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1 April 2012

Online at <https://mpra.ub.uni-muenchen.de/40086/>
MPRA Paper No. 40086, posted 16 Jul 2012 13:18 UTC

Nonlinear growth effect of remittances in recipient countries: an econometric analysis of remittances-growth nexus in Bangladesh

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Abstract:

The macroeconomic impacts of remittances flows on developing economies are not well understood. The paper is an attempt to understand the impact of inward remittances flows on per capita GDP growth in Bangladesh during 1974-2006. We find that the growth effect of remittances is negative at first but becomes positive at a later stage- a strong evidence of a non-linear relationship. This could be due to unproductive use of remittances in the beginning followed by more productive utilisation. Remittances positively affect per capita GDP growth in Bangladesh when the complementarity between remittances and financial development is incorporated into the analysis.

JEL Codes: F0, F4, O1.

Keywords: Remittances; Economic Growth; Bangladesh; IV-estimation;
Remittances utilisation.

1. Introduction

The importance of the flow of workers' remittances in the economies of developing countries during the last few decades or so cannot be ignored at the face changing global order where most of the economies in the world are transforming themselves to the call of globalization and transmuting towards more open markets with freer flows of goods and factors across borders. Remittances – the unrequited transfer of funds by the migrants to their families at home – are a source of foreign exchange which is much scarce in developing economies. It is a more stable and less volatile source of external finance when compared to the other forms of flows which include official development assistance and foreign direct investment (Ratha 2007). Given the surge in the flows of remittances world wide (IMF 2005, World Bank 2005, and Ratha 2007), especially in the developing countries where remittances are twice the size of official development assistance (ODA) and as large as foreign direct investment (FDI), it has become important to study the development impacts of remittances in those economies. Potentially remittances inflows can have strong development impacts in the economy. As Kapur (2004) notes:

“Remittances finance consumption, land and housing purchases and philanthropy; they are an important source of social insurance in lower income countries; and they provide liquidity for small enterprises (in the absence of well functioning credit markets) as well as capital investments – in equipment, land, wells and irrigation works and education – with longer-term implications for economic development.”

However, remittances can also have counter effects in the source economy unlike ODA or FDI because it is an outcome of labour migration. Like there are externalities (positive and/or negative) associated with labour migration, the impact of remittances on the economy measured at the macroeconomic, household or community level can be either positive or negative in the country of origin. Table 1 compiles the major conclusions reached in the researches that fall under the heading of “development impact of remittances”.

Table. 1 Possible Positive and Negative Impacts of Remittances

	Positive Impact of Remittances	Negative Impact
Macroeconomic level	<ul style="list-style-type: none"> • Strengthening balance of payments by provision of foreign exchange • Remittances are stable and counter-cyclical 	<ul style="list-style-type: none"> • Deterioration of balance of trade by stimulation of import and appreciation of local currency • Deterioration of ‘social balance’ • Remittances tend to decrease as migrant community is more established in the destination country • Economic dependency of remittances
Household level	<ul style="list-style-type: none"> • Allow family to meet basic needs • Opening up of opportunities for investing in children’s education, health care etc. • Loosening of constraints in family budget to invest in business or savings • Emergency resources • Social security resource base 	<ul style="list-style-type: none"> • Dependence on remittances and neglect of local productive activities by families • Hardly used for productive investment
Community and regional level	<ul style="list-style-type: none"> • Boost local economy • Financing local development projects 	<ul style="list-style-type: none"> • Increase inequality between families who receive remittances and those who do not • Inflation

Source: De Bruyn, T. and Wets, J. (2006)

The topic of “development impact of remittances” is a broad and complex one and the analysis is less straight forward. During the last decade or so there has been a surge in researches on remittances and consequently there has emerged a vast literature around the

topic of “development impact remittances”. This paper however is directed towards studying only the growth impacts of remittances in Bangladesh where “remittance and economic growth” is a topic in the “macroeconomic impact of remittances” – a subsection of “development impact of remittances” literature.¹

This paper is organized as follows. Following this brief introduction the paper will discuss in section two the dynamics of remittances flows and other important macro economic variables in Bangladesh. Section three will provide a review of researches on remittances in Bangladesh followed by section four which reviews the literature on remittances and economic growth. In section five the paper will present an econometric model and provide econometric results on the impact of remittances on economic growth in Bangladesh during 1974 – 2006 and conclude by outlining the main findings and limitations of the study and providing guidance for further research.

