Public Expenditure, Employment and Poverty in Bangladesh
An Empirical Analysis

Paper 72

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Dissemination of information and knowledge on critical developmental issues continues to remain an important component of CPD's activities. Pursuant to this CPD maintains an active publication programme, both in Bangla and in English. As part of its dissemination programme, CPD has been bringing out **CPD Occasional Paper Series** on a regular basis. Dialogue background papers, investigative reports and results of perception surveys which relate to issues of high public interest are published under this series. The Occasional Paper Series also include draft research papers and reports, which may be subsequently published by the CPD.

The present paper titled **Public Expenditure, Employment and Poverty in Bangladesh An Empirical Analysis** 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
DCI	Direct Calorie Intake
GDP	Gross Domestic Product
GNI	Gross National Income
GoB	Government of Peoples' Republic of Bangladesh
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMR	Infant Mortality Rate
LFS	Labour Force Survey
LGED	Local Government Engineering Department
NGOs	Non-government Organisation
SUR	Seemingly Unrelated Regression
UNDP	United Nations Development Programme
US	United States

1. INTRODUCTION

Bangladesh has made some noteworthy progress in the economic growth and poverty reduction since the early 1980s. In 2005-2006 GDP growth reached 6.6 per cent from an average of 3.8 per cent per year in the 1980s. During this period, the share of population below poverty line has fallen from 62.6 per cent in 1983-84 to 44.3 per cent in 2000.

Economic growth, employment and wages are three fundamental factors that helped reducing poverty in Bangladesh. Government policy directed towards economic growth, creation of employment and improving wages play a crucial role in reducing poverty. Among these policies, government expenditures on education, health, infrastructure, and agricultural development have been most instrumental.

Economic theory provides rationale for government expenditure: correction of market failure and improvement are the two such primary rationales. When a market economy fails to allocate resource efficiently, market failure occurs. One such example is the case of "externalities." Government can curb negative externalities (for example, pollution) and promote positive externalities (for example, education and health) by means of regulation, taxation and subsidy, and public provision. Hence, the justification of government provision of pure "public" good is clear.

Poverty reduction considerations may also lead the government to provide "private goods"–those which are disproportionately consumed by the poor–through transferring resources to a targeted group of people who are unable to make provisions by themselves due to market failure. Theoretically, a market based economy can distribute income in a socially unacceptable ways, and in these cases the government often feels obligated to protect the poorest vulnerable segment of the society through interventions. Food and housing services are some of the main anti-poverty programme. But none or very few society has managed to reduce poverty through direct welfare transfers alone. Education and health expenditures which help reduce human poverty and increase employability and productivity are indirect but more sustained way of reducing poverty.

Government spending is also needed to provide an enabling environment for the private sector. Much of the impact of public expenditure can be broadly viewed as existing infrastructure for economic growth, i.e. social infrastructure such as education and health; and physical infrastructure such as roads and highways, energy and power, and fertiliser. For the market to operate smoothly to create growth, these infrastructures are needed and yet in most of the cases it is beyond the capacity of the private sector to provide for these.

Hence, it is usually the government who provides for these infrastructures, and here lies the crucial link between public expenditure and poverty reduction.

There has been some prior studies that analysed the impact of public spending, especially that on poverty reduction. One such study by Reinikka and Collier (2001), funded and published by the World Bank, used data from a series of household surveys in Uganda from 1992 to 1999, found that education, access to roads, and access to extension services have a major positive impact on agricultural production, which has a connection with reducing rural poverty. Similar study, but using a different method, by Fan, Zhang and Rao (2003) of the International Food Policy Research Institute (IFPRI), using district level data for 1992, 1995 and 1999, estimated the effects of different types of government expenditure on agricultural growth and rural poverty in Uganda. They found that government expenditures on agricultural research and extension services and that on rural roads have impacts on poverty reduction. These studies along with some others suggest that public investment must play even greater role in fostering future economic growth and poverty reduction. However, different types of expenditure have differential effects on growth and poverty reduction in different countries. At the IFPRI some more studies have been conducted along this theme for different countries but using secondary data at the national or local government level. These studies are Fan, Hazell, and Thorat (2000) on India; Hao and Fan (2001) on Vietnam; Fan, Zhang, and Zhang (2002) on China; and Fan *et al*. on Thailand. All these countries achieved significant results on growth and poverty reduction in the last two decades in Asia. Although such secondary data are available on Bangladesh, there has been no such previous study to systematically explore the relation between "public expenditure" and poverty reduction.

This paper endeavours to formally establish a link between public expenditure, employment and poverty reduction and empirically test the propositions for data available in Bangladesh. After reviewing relevant literature, this paper develops an analytical framework and applies it to analyse the impact of different types of public expenditures[1] on poverty reduction for the period of 1995–2006. Particular attention is paid to the major determinants of poverty. These are growth, employment and wages–variables which have been propounded to have considerable impact on the reduction of poverty by studies carried out by the International Labor Organization (ILO) and United Nation's Development Programme (UNDP). The focus of this study has been to see how different public expenditures affect these variables and thus affect poverty. This study is organised as follows: we provide an overview of the trend in poverty and public expenditure in the section 2. Here we propose a link among public expenditure, employment and poverty

[1] By public expenditure we refer to the actual expenditure recorded on the government's annual development programme (ADP) only. It excludes current expenditure.

reduction in Bangladesh. In section 3 we provide a review of different types of public expenditures in Bangladesh. In section 4, the discussion focuses on the impact of public expenditure in the rural area. We propose an analytical framework for the analysis in section 5. Empirical estimation and results are discussed in section 6, followed by conclusion with policy recommendations.

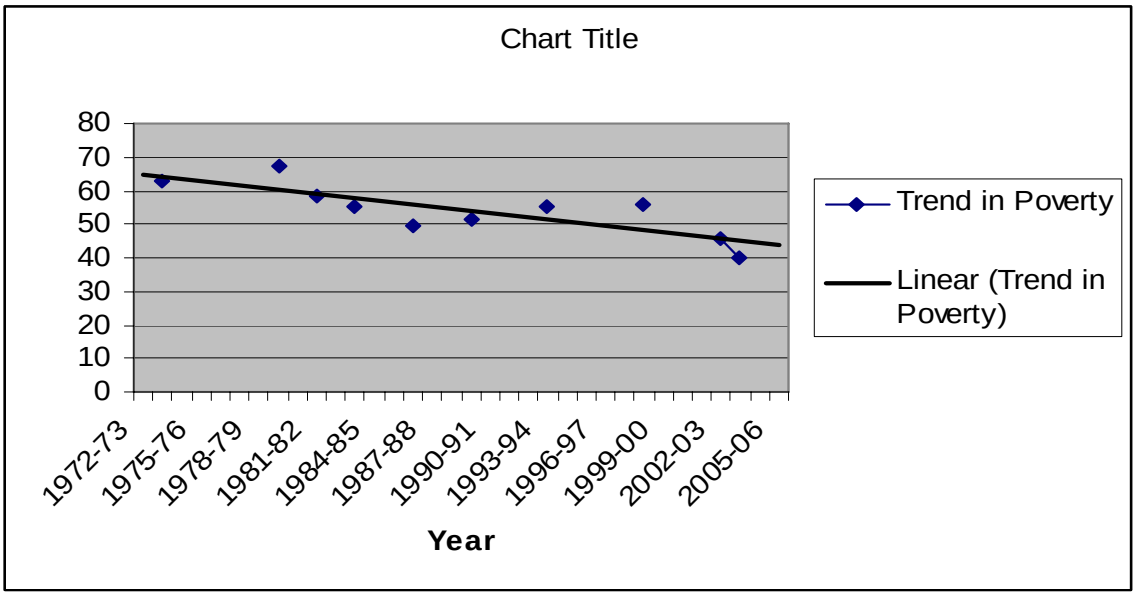
2. PUBLIC EXPENDITURE AND POVERY REDUCTION: A LINK

This section reviews public expenditure and poverty in Bangladesh juxtaposed with growth, employment and wages.

Trends in Poverty

Bangladesh gained independence in 1971 from Pakistan through nine months of war of freedom. Prior to gaining independence Bangladesh was already a densely populated poor country with 75.6 million people with a per capita GNI of US$ 200. Having lost much of its physical and social infrastructure in the war of independence, Bangladesh, the "test case of development," had a tough time for future in the beginning. The proportion of national population living below poverty line in 1973/74 was as high as 74 per cent. In 2005, the proportion of population below poverty line has fallen to 40 per cent with a per capita GNI of US$ 482. In span of a little over three decades, Bangladesh was successful in reducing the number of poor people by a third and more than doubling its per capita income.

