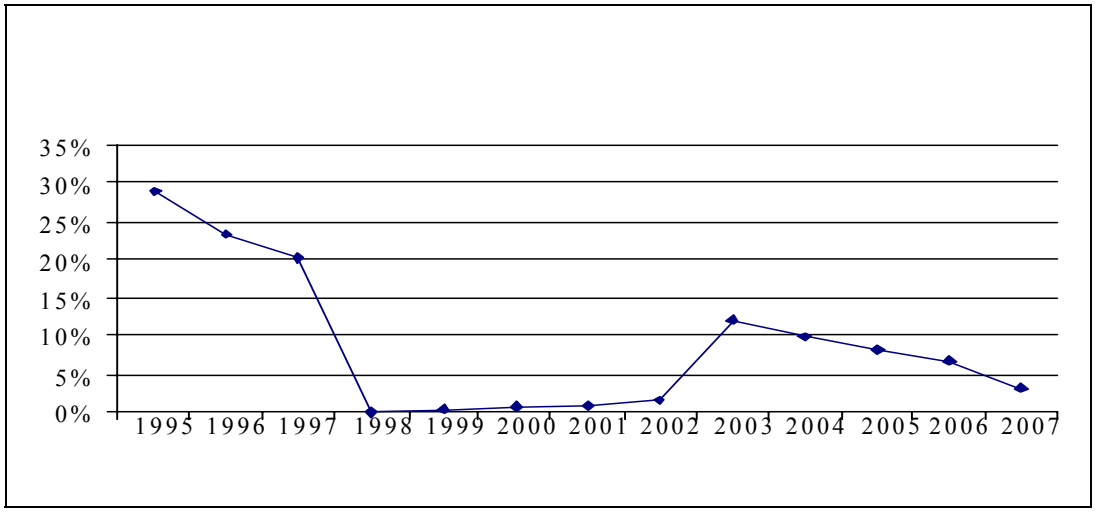
3.3 Health, Population and Family Welfare

Bangladesh has made substantial progress in the provision of health care facilities over the years. Bangladesh Public Expenditure Review (2003) reports that considerable improvement came through investment in this sector- infant mortality rate has declined, life expectancy has increased by 14 years and spread of preventable diseases, such as

polio and malaria, has been contained. Many more challenges remain still; much less progress came in reducing malnutrition of children and maternal mortality has remained very high.

The sector was included in the current study as it ranks high in terms of proportion of allocation in ADP. However, after disaggregation, the sector was found to be very insignificant, particularly for the years 1998 onward. Figure 9 depicts year wise disaggregation found in this sector for different districts. It can be seen from Figure 9 that starting from the fiscal year 1998/99 the level of disaggregation dramatically declined below 1per cent and has remained below 10 per cent for recent years. The reason behind such decline had to do with government's decision to shift to a programmatic approach from the previous project based approach. Due to such low level of disaggregation, no meaningful regression or analysis can be conducted on the basis of the disaggregated data.

FIGURE 9: LEVEL OF DISAGGREGATION IN THE HEALTH ADP ALLOCATION, 1995/96-2007/08



Source: Authors' calculation.

Although no direct analysis could be conducted on the basis of data due to idiosyncrasy of this sector, there are reasons to believe that public spending over time had been regionally equitable in nature. As have been mentioned, Bangladesh has been successful in containing many preventable diseases. Such success would require equity in spending; otherwise, constant migration would compromise success in any region.

The government has initiated a shift in the Health, Population and Family Welfare sector from 1998 in which project based approach has been replaced with programmatic approach. The Health and Population Sector Program (HPSP) aims at making changes which are Bangladesh wide and therefore requires investment equitably at least at the

Thana levels. However, if or not equitable distribution in spending was achieved in reality can only be found through primary data collection from the field level studies.

3.4 Education and Religious Affairs

Bangladesh's achievement in the education sector is quite impressive compared to other least developed countries and particularly compared to its neighbours. Government's strong commitment to education, manifested in the fact that this sector is receiving the highest share of the public expenditure (ADP and recurrent budgets combined) for quite a number of years now, has made this possible.

TABLE 12: BANGLADESH PUBLIC EDUCATION EXPENDITURE

Fiscal Year	Revenue Expenditure (per cent of GDP)	Development Expenditure (per cent of GDP)
1995/96	1.30	0.83
1996/97	1.30	n.a.
1997/98	1.39	0.73
1998/99	1.35	0.80
1999/00	1.37	0.84

Source: Bangladesh Public Expenditure Review (2003).
Note: n.a. not available

However, not all the regions of the country have witnessed similar success in education. Though all regions have seen some progress, but there is still wide variation across regions in terms of the key indicators of education, and the gap is not narrowing. Under this context, one may try to analyse the distribution of public investment across regions to see whether government expenditure decision has anything to do with it.