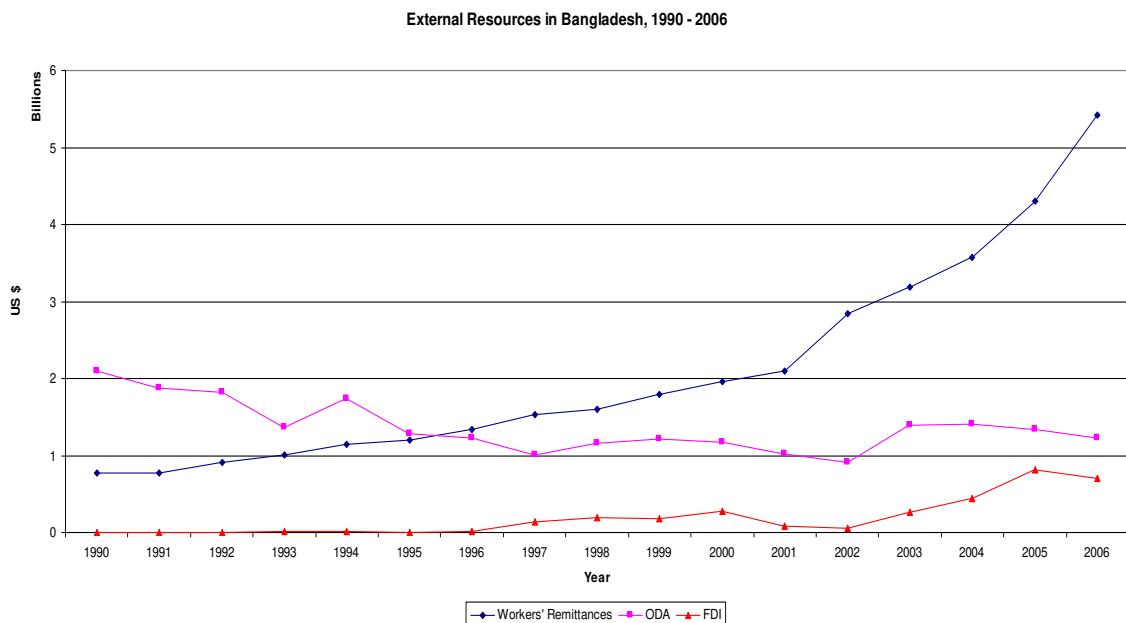
¹ The development impact of remittances literature include (along with macro topics) those topics that study its effect on household poverty and inequality, household's labor supply, schooling of children, child labor, child health and other household behaviors (e.g. savings, and expenditures). These topics use household level survey data for analysis in contrast to the “macroeconomic impact of remittances” studies which use aggregate macroeconomic data.

2. Remittances Flows in Bangladesh

Bangladesh has experienced continuous surge in inward remittances flows both in terms of volume as well as in terms of ratio to GDP over the last thirty years. According to Bangladesh Bank's Quarterly² total inward remittances was USD 24 million in 1976, but the amount stood at a staggering USD 6584 million (just over 6.5 billion) in 2007.

According to IMF's International Financial Statistics, October 2007, Bangladesh was the tenth largest remittances recipient economy among the developing countries measured by the average for the flows over the period 1990 – 2005. It was on the top ten recipients of remittances list in 2006 by Ratha (2007) based on volume and ranked 14th in 2005 (World Bank, Global Economic Prospect 2006). The remittances to GDP ratio reached to an impressive 9.4 percent in 2007 from a decent 3.5 percent in 1997.

Figure 1. External Flows in Bangladesh



. In Figure 1 we can see that compared to other forms of external finances viz overseas development assistance (ODA) and foreign direct investment (FDI), remittances flows in Bangladesh was more stable, less volatile and constantly rising. After 1996 the sizes of remittances have exceeded other flows. In the wake of falling ODA, remittances remain as the most important source of external finance.

² www.bangladesh-bank.org

The nature and size of remittances inflows warrant a systematic study of their macroeconomic impacts into the economy. According to Chami et al. (2008) there are three main features of remittances that provide impetus to study their macroeconomic impacts. These are: i) size of these flows relative to the size of the recipient economies; ii) the likelihood that these flows will continue unabated because of continued trend in globalization; and iii) These flows are quite distinct from those of official aid or private capital. (In contrast to these remittances are composed of numerous small transfers between private individuals which are tied to familial relationship in the home country).