FIGURE 1: POVERTY LINE



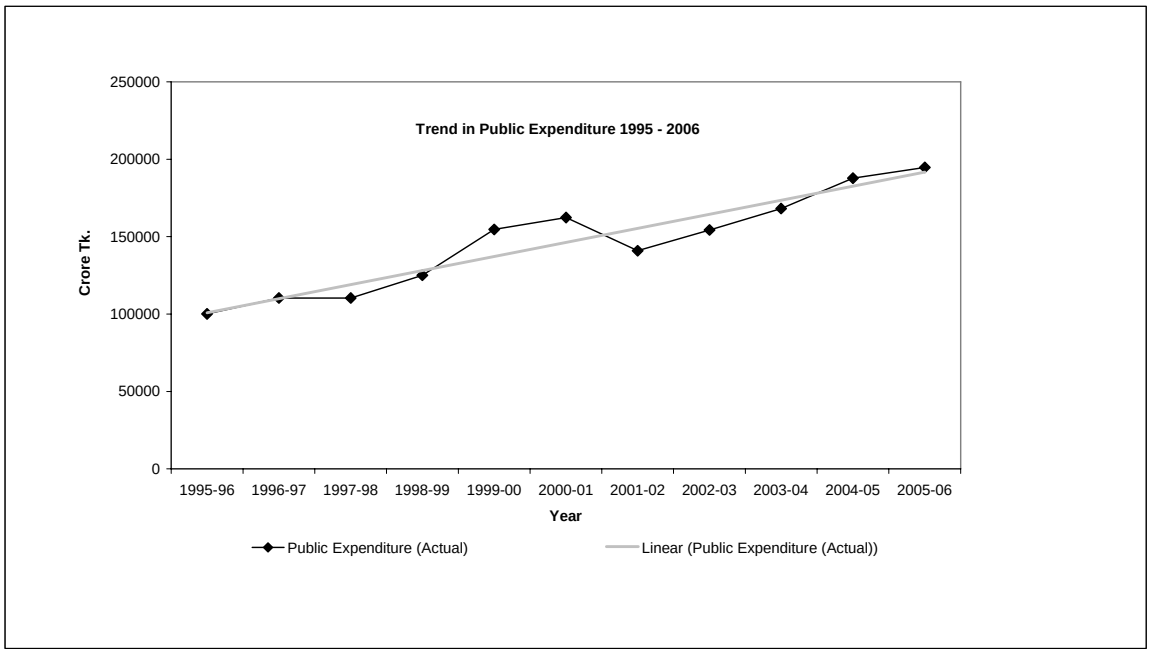
Source: BBS Statistical Year Book of Bangladesh (1992and 2005), and Bangladesh Economic review (1998 and 2003).

Trends in poverty have some discerning character in Bangladesh. Income poverty trends in the 1980s and early 1990s have the following pattern. Between 1983/84 and 1985/86, the incidence of poverty fell from 62.6 per cent to 55.7 per cent, which was a 7 percentage points reduction in poverty. Another impressive 8 percentage points reduction in poverty was achieved in just four years when poverty fell to 47.8 per cent in 1988/89. The dynamics of poverty somewhat stagnated after this time. In 1995/96 the proportion of people below poverty line was estimated to be 47.5 per cent, meaning between 1988/89 and 1995/96 only 0.3 percentage point reduction in poverty was achieved. Most recent estimate of poverty is of 2005, which indicates that proportion of poor people is 40 per cent. That leads to an impressive reduction of 7.5 percentage point in poverty between 1995/96 and 2005.

Trends in Public Expenditure

In the time period of 1973/74 to 2005, public expenditure rose steadily in Bangladesh. From the early 1980s up to 1989/90, public expenditure increased at an almost constant rate where year to year variability of expenditure was considerably lesser. After that period, in the 1990s, expenditures rose more sharply. The rate of growth of public expenditure in the period between 1991/92 and 2000/2001 was much higher compared to the previous decade. The volatility of expenditure also increased during this time. This trend continues up to 2001/2002 when expenditure fell a little only for a short time and vigorously picking up in 2003 and continued to grow till 2005.

FIGURE 2: TREND IN PUBLIC EXPENDITURE



Source: IMED, Ministry of Planning and Finance Division.

Trends in Growth, Employment and Wages

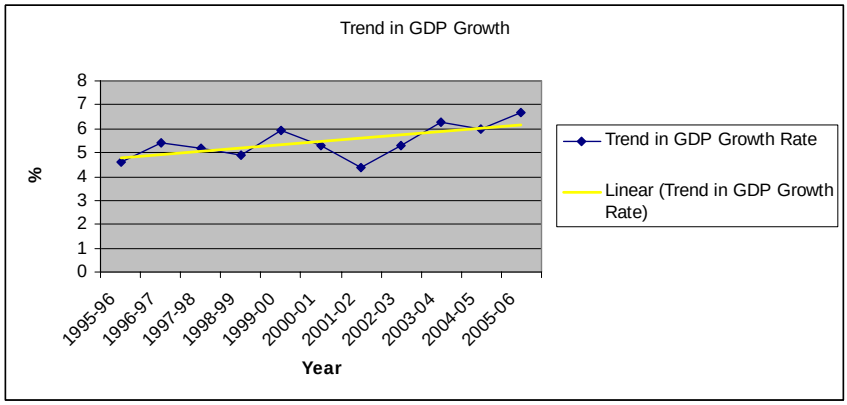
The long run trend in poverty is falling but in contrast the long run trend in public expenditure is rising. If we are to suggest any link between these two, it has to come through some channels through which public expenditure reduces poverty. Evidence shows that countries which are successful in achieving poverty reduction were also successful in achieving sustained high growth. However, growth is not alone sufficient in itself–countries with much better record of reducing poverty had much higher employment intensity of economic growth than those with not so impressive record of poverty reduction and as such employment serves as a key link between economic growth and poverty reduction (Islam 2001, 2003, 2004).

Theoretically, the link between public expenditure and poverty comes from three sources: growth, employment and wages. Increases in public expenditure increases aggregate demand in the economy. Demand for labour, being a derived demand, also increases, raising the level of employment and productivity. Higher employment and productivity lead to two paths. One leads to a rise in wages and thus contributing to reduction in poverty and the other leads to acceleration in economic growth which, in turn, leads to a rise in public expenditure. The schematic diagram of the link between public expenditure, employment, growth and wages is modeled in the appendix.

Trends in Economic Growth

The early 1970s were a period of economic and political turbulence. By the late 1970s the economy was stabilised and various market-based reforms were introduced. But it was in the mid-1980s that the economy started to grow at a steady pace of 4.5 per cent per year. Growth started to accelerate in the early 1990s and the economy grew at 5.6 per cent per year during the 1995-2000 periods. Bangladesh economy moved into a robust growth path of around 6 per cent in the mid-2000s. During 1985-2005, when the economy took a transition from slow growth to accelerated growth, success in poverty reduction was particularly noteworthy (see Tables A.2 and A.5).

FIGURE 3: TREND IN GDP GROWTH



Source: Penn World Table website and Bangladesh Bank.

Several factors can be attributed to account for such growth performance. First, with the successful completion of the World Bank-IMF supported structural adjustment programmes in the late 1980s and early 1990s, the country, through the adoption of prudent–basically tightened–monetary and fiscal policies, achieved macroeconomic stability throughout the 1990s. Second, both public and non-public (NGOs) interventions in the economy led to the expansion of education and health service to the people. This created a better educated, healthier and skilled labour force congenial to the need of the private sector which contributed to progression of the higher growth path. Both these involved public expenditure shifting and expenditure switching from low productivity to higher productivity sectors. Third, with the gradual opening up of the economy, it was possible to shift resources towards more employment intensive non-traditional exports, especially readymade garment that expanded manufacturing activities and related services. Finally, steady increase in the workers' remittance helped to boost the economic activities in the construction, retail trade and services sectors.