Level of Disaggregation

Unfortunately, in the ADP, the regional investment figures are not readily available. So the study team had to engage in identifying the funds directed towards each region based on the name of the project. This allowed regional disaggregation of only a very small portion of the total investment (Table 13).

TABLE 13: DISAGGREGATION OF DECLARED ADP EDUCATION AND RELIGIOUS AFFAIRS SECTOR DATA BY GREATER DISTRICTS, 1995/96-2007/08

ADP Year	Total ADP in Education (in Lakh Taka)	Total Amount of ADP Disaggregated by Greater District (in Lakh Taka)	Percentage of Sectoral ADP Disaggregated
1995/96	1,59,648	10,393	6.510
1996/97	1,75,822	14,962	8.510
1997/98	1,67,711	13,205	7.874
1998/99	1,70,290	14,368	8.437
1999/00	1,92,411	11,767	6.116
2000/01	2,24,500	14,529	6.472
2001/02	2,38,673	15,678	6.569
2002/03	2,89,450	17,698	6.114
2003/04	2,34,364	19,270	8.222

ADP Year	Total ADP in Education (in Lakh Taka)	Total Amount of ADP Disaggregated by Greater District (in Lakh Taka)	Percentage of Sectoral ADP Disaggregated
2004/05	302225	19065	6.308
2005/06	278222	34828	12.518
2006/07	752291	31700	4.214
2007/08	359317	29855	8.309
Total	**3544924**	**247318**	**6.977**

Source: Authors' calculation.

Total and Per Capita Allocations

Analysis of the disaggregated data reveals that there exist significant differences in the public investment in education and religious affairs across regions (Table 14). It may happen because these regions vary in terms of size of the population. However, the variation does not go away when one looks into per capita public investment in this sector. In fact, the rankings are almost similar, indicating that regions that dominate in receiving public investment also do so in per capita sense.

TABLE 14: RANKING OF GREATER DISTRICTS (RECEIVING SIGNIFICANT INVESTMENTS) IN TERMS OF EDUCATION ADP (PORTION DISAGGREGATED), 1995/96-2007/08, DECLARED (TOTAL, CUMULATIVE)

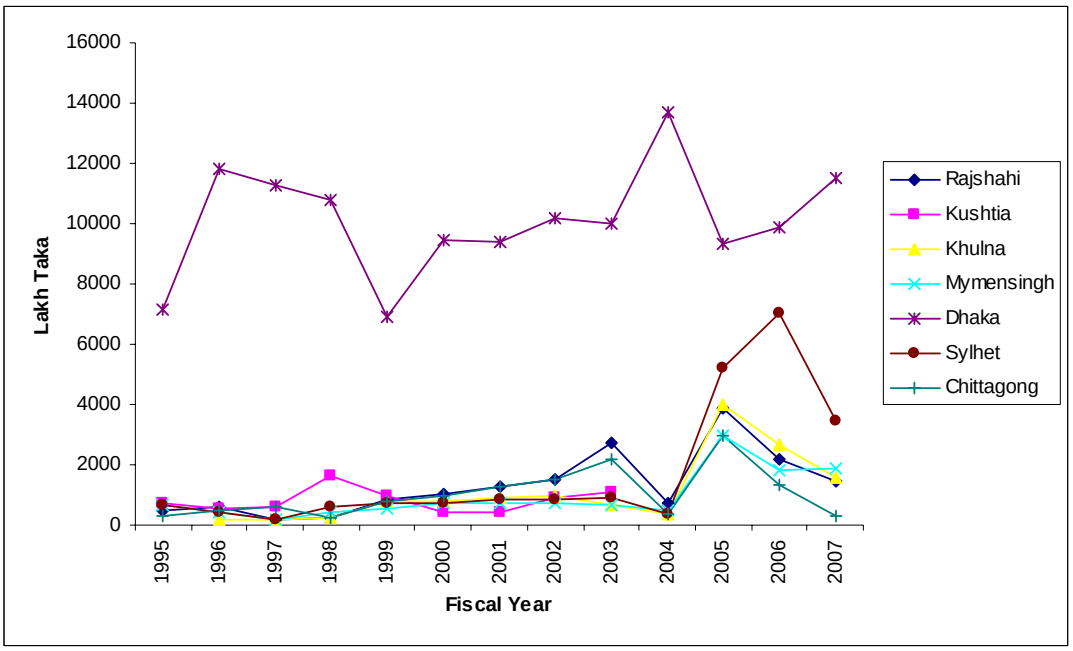
Ranking	District	ADP (Lakh Taka)	District	ADPPC (Taka per capita)
1	Dhaka	1,31,406	Dhaka	763.17
2	Sylhet	21,866	Sylhet	266.54
3	Rajshahi	17,135	Khulna	225.75
4	Khulna	13,416	Kushtia	225.12
5	Chittagong	13,330	Rajshahi	220.46
6	Mymensingh	12,136	Chittagong	156.13
7	Kushtia	7,326	Mymensingh	115.03
8	Noakhali	5,147	Noakhali	95.63
9	Comilla	4,739	Barisal	73.58
10	Barisal	4,386	Bogra	69.88
11	Faridpur	3,961	Jessore	63.56
12	Jessore	3,754	Faridpur	62.79
13	Bogra	2,788	Comilla	49.49
14	Dinajpur	1,402	Dinajpur	28.03
15	Pabna	745	Pabna	14.37