Given the importance of studying the macroeconomic impact of remittances as outlined above, in my Ph.D. thesis, we endeavour to concentrate our study into four areas of the macroeconomy in Bangladesh where remittances can have potential impacts. These are the impact of remittances on macroeconomic volatility, financial development, real exchange rates and on economic growth. Our hypotheses are in Bangladesh remittances reduce macroeconomic volatility, promote financial development, and appreciate real exchange rate and through these channels affect economic growth. However, in this paper we will just concentrate on the impact of remittances on GDP growth in Bangladesh.

The macroeconomic effects of remittances in the economy can be decomposed into their effects on savings, investment, consumption and growth. As a basic macroeconomic identity we know that total disposable income equals consumption plus savings.

Remittances can be thought of augmenting total disposable incomes of the households. A part of which is consumed and rest is saved. In the portion of consumption expenditures some are actually investments as represented by expenditure incurred to buy durable household goods, finance education and health, purchase land or to provide capital for micro business start ups etc. So the impact of remittances on the receiving economy should be working through savings and investment as well as short run effects on aggregate demand and output through consumption. Some important graphs related to remittances and other macroeconomic variables in Bangladesh like investment, savings, consumption, financial deepening, and growth are provided through Figures 2 to 8.

Figure 2. Remittances and Fixed Investment

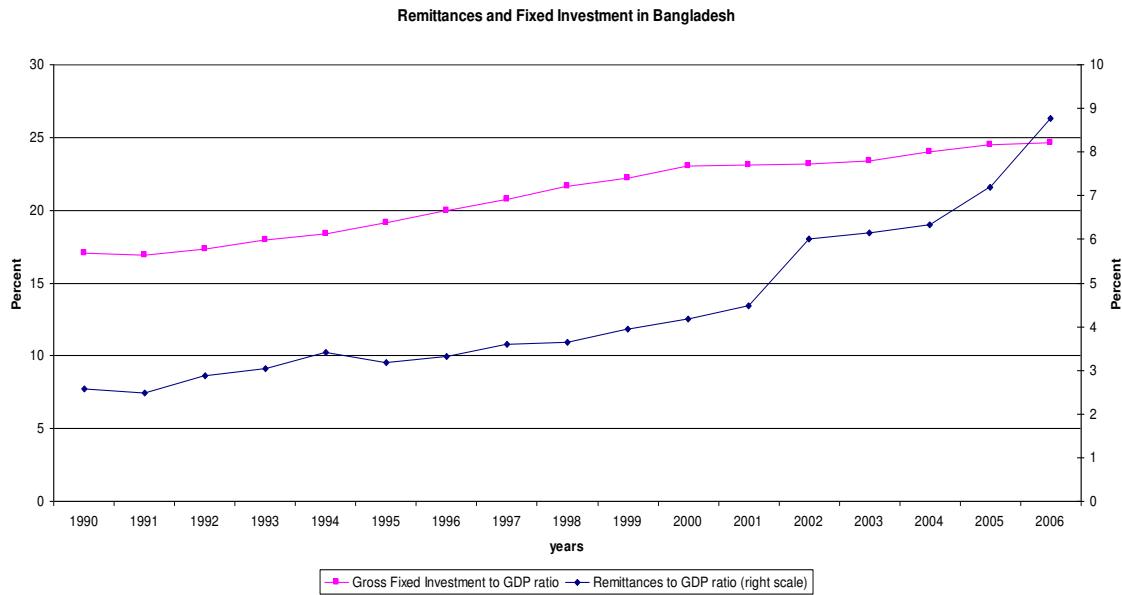


Figure 2 shows that remittances to GDP ratio and gross fixed investment to GDP ratio in Bangladesh seem to be positively connected over the period over the period 1990 – 2006. Remittances can also go towards financing household consumption as we can see in Figure 3.