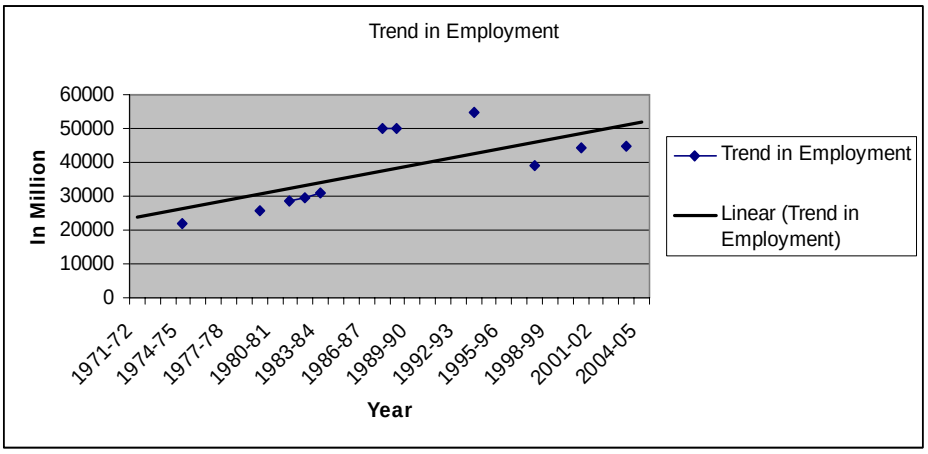
Steady economic growth since the mid-1980s has brought about a significant structural change in the economy in favour of the non-traditional sector (see Table A.3). Agriculture, which was traditionally the dominant sector, presently accounts for 19 per cent of the GDP. With this transformation process the service sector has gained the most, whereas shares of small scale manufacturing and construction sectors in GDP rose steadily.

Trends in Employment

From the early 1970s to early 1980s, employment growth was sluggish in Bangladesh or it might as well have a slightly negative trend. However, from 1980 to 1990, there is a

very sharp significant increase in employment, the trend in employment growth was very steep during this period. From the high level of employment in1990, there is a slight decline in 1995. From there, total employment has not changed much in 2004. On the average, the trend in employment is rising from the mid-1980s to mid-2000s (see Table A.4).

FIGURE 4: TREND IN EMPLOYMENT



Source: BBS, Labour Force Survey (various years).

In the pattern of employment structure it is found that in Bangladesh there is a low level of formal employment and an overwhelming dominance of self-employment and daily wage employment in the 1990s.

Given the predominant economic activity, agriculture remains the main source of employment for an increasing labour force of about 60 millions (45 per cent of the total population) in 2000. Though agriculture employed about 80 per cent of the labour force in the past, in the 1990s this share gradually declined to the level of 60 per cent and still this is the dominant source of employment in the economy. This shift largely occurred in construction, trade, transport, community and personal services (see Table A.4).

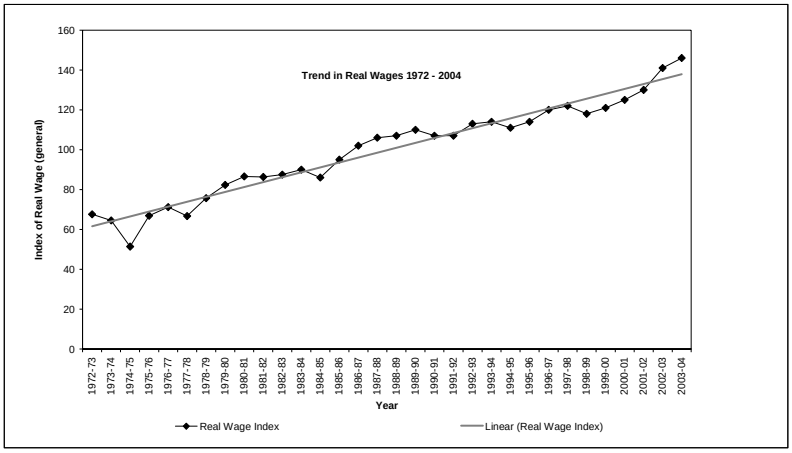
The structural transformation process in employment over the past one decade and a half was unique in the sense that it was the service sector rather than the manufacturing that absorbed the incremental labour force.

Trend in Real Wages

The trend in wages in Bangladesh is found from the Wage Rate Index compiled by the Bangladesh Bureau of Statistics (BBS) by counting 1969-70 as the base year. In 1997/98 the nominal wage rate index stood at 2,141, which grew to 3,507 in 2005-06. Compared

to 2004/05, the nominal index was up by 6.50 per cent in 2005-06. The real wage index was 146 in FY2003/04. The index stood at 149 in 2004/05, growing at the rate of 2.05 per cent and in 2005/06 the index remains the same i.e. 149. It is observed from the nominal wage rate index that in 2005/06 the growth rate of agriculture, manufacturing and construction sector index is higher than that of the previous fiscal year. In terms of overall trend, real wage rate index increased from 60 (not shown in table) in 1974/75 to 149 in 2005/06. This provides evidence to support the view that there has been a steady increase in the level of real wages rate in Bangladesh.

FIGURE 5: TREND IN REAL WAGE



Source: Economic Review of Bangladesh (1992 and 2006)

3. TRENDS AND COMPOSITION OF PUBLIC EXPENDITURE IN BANGLADESH: 1995–2006

Total Public Expenditure

Bangladesh's public expenditure (see Table A.6), at current prices, increased from 23,165 crore taka in 1995/96 to 64,383 crore taka in 2005/06, a growth rate of around 1.8 per cent per year during the period 1995–2006. However, non-development expenditure rose more than development expenditure during this period. Non-development expenditure registered a growth rate of 2.4 per cent per year, rising to 37,333 crore taka in 2006 from 11,712 crore taka in 1995. The growth rate of development expenditure during the same period is a little less compared with its non-developmental counterpart. Development expenditure of the government rose from 9,866 crore taka in 1995 to 24,500 crore taka in 2006, a growth rate of around 1.6 per cent per year.

As a percentage of GDP, public expenditure in Bangladesh did not have any discerning trend rather it fluctuated. The ratio fell in 1997 to 12.92 per cent from 13.33 per cent in 1995. From 1997 it slowly but steadily rose to 14.92 per cent in 2001 but fell again to 14 per cent in 2002. Public expenditure/GDP ratio oscillated from 13.93 per cent in 1995 to

15.47 per cent in 2006. Although it was not uniform for both development and non-development expenditures, the share of non-development expenditure as percentage of GDP increased to around 9 per cent in 2006 from 7 per cent in 1995. In contrast, the ratio of development expenditure as percentage of GDP actually marginally fell during the same period. The development expenditure/GDP ratio decreased to 5.89 per cent in 2006 from 5.93 per cent in 1995.

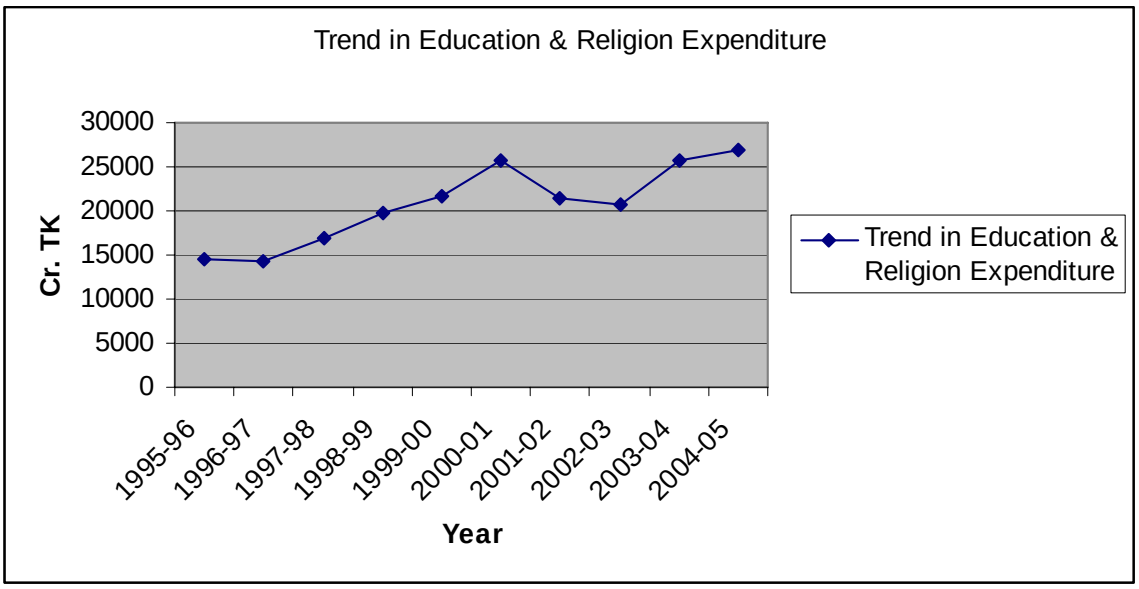
Composition of Non-development Expenditure

Three main sources of non-development expenditure are (i) pay and allowances, (ii) subsidy and current transfer, and (iii) total interest payment on domestic and foreign loan. In 2005/06, these shares were 26.5 per cent, 31.4 per cent and 18.9 per cent respectively. Expenditure on pay and allowances was 30 per cent of total non-development expenditure. In 2002/03, 2003/04 and 2004/05, these ratios went down to 28.8, 27.9 and 26.3 per cent respectively. In 2001/02, the expenditure on subsidy and current transfer accounted for 26.1 per cent of total non-development expenditure. In 2002/03, 2003/04 and 2004/05, the expenditure on subsidy and current transfer accounted for 28, 28.8 and 31.3 per cent of total non-development expenditure respectively. In 2001-02, the share of interest payments on foreign and domestic loans in total non-development outlay was 19 per cent. In 2002/03, 2003/04 and 2004/05, the shares of interest payments on foreign and domestic loans in total non-development outlay were 22.0, 20.6 and 19.5 per cent respectively.