Source: Authors' calculation.

A look into the investment flows over time reveals that Dhaka always gets the major share of the public investment (Figure 10). This also holds true till 2004 when per capita investment flows are considered (Figure 11). After 2005, Sylhet, Mymensingh and Khulna received more public investment per person than Dhaka and other regions.

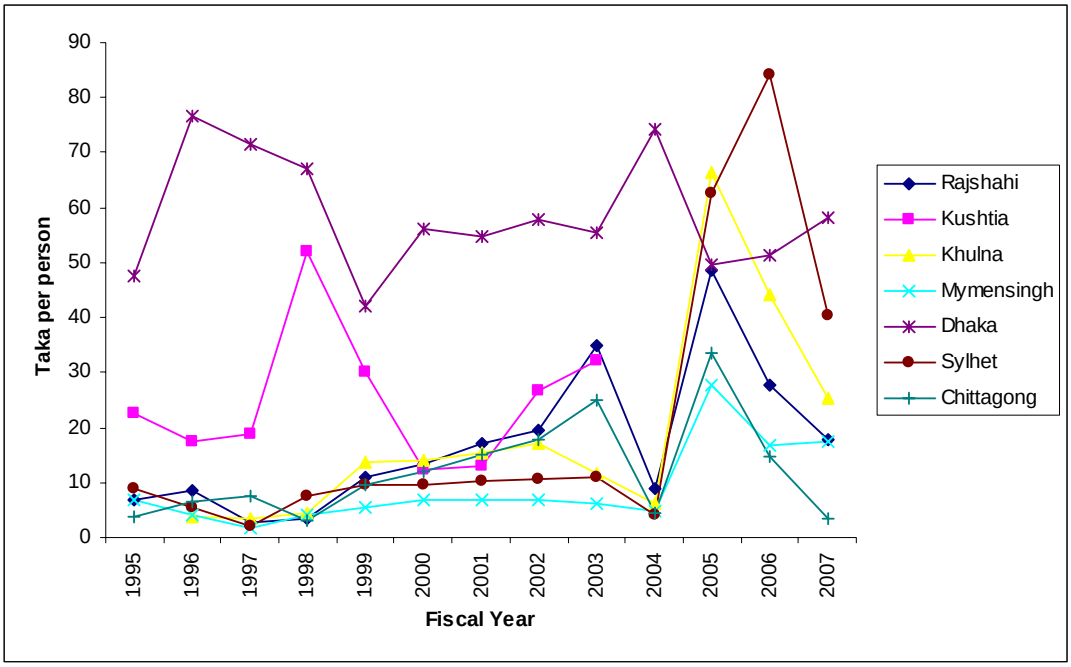
Now if one considers per capita regional gross domestic product as a measure of regional prosperity, and if the data reveals that per capita ADP spending is associated with this variable, then it may happen that the variation in public investment across regions is partly explained by regional inequality. Strength and vulnerability of the ruling party in a particular region might also play a role.

FIGURE 10: ADP EXPENDITURE IN EDUCATION AND RELIGIOUS AFFAIRS IN SELECTED REGIONS



Source: Authors' calculation.

FIGURE 11: PER CAPITA ADP EXPENDITURE IN EDUCATION AND RELIGIOUS AFFAIRS IN SELECTED REGIONS



Source: Authors' calculation.