Figure 3. Remittances and Consumption Expenditure

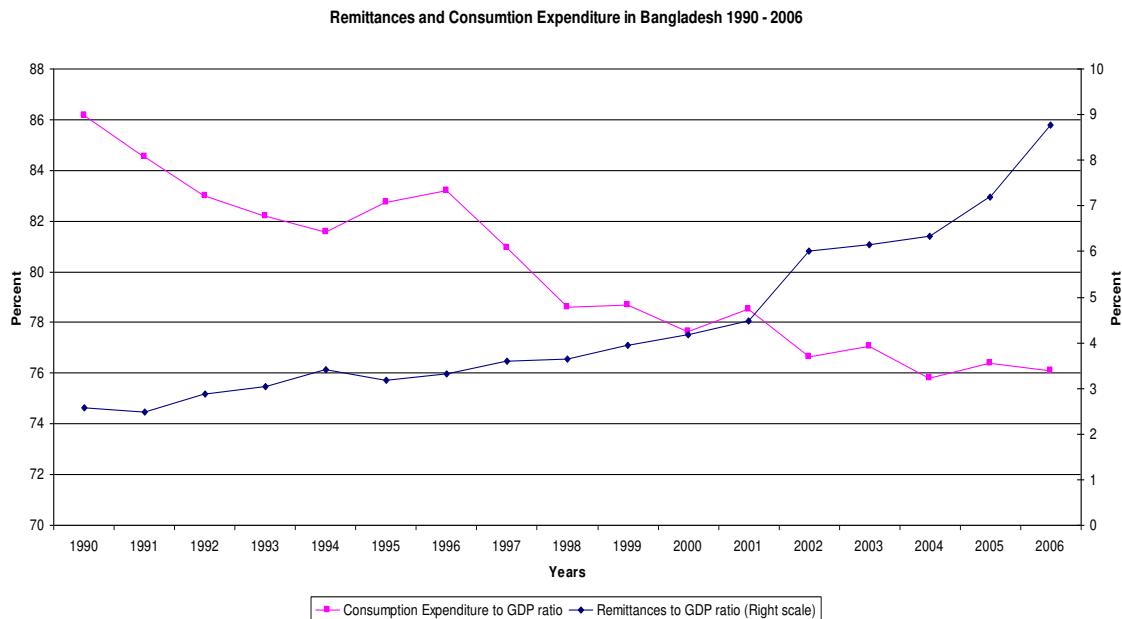
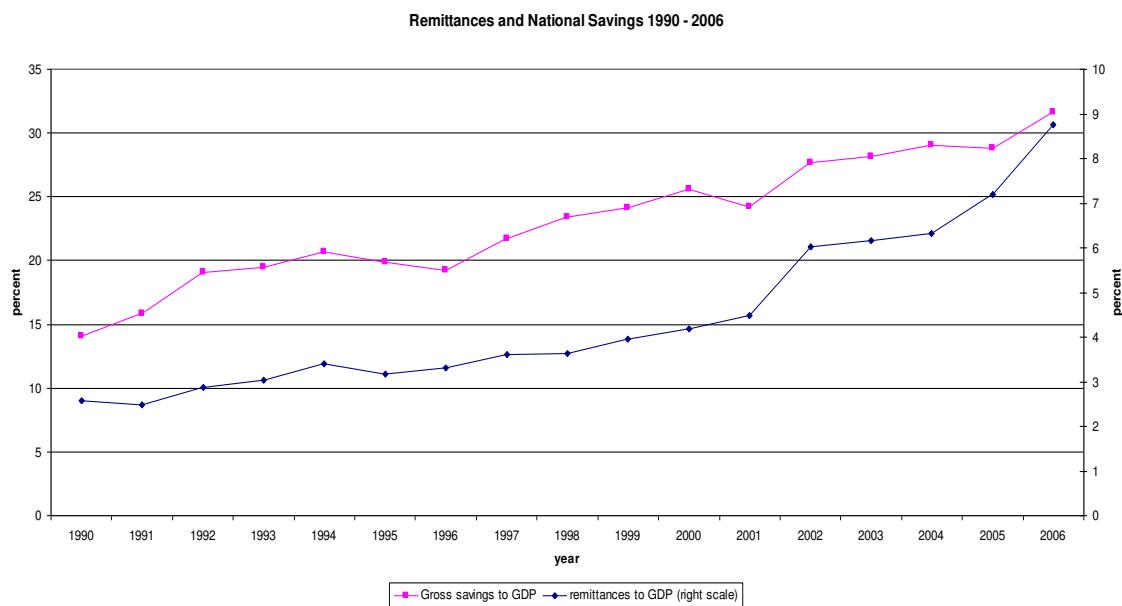


Figure 3 shows how remittances to GDP and household consumption expenditures to GDP behaved during the period 1990 – 2006. Household final consumption expenditures to GDP ratio have fallen over the period 1990 – 2006 in Bangladesh while remittances to GDP ratio have surged. These two series may be negatively related. This may imply that at the macroeconomic level remittances flows did not contribute to increased consumption in Bangladesh. This leads to the speculation that remittances inflows may have contributed to the pool of national savings instead.