Composition of Annual Development Expenditure

In the period 1995/96–2005/06, actual expenditure against the revised allocation of ADP was around 90 per cent (see Table A.7). Composition of government development expenditure reflects government priorities and policies. In Bangladesh the main objectives of public expenditures are to improve the living standard of the people, develop human resources and physical infrastructure and reduce poverty. Actual development expenditure in current prices rose steadily from 6,024 crore taka in 1991/92 to 19,472 crore taka in 2005/26, which means a growth rate of 2.1 per cent per year and more than a threefold increase in absolute term. In 2005/06, the top four expenditures in Bangladesh were rural development, power, transport, and education respectively (see Table A.8).

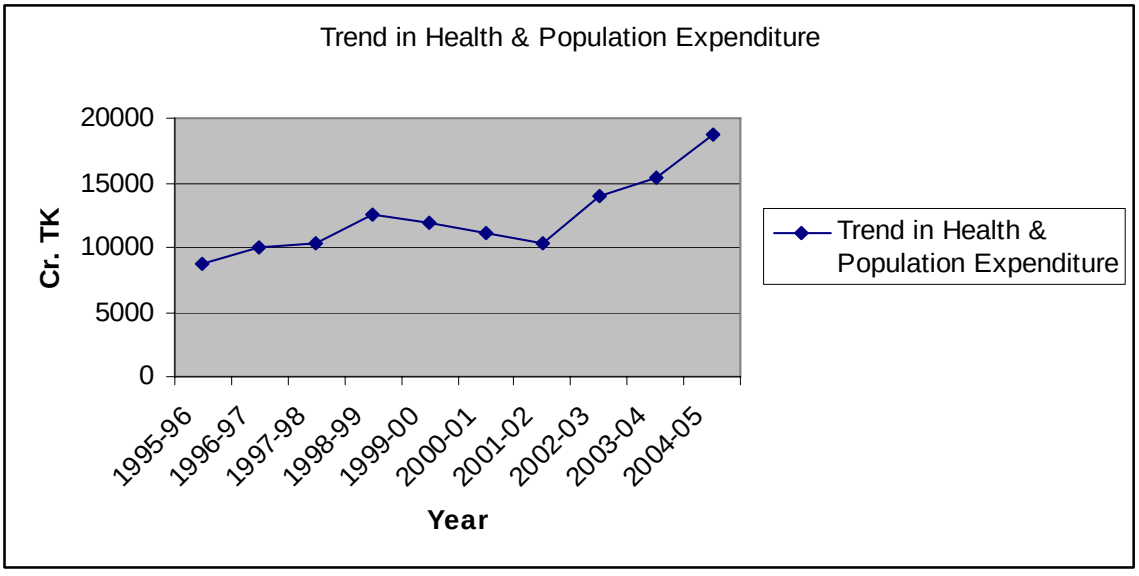
FIGURE 6: TREND IN EDUCATION & RELIGION EXPENDITURE



Source: IMED, Ministry of Planning.

There have been some changes in the relative spending priority in Bangladesh. In 1995-06 the highest priority was in the transport sector which accounted for 20.1 per cent of the ADP, followed by power sector, which accounted for 13.7 per cent of ADP and marginally ahead of the education sector, which accounted for 13 per cent. Relative to this, rural development sector only accounted for 6.8 per cent of ADP, which was just lagging behind the health sector accounting for 6.9 per cent of ADP.

FIGURE 7: TREND IN HEALTH & POPULATION EXPENDITURE

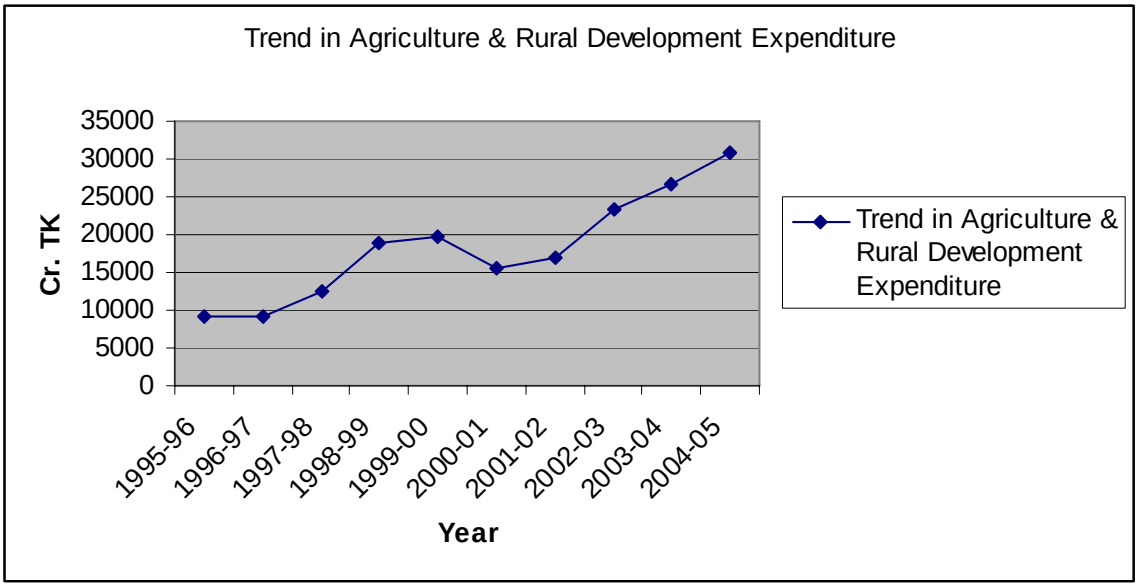


Source: IMED, Ministry of Planning.

In contrast, rural development was the highest priority sector in 2005–06 accounting for 19.07 per cent of the allocation in ADP. As a percentage of ADP, rural development

sector managed to score a threefold increase in its share–from 6.8 per cent in 1995 to 19.07 per cent in 2006. The share of the power sector in ADP did not score such a dramatic rise, but it rose nonetheless to 18.08 per cent in 2006 from 13.7 per cent in 1995.

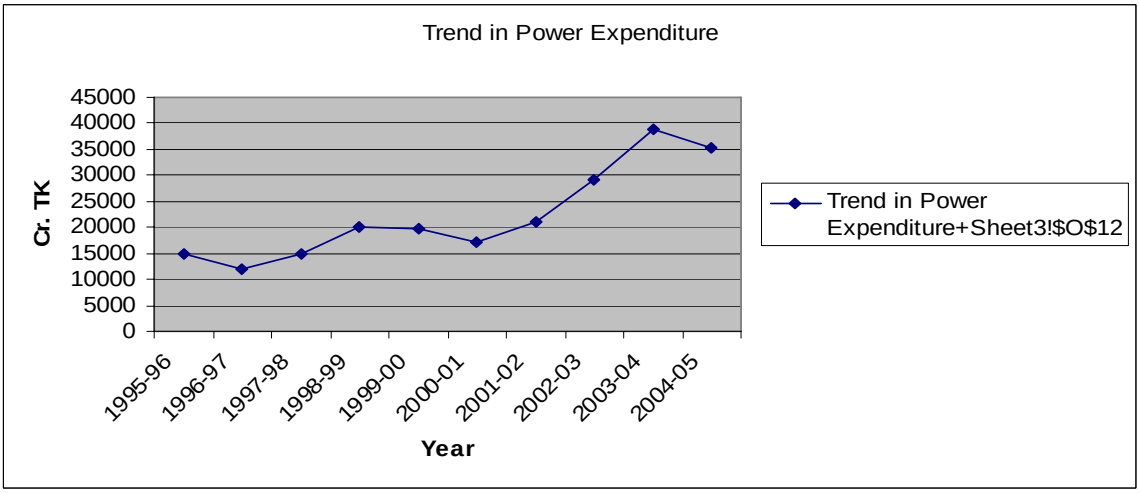
FIGURE 8: TREND IN AGRICULTURE & RURAL DEVELOPMENT EXPENDITURE



Source: IMED, Ministry of Planning.