Correlation Coefficients

The results (Table 15) do indicate that the association between per capita ADP spending in this sector and per capita regional gross domestic product is moderate and positive and it is significant as well. The association between per capita ADP spending and percentage of constituencies in a region won by ruling party turns out to be very small and positive, but this association is not significant. Vulnerability of the ruling party, measured as percentage of seats won by the ruling party in a region where the victory margin is less than 10 per cent, does not have any association with per capita ADP spending.

TABLE 15: PEARSON CORRELATION RESULTS

	Per capita ADP investment allocation in a greater district in a year in the education and religious affairs sector (portion disaggregated by greater district)
Per capita regional GDP	0.684*** *(0.000)*
Percentage of constituencies within greater district with ruling party MP	0.112 *(0.106)*
Percentage of constituencies won by the ruling party within greater district with winning margin being less than 10%	−0.032 *(0.647)*

Source: Calculated from ADP of various years, and from election commission reports (N=209).
Data on ADP allocation from 1995-96 to 2005-06.
(p-values of two-tailed test in parenthesis).

Estimation Procedure

As per the methodology, regression of the regional variation in per capita ADP investment on the per capita regional GDP, population density, area of the greater district, percentage of constituencies within greater district with ruling party MP, and the "vulnerability indicator" (percentage of the constituencies within the greater district won by the ruling party but by a margin of votes less than ten percent)- was carried out. Heteroscedasticity-consistent standard errors were used. Random effects specification was selected instead of fixed effects specification.

Regression Results

The results indicate that the pool of independent variables do explain the variation in the dependent variable (Table 16). The constant term and the coefficients of the vulnerability indicator of constituencies with the region and natural log of per capita district GDP turn out to be significant at 1 per cent level and the coefficients of population density and area are significant at 5 per cent level. The sign of the coefficient of per capita GDP is positive which indicate that regions with higher level of per capita GDP tend to receive more public investment per person. The negative relationship as seen from the result between the dependent variable and the vulnerability indicator is not expected and as seen the coefficient is not economically significant. Dhaka and Kushtia are the two regions that receive significantly more public investment than the average and for Rangpur it is just the opposite. However, one has to be very cautious in interpreting these results as the analysis is carried out using a very small percent of the total spending and the estimation may suffer from omitted variable bias.

TABLE 16: RANDOM EFFECTS REGRESSION RESULTS WITH ROBUST STANDARD ERRORS OF THE EDUCATION AND RELIGIOUS AFFAIRS SECTOR (ADP DECLARED ALLOCATION, 1995/96-2005/06)

Dependent variable Per capita ADP investment allocation in a greater district in a year in the Education and Religious Affairs sector (in Taka per person) (portion disaggregated by greater district)	Estimated Coefficients *(Heteroskedasticity-robust Standard Error)*	p-value
Independent variables		
Natural Log of Per capita District GDP (Tk.)	13.145***(3.741)*	0.000
Population Density (Person/Sq. Km.)	0.008***(0.004)*	0.029
Area (Sq. Km.)	0.002**(0.001)*	0.046
% of Constituencies within Greater District with Ruling Party MP	– 0.008 *(0.024)*	0.751
Vulnerability Indicator of Constituencies within Greater District	– 0.091*** *(0.029)*	0.002
Constant	– 140.417*** *(34.918)*	0.000
Estimates of Random Effects		
Dinajpur district	– 4.389	
Rangpur district	– 11.120	
Bogra district	1.230	
Rajshahi district	6.732	
Pabna district	– 4.023	

Kushtia district	17.835	
Jessore district	– 7.483	
Khulna district	1.789	
Barisal district	– 0.588	
Patuakhali district	– 6.071	
Tangail district	– 0.065	
Jamalpur district	– 1.422	
Mymensingh district	– 7.016	
Dhaka district	27.193	
Faridpur district	– 3.624	
Sylhet district	2.858	
Comilla district	– 12.641	
Noakhali district	4.714	
Chittagong district	– 3.830	
Model Predicted Value (at Mean)		
Predicted Value	8.535	
Hausman test for comparison between fixed effects and random effects	Chi-square= 3.02	Pr>chi-sq= 0.554
Breusch and Pagan Test	Chi-square= 195.100	Pr>chi-sq= 0.000

Source: Author's estimation based on BBS.

Note: Number of Observations= 209.
Model Utility: Wald Chi Sqr= 28.65 with Prob.>chi-sq= 0.000.
R^2 (within)= 0.135, (between)=0.477, (overall)= 0.362,
correlation (u_i, Xb)= assumed zero; sigma(e)= 9.091; sigma(u)= 8.965
and rho (fraction of variance due to u_i)= 0.507.
***significant at 1% level, **significant at 5% level and *significant at 10% level.