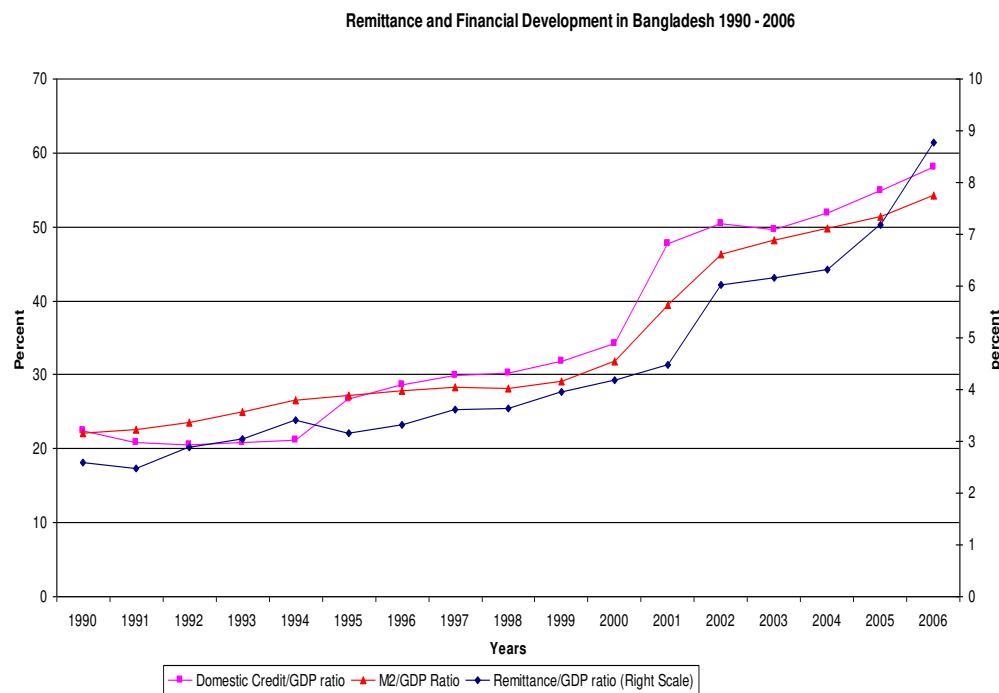
Figure 4. Remittances and National Savings



The total savings effect of remittances is the sum of foreign savings and domestic savings. Remittances are component of foreign savings and should be augmenting national savings which is a sum of domestic and foreign savings by increasing the total pool of resources for investment. According to Figure 4 there seems to be a strong indication that in Bangladesh the two ratios-gross savings/GDP and remittances/GDP - are positively correlated. Especially during 2001 to 2006 when remittance to GDP ratio rose from around 4 percent to just above 8 percent, saving to GDP ratio increased from around 25 percent to just above 30 percent.

Remittances can lead to increase in the demand for money and expand the supply of funds into the recipient countries' banking system. This could be affecting the broad measures of financial development – credit to private sector to GDP and M2 to GDP – in Bangladesh.

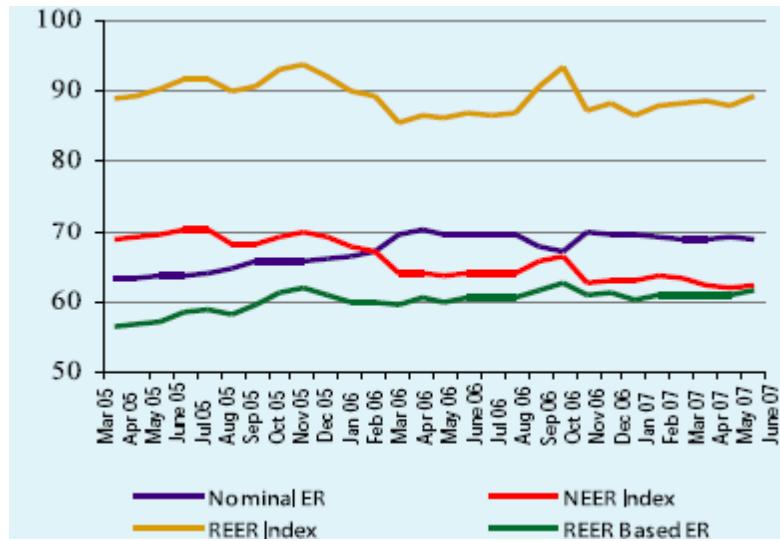
Figure 5. Remittances and Financial Development