The share of transport sector in ADP actually fell in 2005 to 15.21 per cent from 20.1 per cent in 1995. Education has been a sector which got the priority throughout these years. The share of education had an increasing trend–rising from 13 per cent of ADP in 1995 to 14.49 per cent in 2006. This summarises the trend in spending priority of the government in the four major sectors over the time period in question. Other than these four sectors, two sectors that deserve close scrutiny are health and agriculture.

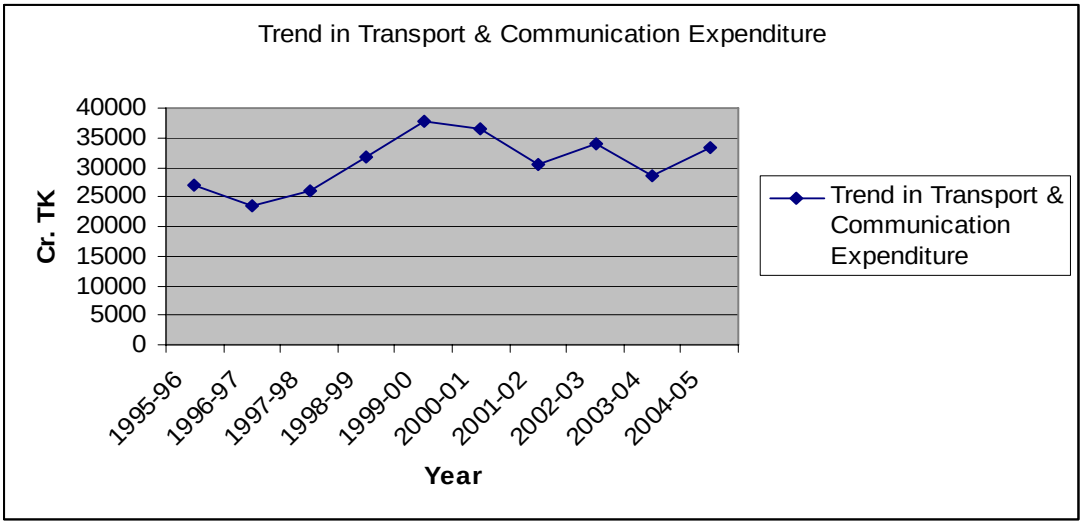
FIGURE 9: TREND IN POWER EXPENDITURE



Source: IMED, Ministry of Planning.

The share of agriculture in ADP has been constant around 5 per cent. There seems to be no shift in priority over this sector. As a percentage of actual development expenditure, agriculture's share in ADP in 1995 was 4.5 per cent, rising marginally to 4.91 per cent in 2005/06. The priority of the spending share of the health sector in ADP has also risen over the period, but its growth was rather slower comparable to that of education sector. The share of health and population in 1995 accounted for 6.9 per cent of ADP. This steadily climbed to 8.17 per cent of ADP in 2004/05 but abruptly fell to 5.12 per cent in 2006, which was lower than its 1995 rate.

FIGURE 10: TREND IN TRANSPORT & COMMUNICATION EXPENDITURE



Source: IMED, Ministry of Planning.

Budget and Financing

Formulation of budget in Bangladesh is influenced by the objective of accelerated economic growth and poverty reduction. Because of existing resource constraints, government expenditure typically exceeds revenues and thus leads to budget deficits. The trend in budget deficit as a percentage of GDP has been hovering around 4.5 per cent up to 2005/06. Two major observations are–the trend in net foreign financing of deficit has been falling during 1995–2006 and the trend in net domestic financing is rising for the same period (see Table A.9)

Domestic Resources for ADP

The contribution of domestic resources towards financing of ADP shows an upward trend. Forty-three per cent of ADP was financed by domestic resources in 1994/95, whereas in 2005/06 it was 50.23 per cent (see Table A.10).

4. RURAL DEVELOPMENT, EDUCATION AND HEALTH: PRO-POOR EXPENDITURE

This section extends the analysis of expenditure on rural development, education, and health terming them as pro-poor. Such expenditures create public and social capital conducive for long-term economic growth and poverty reduction.

Accelerated Rural Infrastructural Development

Government policies in Bangladesh have traditionally emphasized development of the rural economy as a means to alleviate poverty and contain the impact of natural calamities. In the 1970s the emphasis was on direct market interventions and large capital spending on flood control, irrigation and drainage projects. In the 1980s most public expenditures focused on broad agricultural development, with relatively low emphasis on rural infrastructure. In the 1990s the development of physical infrastructures–including roads, bridges, culverts, and market places–was singled out as the major element of the new rural development strategy which explains the dramatic rise in the priority of rural development sector in annual development (ADP) expenditure.

The rise in relative importance of rural development sector in ADP prompted the Local Government Engineering Department (LGED) to initiate numerous projects for the development of feeder roads, sub-district connecting roads and nascent market/growth centres throughout the country. Indeed, the creation of LGED in itself as the new focal point with empowered centralised authority outside the direct day-to-day scrutiny of the Ministry of Local Government, for overseeing the speedy implementation of the road infrastructure projects was a major institutional breakthrough without which the rapid development of the country-wide rural road network would not have been possible. The road development projects, connecting 1400 of the 2100 growth centres/markets, contributed to increasing farm and non-farm output, employment and income, especially of the rural poor and women. Moreover, the functionally landless and small farmers gained a larger share of the increase from crops, wages, livestock and fisheries (World Bank 1996). Other positive impacts of the rural infrastructure development policy included the rapid growth of non-farm sector employment, roadside shops, petty trading, etc. (Mandal 2002).

Education

Bangladesh's achievements in education over the last two decades have been impressive (see Table A.1), especially when seen against the backdrop of the performance of other countries in the region. Major successes include (a) rapid expansion of primary education–the gross primary enrollment increased from 72 per cent in 1990 to 91 per cent

in 2000 (b) a narrowing of disparity between rural and urban primary enrollment, and (c) the closing of the gender gap, including the very poor. Moreover, enrollment in secondary education expanded at an annual rate of 10 per cent during 1993-99. Roughly 9 out of every 10 children eventually enroll in primary school, and Bangladesh has achieved levels of primary and secondary gross enrollment similar to those in countries with higher per capita income, such as Vietnam, Thailand and Indonesia (BIDS 2001, GoB 2003, World Bank 2002, 2003).

Three key public policies underscored successes in primary and, in recent years, secondary education in Bangladesh. These include (i) sustained injections of public resources, (ii) effective partnership with non-government institutions for service delivery, and (iii) provision of subsidies to influence the demand for education in favour of the poor. The greater emphasis on primary education, especially girl's education, has been a consistent feature of the successive regimes, more explicitly after transition to democracy in 1991. Expenditure in education has been the largest single item in the revenue and development budget, and has become an important part of the electoral competition. Thus, the proportional allocation of education has continuously increased over the past two decades: the matched share has actually doubled from 8 per cent to 16 per cent between the early1980s and late 1990s.

Health

Bangladesh's achievement in health sector is also impressive (see Tables A.1). Apart from increasing life expectancy at birth of both male and female to 61 years in 2000 from 46 years in 1975, there are three other indicators which can capture the broad trends in the area of public health relevant to the concerns of pro-poor growth. These are child mortality, child malnutrition, and maternal malnutrition. The historical trends in infant mortality culled from different sources and surveys show a very high level of infant mortality prevailing in the 1950s and 1960s. The infant mortality rate (IMR) started declining slowly since the mid-1970s; by 1985, it stood at 121 compared with 173 in 1973. It is only after 1989 does one see a definitive and a faster trend of decline, with dramatic improvements in child mortality in the 1990s as the level of IMR dropped to 51 in 2002. This has prompted some observers to rank the country as the "fastest reducer of infant mortality" in the 1990s (Stern 2002). In Bangladesh, the prevalence of child malnutrition has gone down substantially over the last decade, with faster decline recorded for the second half of the 1990s. The proportion of children (6-71 months) underweight has declined nationally from 72 per cent in 1985/86 to 51 per cent in 2000. The extent of improvement was not restricted to the category of moderate malnutrition alone, but also occurred at the level of severe malnutrition, though the progress was slightly slower in the case of the latter. Improvement in child malnutrition is closely

linked to improvement in maternal malnutrition. The status of maternal nutrition has improved quite noticeably over the 1990s. While the share of malnourished mothers was 52 per cent in 1996/97, it was 42 per cent in 2000 (Sen and Ali 2004).