4. CONCLUSION AND RECOMMENDATIONS

The share of ADP investment figures that can be disaggregated by regions turns out to be on the lower side and in some instances very low for the sectors considered. This task is quite challenging, given the nature of the public documents which are not user friendly. The citizens of the country require better access to information regarding public expenditure allocation to be able to better understand the functioning of the government and its contribution to their economic well-being.

In order to have a thorough investigation in to the subject one needs more data. This requires a comprehensive data collection phase, which was beyond the scope 07 this study.

The limited data set does indicate that investment is substantially high for Dhaka. However, once adjusted for population, the difference becomes moderate in all the sectors. This may imply that public expenditure allocation in Bangladesh has some in-built regional inequality features that, if not addressed properly, may have adverse consequences for the homogenous development of the country in the long run.

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ANNEX TABLE 1. PUBLIC EXPENDITURE IN BANGLADESH (1995-96 TO 2005-06) (IN MILLION TAKA) (REVISED ESTIMATES)

Year	**1995-96**	**1996-97**	**1997-98**	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Development Expenditure	100157	110410	110370	125090	154710	161508	140902	154343	168173	187260	194720
Revenue Expenditure	120833	123731	148450	168783	185820	206619	220002	265881	274322	327736	351544
GDP at current market prices	1663240	1807013	2001766	2196952	2370856	2535464	2732010	3005801	3329731	3707070	4157279
Dev. Exp. as % of GDP current market prices	6.022	6.11	5.514	5.694	6.525	6.37	5.157	5.135	5.051	5.051	4.684
Rev. Exp. as % of GDP current market prices	7.264	6.847	7.416	7.683	7.838	8.149	8.053	8.846	8.239	8.841	8.4564
Public Expenditure as % of GDP	13.287	12.957	12.93	13.377	14.363	14.519	13.21	13.981	13.289	13.892	13.14
Population at mid financial year (million)	122.1	124.3	126.5	128.2	129.8	129.9	131.6	133.4	135.2	137	n.a.
Per capita Total Expenditure											
at constant prices (base: 1995-96) (in Tk.)	893	1827	1885	2018	2268	2411	2261	2485	2477	2707	n.a.
at current prices (in Tk.)	1810	1884	2046	2292	2623	2834	2742	3150	3273	3759	n.a.

Source: Statistical Yearbook of Bangladesh (Various Years), B.B.S.
n.a. not available

ANNEX TABLE 2. BANK ADVANCES BY MAIN ECONOMIC PURPOSES (1995-96 TO 2005-06) (IN MILLION TAKA)

Economic Purpose	**1995-96**	**1996-97**	**1997-98**	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Agriculture, Fisheries & Forestry	64337.8	67399.3	69904.6	80378.6	86749.0	93147.7	96458.1	93401.1	98435.7	106746.4	113529.2
Industry (Other than Working Capital Financing)	97126.9	111738.8	141409.4	153524.2	168945.0	182454.0	180887.2	168951.5	183792.6	199521.9	244756.1
Working Capital Financing	39127.6	49486.2	50900.8	58036.9	51985.3	62088.3	98008.6	149718.9	174960.3	220689.1	257989.6
Construction	20491.5	24241.2	26214.0	31841.3	34064.6	39189.5	45725.5	56373.9	64262.8	74562.1	86684.7
Electricity, Gas, Water and Sanitary Services	1021.6	129.9	162.6	106.8	196.8	35.1	131.6	74.9	20.1	56.1	34.8
Transport & Communication	5271.3	6613.6	9457.3	7621.3	8172.8	9896.0	12653.8	12753.0	11646.2	13837.0	19595.2
Storage	4351.5	5243.2	7535.6	8481.4	9091.5	9872.1	9897.1	8691.8	8438.1	7493.0	9193.3
Trade	111141.9	120953.2	130003.5	146930.4	172240.4	203611.3	236070.2	278667.0	320261.0	394935.8	437604.4
Miscellaneous	28790.3	31940.2	41309.4	52914.9	62172.0	87486.1	87891.5	78709.0	89485.7	99180.0	122265.7
Total	371660.4	417645.6	479897.2	539835.8	593617.4	687780.1	767723.6	847341.1	951302.5	1117321.9	1291653.0

Source: Statistical Yearbook of Bangladesh (Various Years), B.B.S.