We can see from Figure 5, there seems to be a strong link between remittances to GDP ratios and the measures of financial deepening (M2/GDP and Domestic Credit/GDP) in Bangladesh. The graph shows a positive correlation between remittances and other two series leading to the conjecture that remittances inflow could contribute to the development of the financial sector in the Bangladesh economy.

In Figure 6 we will casually observe the dynamics of real effective exchange rate in Bangladesh. Inflows of remittances can cause real appreciation of the real effective exchange rate (REER) and make the external sector uncompetitive giving rise to the phenomenon called “Dutch disease”. Based on Bangladesh Bank’s Quarterly the dynamics of real exchange in Bangladesh over the two year periods 2005 and 2007 was rather stable on average.

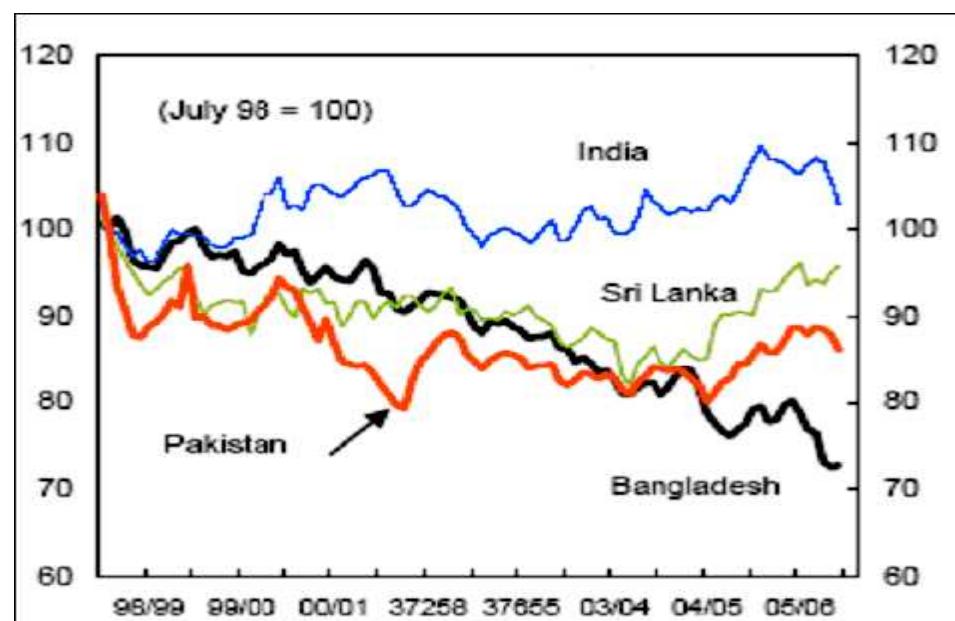
Figure 6. Exchange Rate Movements, March 2005- June 2007



Source: Bangladesh Bank Quarterly, June 2007

Based on Figure 6, for this time period March 2005 to June 2007, there is no apparent trend of increase in the REER index or real appreciation of exchange rate in Bangladesh. There is some indication of REER appreciation during March 2005 to December 2005 followed by depreciation until March 2006. Then come the period of stable REER only except July to September 2007 which had been characterised by a slight appreciation. The overall trend is that REER is at the same level at the end of period compared to where it was in the beginning of the period. If we take a look at the data of REER for a bit longer time period, we can see instead that there is some sign of real depreciation compared to other South Asian economies. Figure 7 shows that over the longer time period of 1998/99 to 2005/06, there is also no sign of overvaluation of real exchange rate and erosion in the competitiveness of the tradable sector in Bangladesh. In fact, compared with its neighbouring countries, Bangladesh's real exchange rate has depreciated over the period 1998 – 2006 and has become increasingly more competitive over time. We can say that, over the period 1998 – 2007, during when remittances continued to surge in Bangladesh, the REER was depreciating most of the time or has remained stable, but it had not been rising to erode the competitiveness of the tradable sector.