The national health programme in Bangladesh has over the years focused on the provision of affordable rural primary health care (through Upazila Health Complexes and Union Health and Family Welfare Centres) and on developing partnerships with non-government organisations (NGOs). NGOs have been an extremely important source of health successes in Bangladesh, especially in the area of family planning and immunization services. Consistent with the long-standing emphasis accorded by public policy to human resources development, public spending on health has been increasing in both nominal and real terms over the last three decades. The distribution of public health spending was also found to be pro-poor: the health subsidy represents 1.45 per cent of the average per capita expenditures of the poor and 0.8 per cent of the non-poor (World Bank 2002).

5. CONCEPTUAL FRAMEWORK AND MODEL

It has been discussed in the previous section how public expenditure affects poverty reduction. Public expenditure typically affects poverty through three channels: growth, employment and wages. It also helps to increase national productivity which, in turn, helps to increase wages and employment. Increase in agricultural output through public investment in rural infrastructure often leads to lower food price which indirectly helps to reduce the incidence of poverty.

There have been some previous studies on public expenditure and poverty reduction. However, the objective and approach of those studies not always coincided to the model proposed in this paper. For example, the study made by Foster and Mijumbi (2002) focused on the relation between public expenditure and on the performance of budget implementation. The other studies by Deininger and Okidi (2003) analysed the impact of various infrastructure, education and health variable on farmers' income and poverty. Fan, Hazell, and Thorat (2000) and Fan, Zhang, and Zhang (2002) constructed econometric models to estimate the effects of government spending on poverty reduction, through various channels, using secondary data for India and China. Both these countries had data on disaggregated government spending.

Building on such previous studies, this paper develops and adapts a simultaneous equations model to estimate the effects of public development expenditure and poverty reduction in Bangladesh for the period 1995/96 to 2005/06.

Equations (1) to (4) give the formal structure of the model.

$$P = f(ZGDP, EMPT, WAGES) \quad (1)$$

$$ZGDP = f(INVDP, ZPOP, EDUEX, HLTHEX, TRCEX, PWREX, ARDEX) \quad (2)$$

$$EMPT = f(ZGDP, EDUEX, HLTHEX, TRCEX, PWREX, ARDEX) \quad (3)$$

$$WAGES = f(ZGDP, EDUEX, HLTHEX, TRCEX, PWREX, ARDEX) \quad (4)$$

Equation (1) gives the hypothesized major determinant of poverty (P), which includes GDP growth (ZGDP), level of employment (EMPT), and level of national wages (WAGES). The nexus between wages, employment, growth and poverty reduction is well documented in the researches of various developmental organisations. Various papers at ILO-IEPDP, such as Khan (2001, 2004 and 2005) and Islam (2003 and 2004), have discussed this issue along with other papers, such as Khan (2005), under the joint ILO-UNDP programme "promoting employment for poverty reduction"–growth reduces poverty via the means of more jobs and better wages. Hence, all the arguments of Equation (1) are postulated to reduce poverty.

Government expenditure is hypothesized to reduce poverty via affecting the three major determinants of poverty as proposed by Equation (1). GDP growth (ZGDP) equation is given by Equation (2). Here ZGDP is postulated to be determined firstly by investment/GDP ratio (INVDP) and population growth (ZPOP) which are standard in growth literature. Various other yearly disaggregated public expenditure variables are then added to the growth equation–these include education expenditure (EDUEX), expenditure on health sector (HLTHEX), expenditures on transport and communication (TRCEX), expenditure on power sector (PWREX) and on agricultural and rural development (ARDEX). Adding these public expenditure variables to the growth equation will enable us to see how growth is affected by public expenditure.

Equation (3) gives us employment determination relation which depends on how much growth (ZGDP) is generated and on all other various public expenditure variables. Similarly, Equation (4) gives us the wage setting function which depends on rate of growth of GDP (ZGDP) and on all other public expenditure variables. Note both employment and wages are affected by public expenditure as well as by rate of growth of the economy which, in turn, affected by public expenditure.

Marginal Impact of Public Expenditure on Poverty Reduction

By totally differentiating Equations (1)–(4), we can derive the marginal impact of any government expenditure variable on poverty reduction. For example, if we wanted to know the "impact of education expenditure (EDUEX) on poverty reduction," we could derive this by:

$$\begin{aligned} dP/\,dEDUEX = {} & (dP/dZGDP)(dZGDP/\,dEDUEX) \\ & + (dP/dEMPT)(dEMPT/\,dZGDP)(dZGDP/dEDUEX) \\ & + (dP/dWAGES)(dWAGES\,/dZGDP)(dZGDP\,/dEDUEX) \\ & + (dP/\,dEMPT)(dEMPT/\,dEDUEX) \\ & + (dP/\,dWAGES)(dWAGES/dEDUEX) \end{aligned} \quad (5)$$

The first term of the right hand side of Equation (5) measures the direct impact on poverty of higher GDP growth due to changes in educational expenditure. The second and the third terms of Equation (6) capture indirect impact on poverty through changes in employment and wages due to growth of GDP as a result of changes in education expenditure. The fourth and the fifth terms show the direct effects on poverty as a result of higher employment and wages arising from public expenditure on education.

6. DATA, MODEL ESTIMATION AND RESULT

Data

This study estimated the proposed model for the period 1995/96 to 2005/06. Poverty data is based on DCI (direct calorie intake) method of 2,200 calorie per day. Both poverty and employment data are gathered from various BBS publications for various years. However, note that we do not have time series data on poverty and employment in Bangladesh. Labour force surveys (LFS) data on national employment for the years 1983/84, 1984/85, 1990/91, 1995/96, 1999/00, 2002/03 and 2005/06 are available. Based on these trends, this paper has interpolated the time series of employment data for the whole period under consideration. Similarly, poverty estimates based on DCI method are available for 1983/84, 1985/86, 1988/89, 1991/92, 1995/96, 1999/00 and 2004/05 and like employment this study also interpolated the time series of poverty from the trends of these yearly data for the time period of study. Time series data on disaggregate level public development expenditure for the variables included in the model were taken from Bangladesh Economic Survey, Ministry of Finance, GoB for the period 1995/96 to 2005/06. Data on real wages for the same time period is taken from the same source. The time series for investment/GDP ratio and growth of population is taken from World Penn Tables.

Model Estimation and Results

Using seemingly unrelated regression (SUR) the system of four simultaneous Equations (1)–(4) were estimated (see results of estimation in Table 1). The estimated poverty equation (Equation 1) shows that growth of GDP and employment are both significant factors in determining poverty in Bangladesh. The regressors of Equation 1, which are also the major determinant of poverty, have the correct signs as well–increase in their values tends to reduce poverty as suggested by the negative signs on the estimated coefficients of ZGDP, EMPT and WAGES. The estimated coefficient of ZGDP in (1) suggests that an 1 per cent increase in growth can lead to a 0.356 percentage point reduction in poverty significantly. Similarly, a unit (i.e. 10 million) increase in employment can lead to a significant reduction in poverty equaling 0.271 percentage point. On the contrary, according to (1) wages do reduce poverty but it is not significant.

In order to see the impact of public expenditure on poverty, Equations (2), (3) and (4) were estimated. The estimated growth equation (Equation 2) shows that government expenditure on education, health and rural development significantly affects growth, with elasticities of 0.126, 0.161, and 0.245. In terms of magnitude, agriculture and rural development have higher impact on growth. However, the estimated co-efficient on HLTEX and ARDEX is only weakly significant compared to that of EDUEX, as can be seen by their reported t-values. The results show that public investments on education, health and rural infrastructure have significantly contributed to growth directly, and towards poverty reduction indirectly.

Estimation of both Equations (3) and (4) shows that growth of GDP significantly affects employment and wages. The employment and wage elasticity of growth is estimated to be 0.172 and 0.088 respectively. Other than this, the estimation of equation 3 suggests improved agricultural and rural development expenditure significantly affects employment with the estimated coefficient being 0.234. None of other variables are significant. As for Equation 4, health expenditure has a marginally significant bearing on determination of wages with an estimated coefficient of 0.023 and all the other expenditure variables being insignificant.

Calculation of Marginal Impact of Public Expenditure on Poverty Reduction

According to formula of Equation (5) outlined in the previous section, it is possible to calculate the marginal elasticity of the increase in education expenditure to the reduction of poverty as:

$$
\begin{aligned}
dP/\,dEDUEX = {} & (dP/dZGDP)(dZGDP/\,dEDUEX) \\
& + (dP/dEMPT)(dEMPT/\,dZGDP)(dZGDP/dEDUEX) \\
& + (dP/dWAGES)(dWAGES\,/dZGDP)(dZGDP\,/dEDUEX) \\
& + (dP/\,dEMPT)(dEMPT/\,dEDUEX) \\
& + (dP/\,dWAGES)(dWAGES/dEDUEX) \qquad (5)
\end{aligned}
$$

The right hand side terms of Equation (5) is estimated through equations (1) to (4).

$$
\begin{aligned}
dP/\,dEDUEX = {} & (-0.356)(0.126) + (-0.271)(0.172)(0.126) + \\
& (-0.196)(0.088)(0.126) + (-0.271)(0.152) + \\
& (-0.196)(0.133)
\end{aligned}
$$

The product of the coefficient of the last three terms of right hand side is zero because the estimated coefficient of *dP/ dWAGES* and *dEMPT/ dEDUEX* is statistically insignificant. Hence,

$$
\begin{aligned}
dP/\,dEDUEX &= (-0.356)(0.126) + (-0.271)(0.172)(0.126) \\
&= (-0.045) + (-0.006) \\
&= (-0.05)
\end{aligned}
$$

Therefore, the calculation shows, a unit increase in education expenditure would reduce poverty by 0.05 percentage point. Using exactly the same method, the poverty elasticity of changes in health expenditure is:

$$
\begin{aligned}
dP/\,HLTEX &= (-0.356)(0.161) + (-0.271)(0.172)(0.161) \\
&= (-0.057) + (-0.043) \\
&= (-0.10)
\end{aligned}
$$

That is a unit increase in health expenditure reduces poverty by 0.10 percentage point implying the poverty reduction elasticity of health expenditures is higher than that of education expenditure.

The poverty reduction elasticity calculated for agricultural and rural development expenditure is:

$$
\begin{aligned}
dP/\,dARDEX = {} & (-0.356)(0.245) + (-0.271)(0.172)(0.245) + \\
& (-0.271)(0.234) \\
= {} & (-0.087) + (-0.011) + (-0.063) \\
= {} & (-0.16)
\end{aligned}
$$

That is a unit increase in agriculture and rural development expenditure accounts for 0.16 percentage point reduction in poverty, which is the highest among all the elasticites calculated so far.

The elasticites on poverty reduction of other public expenditure variables that is power (PWREX) and transport and communication (TRCEX) cannot be calculated, as they are not significant on the system of equations.

TABLE 1: ESTIMATION OF SYSTEM OF EQUATIONS (1) – (4)

(1) $P = -0.356ZGDP \underset{(-4.04)^*}{} - 0.271EMPT \underset{(-2.75)^*}{} - 0.196WAGES \underset{(-0.98)}{}$ $R^2 = 0.391$

(2) $ZGDP = 0.345INVDP \underset{(4.75)^*}{} + 0.228ZPOP \underset{(3.21)^*}{} + 0.126EDUEX \underset{(3.65)^*}{} + 0.161HLTEX \underset{(2.99)^*}{}$

$- 0.012TRCEX \underset{(-0.51)}{} - 0.032PWREX \underset{(-1.39)}{} + 0.245ARDEX \underset{(1.75)^*}{}$ $R^2 = 0.675$

(3) $EMPT = 0.172ZGDP \underset{(2.02)^*}{} + 0.152EDUEX \underset{(0.66)}{} - 0.053HLTEX \underset{(-0.78)}{} - 0.216TRCEX \underset{(-0.25)}{}$

$- 0.104PWREX \underset{(-0.62)}{} + 0.234ARDEX \underset{(3.05)^*}{}$ $R^2 = 0.315$

(4) $WAGES = 0.088ZGDP \underset{(1.96)^*}{} + 0.133EDUEX \underset{(1.06)}{} + 0.023HLTEX \underset{(1.79)}{} - 0.068TRCEX \underset{(-0.63)}{}$

$- 0.045PWREX \underset{(-1.12)}{} - 0.216ARDEX \underset{(-0.32)}{}$ $R^2 = 0.219$

Note: Figures in parentheses are reported t-statistic and an asterisk indicates coefficients are statistically significant at 10 per cent level.

7. CONCLUSION AND POLICY RECOMMENDATION

This study was undertaken to see if there is a relation between public expenditure and poverty reduction. This study concludes that there is link between these two and the channels through which public expenditures reduce poverty are through fostering economic growth, generating employment and raising national wages.

Using national level data from 1995 to 2006, this study found that most government expenditures such as those on agriculture and rural development, education and health are directly pro-poor as they help to reduce national poverty. Other expenditures such as those on power and transport and communication are important for building national infrastructure and industrial growth, but are not pro-poor since no evidence was found according to our model that they have implications for poverty reduction.

Based on the estimation of the simultaneous equation model that this study developed, poverty reduction elasticities of different public expenditures were calculated. It was found that, among all categories of public development expenditures, agriculture and rural development has the highest elasticity of poverty reduction, followed by health and education.

Though a considerable share of ADP expenditure has been allocated towards rural development, the shares of agriculture and that of health have been lower than those of similar economies in South Asia and Southeast Asia. With the millennium objective to reduce poverty by half by 2015, this paper recommends to shift some resources away from not so pro poor sectors (for example, power and transport) to these priority sectors so that poverty reduction gets higher momentum. This is a “win-win” strategy inasmuch as public spending on agriculture and health reduces poverty and generates long run growth which makes way for more resources in future.

This study has some limitations. First, this is a time series study but time series data on employment and poverty are not available; hence, data on these two variables had to be interpolated. This resulted in low or weak significance of the estimated coefficients on the regressors in model and the estimated coefficients of some important variables turned out insignificant or with a wrong sign or both. Second, data on disaggregate level of government expenditure is only available from 1995 to 1996, which is a bit lower for a proper time series study. One way to overcome this problem would be to take a cross section of disaggregated expenditure data for all the districts for the years when LFS took place. This would make the results of the model more robust with high significance.

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ANNEXURE

TABLE A.1: DEMOGRAPHIC INDICATORS

Population	**1970-75**	**1980-85**	**1994-00**	**2002**
Total population, mid, -year (millions)	75.6	97.1	131.1	135.7
Growth rate (per cent, annual average for period)	2.6	2.6	1.7	1.7
Urban population (per cent of total population)	9.8	17.0	24.5	26.1
Total fertility rate (births per woman)	6.6	5.3	3.1	3.0
Net Primary School Enrollment Rate (% of age group)	**1970-75**	**1980-85**	**1994-00**	**2002**
Total	50	56	104	-
Male	66	65	106	-
Female	33	47	102	-
Immunisation Rate (% under 12 months)	**1970-75**	**1980-85**	**1994-00**	**2002**
Measles	-	1	71	-
DPT	-	2	72	-
Children	-	68	61	-
Life Expectancy at Birth (years)	**1970-75**	**1980-85**	**1994-00**	**2002**	**2005**
Total	46	52	61	62	64
Male	47	52	61	62	-
Female	45	51	61	62	-
Mortality	**1970-75**	**1980-85**	**1994-00**		**2005**
Infant (per 1,000 life births)	138	114	66		54
Under 5 (per 1,000 Life births)	238	173	83		-
Adult Mortality (15-59)	**1970-75**	**1980-85**	**1994-00**		**2002**
Male (per 1,000 life birth)	473	383	278		-
Under 5 (per 1,000 Population)	486	388	272		-
Maternal (per 100,000 life births)	-	-	600		-

Source: BBS

TABLE A.2: REAL ECONOMIC GROWTH: 1951-2006

Period (Annual Average)	Economic Growth (Per cent)	Year	Economic Growth (Per cent)
1951-1955	2.8	1999	5.2
1956-1960	2.1	2000	6.0
1961-1965	5.0	2001	5.3
1966-1970	3.6	2002	4.4
1971-1975	-8.6	2003	5.3
1976-1980	5.2	2004	6.3
1981-1985	3.8	2005	6.0
1986-1990	4.2	2006	6.7
1991-1995	4.2		
1996-2000	5.6		
1999-2003	5.4		

Source: Penn World Table and BBS

TABLE A.3: SECTORAL SHARES OF OUTPUT: 1973-2002
(PER CENT OF GDP AT CONSTANT PRICES)

Agriculture	49.8	43.9	38.3	24.0	18.5
Industry	9.0	11.2	9.9		
Manufacturing				12.5	15.1
Construction	4.6	4.1	6.0	5.5	8.0
Transport, storage and communication	10.5	10.8	11.9	8.9	9.8
Trade services	7.4	9.8	9.0	12.0	13.1
Others	18.7	20.2	24.9	37.0	35.5

Source: BBS

TABLE A.4: TYPES OF EMPLOYMENT AND ITS DISTRIBUTION BY ECONOMIC ACTIVITY: 1991-2000

	1991	1996	2000
Total Labor Force (millions)	51.0	56.0	58.0
Types of employment (per cent)	100.0	100.0	100.0
Formal	11.7	12.4	13.1
Non-formal	87.9	87.6	86.9
Family-based	47.2	40.1	37.0
Daily basis	13.9	17.9	17.6
Self-employed	26.8	29.6	32.3
Employment by activity (per cent)	100.0	100.0	100.0
Agriculture, forest, fisheries	66.4	63.2	62.5
Mining and quarrying	-	-	0.7
Manufacturing	11.8	7.5	7.4
Electricity, gas and water	0.1	0.2	0.2
Construction	1.0	1.8	2.1
Trade services	8.5	11.2	12.0
Transports and communication	3.2	4.2	4.6
Finance and business service	0.6	0.4	0.5
Community and personal service	3.8	9.3	10.0
Others	4.5	2.2	0.0

Source: BBS

TABLE A.5: POVERTY, HARDCORE POVERTY AND INCOME INEQUALITY: 1984-2000

Type of Poverty	1983-84	1985-86	1988-89	1991-92	1995-96	2000
Poor National	62.6	55.7	47.8	47.5	47.5	44.3
Rural	61.9	54.7	47.8	47.8	47.1	42.3
Urban	67.7	62.6	47.6	46.7	49.7	52.5
Hardcore Poor National	36.8	26.9	28.4	28.0	25.1	20.0
Rural	36.7	26.3	28.6	28.3	24.6	18.7
Urban	37.4	30.7	26.4	26.3	27.3	25.0
Human	1981-83			1993-94	1995-97	1998-00
Poverty						
Index	61.3			47.2	41.6	34.8

Source: BBS

TABLE A.6: PUBLIC EXPENDITURE

Particulars	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Public expenditure (a+b+c)	23,165	24,082	25,859	29,779	34,464	37,399	40,757	42,075	47,184	53,903	64,383
Non-development expenditure	11,712	12,305	14,232	16,562	18,195	20,536	22,700	25,307	28,390	33,324	37,333
(b) Development expenditure (ADP)'	9,866	10,886	10,867	12,325	15,221	15,901	15,050	15,271	16,817	18,771	24,500
(c) Other expenditure2	1,597	891	760	892	1,048	962	3,008	1,497	1,977	1,808	2,550
As Percentage of Gross Domestic Product **(GDP)**											
Public expenditure as per cent of GDP (a+b+c)	13.93	13.33	12.92	13.55	14.54	14.75	14.92	14.00	14.17	15.01	15.47
(a) Non-development expenditure	7.04	6.81	7.11	7.54	7.67	8.10	8.31	8.42	8.53	8.99	8.97
(b) Development expenditure	5.93	6.02	5.43	5.61	6.42	6.27	5.51	5.08	5.05	5.53	5.89
(c) Other expenditure	0.95	0.49	0.38	0.41	0.44	0.38	1.10	0.50	0.59	0.49	0.61

Source: IMED

TABLE A.7: IMPLEMENTATION OF ANNUAL DEVELOPMENT PROGRAMME (ADP)

(In crore Taka)

Year	Original Allocation	Revised Allocation	Actual Expenditure	Expenditure as % of Revised Allocation
1991/92	7,500	7,150	6,024	84.3
1992/93	8,650	8,121	6,550	80.7
1993/94	9,750	9,600	8,983	93.6
1994/95	11,000	11,150	10,303	92.4
1995/96	12,100	10,447	10,016	96.0
1996/97	12,500	11,700	11,041	94.0
1997/98	12,800	12,200	11,037	90.5
1998/99	13,600	14,000	12,509	89.4
1999/00	15,500	16,500	15,471	93.8
2000/01	17,500	18,200	16,240	89.2
2001/02	19,000	16,000	14,090	88.1
2002/03	19,200	17,100	15,434	90.0
2003/04	20,300	19,000	16,817	89.0
2004/05	22,000	20,500	18,771	91.6
2005/06	24,500	21,500	19,472	91.0

Source: IMED

TABLE A.8: ADP EXPENDITURE AND ITS COMPOSITION BY MAJOR SECTORS (%)

Sector	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Agriculture	4.5	5.0	4.5	4.9	4.7	4.5	4.4	3.74	4.04	3.62	4.91
Rural development	6.8	8.4	8.2	10.1	12.2	12.2	11.1	10.09	13-83	14.27	19.07
Water resources	5.6	8.2	8.1	7.0	6.9	6.1	5.4	4.29	4.04	2.44	2.64
Industries	1.5	1.4	0.8	0.8	1.7	3.3	1.9	1.14	2.74	2.42	1.66
Power	13.7	13.5	10.9	12.0	12.9	12.2	12.1	13.70	17.26	20.74	18.08
Gas, oil & natural resource	4.1	4.4	4.9	4.7	4.3	2.5	3.1	4.00	5A9	6.04	1.67
Transport	20.1	22.4	19.7	17.9	17.4	20.4	19.9	16.15	18.04	12.27	15.21
Communication	2.9	1.9	1.6	2.8	3.1	2.8	6.1	3.63	2.23	2.93	3.94
Physical planning & housing	4.6	5.4	5.1	5.4	7.0	7.5	6.6	5'61	5.91	6.03	6.29
Education & religion	13.0	13.2	12.9	13.5	12.8	13.3	14.2	13.88	12.28	13.70	14.49
Health & population	6.9	7.9	9.1	8.2	8.1	7.3	7.9	6.72	8.27	8.17	5.12
Other	16.4	8.1	14.1	12.8	9.1	7.8	7.4	17.00	6.24	7.38	6.94
Total ADP	100	100	100	100	100	100	100	100	100.0	100.0	100.0

Source: IMED

TABLE A.9: BUDGET DEFICIT

Deficit/ financing	1994-95	1995-96	1996-97	1997-98	1998-99	1999- 00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Overall budget deficit (excluding foreign grants)	-4.6	-4.7	-3.7	-3.4	-4.6	-6.1	-5.1	-4.7	-4.2*	-4.2	-4.5*	-4.5
Overall budget deficit (including foreign)	2	-3.0	-2.0	-2.1	-3.2	-4.5	-4.1	-3.7	-3.4	-3.4	-3.7	-3.7
Net foreign financing	3.8	2.8	2.8	2.3	2.5	2.5	2.0	2.1	2.3	2.4	2.4	2.4
Net domestic financing	1.2	1.8	1.5	1.6	1.9	2.8	2.8	2.7	1.3	2.2	1.8	2.2

Source: Finance Division

TABLE A.10: QUANTUM OF DOMESTIC RESOURCES (ACCORDING TO REVISED BUDGET) IN FINANCING ADP

(in Crore Taka)

	1994/96	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Local Financing	11,150	10,447	11,700	12,200	14,000	16,500	18,200	16,000	17,100	19,000	20,500	21,500
Foreign Financing	6,352	6,033	5,975	6,679	8,188	8,274	8,670	8,215	8,241	9,410	10,430	10,700
Domestic Financing	4,798	4,414	5,725	5,521	5,812	8,226	9,530	7,785	8,859	9,590	10,070	10,800
Domestic financing as % of Total ADP allocation	43.03	42.25	48.93	45.25	41.51	49.85	52.36	48.66	51.81	50.47	49.12	50.23

Source: Finance Division