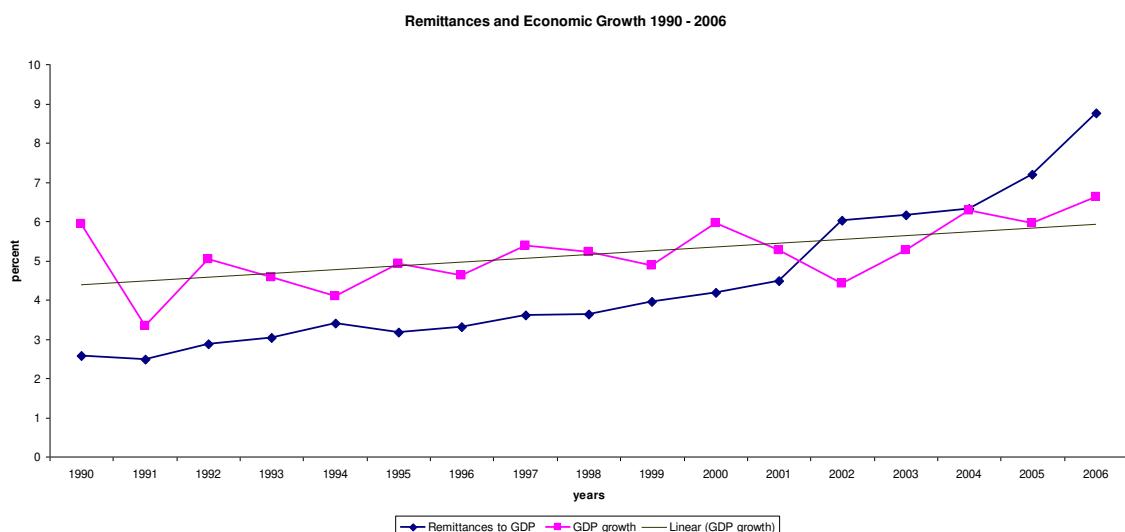
Figure 7. REER in Bangladesh, India, Pakistan and Sri-Lanka



Source: Quibria (2008)

So far we have seen how remittances correlate with investment, consumption, savings, and real exchange rate in Bangladesh. Finally we want to see how remittances correlate with economic growth.

Figure 8. Remittances and Economic Growth



It is difficult to say by looking at Figure 8 if there is any link between remittance and GDP growth in Bangladesh. However, though GDP growth per se is stochastic, trend in GDP growth in the graph is increasing over the period 1990 to 2006 during the time when remittances to GDP ratio are also steadily increasing. So there might be a relationship. One can see another interesting observation in Figure 8. During the time when remittance was increasing steadily, especially from 1992 to 2001, the variability of GDP growth rate, measured as the deviation of GDP growth from the trend, was also considerably less. This could mean that increased flows of remittances can reduce output volatility.

3. Review of Studies on Remittances in Bangladesh

Researches related to remittances in Bangladesh are scant and have not yet been directed in the area where this thesis aims to contribute which is the macroeconomic impact of remittances. The remittances literature related to Bangladesh tends to be both qualitative and quantitative in nature. Some earlier studies employ quantitative methods to analyse the empirical issues related to remittances. The later studies are primarily qualitative aimed towards understanding the nature and profiles of remitter and recipient households in a broader social context.

Remittances and Savings

The earliest paper on remittances in Bangladesh is a micro level study by Mahmud and Osmani (1980) who quantitatively modelled expenditure and saving behaviour of the migrant and the household receiving remittances. They found that migrants remit more than eighty percent of their income from abroad, and that there is a significant difference in the saving rate between remittance receiving and non-receiving household. They also showed that savings ratio monotonically increases with income and for the highest remittance receiving income group saving ratio was found to be almost three fourth of income. One central finding of their study is that remittances go into unproductive use. An early quantitative study at the macroeconomic level of remittances in Bangladesh in comparison to other Asian countries is by Qubria (1986) who showed that the steady flows of remittances have eased the foreign exchange constraints, improved the balance of payments and has augmented national savings.

Remittances, Consumption and Welfare

There is a general tendency among the early authors to conclude that remittances go into consumption. However this may not be necessarily bad. Using computable general equilibrium (CGE) modelling framework, Stahl and Habib (1989) showed that even if only small proportions of remittances income go to direct investment while the majority

go to serve the purpose of consumption needs, remittances could still be developmental. They set up CGE model and quantitatively explored whether expansion in consumption increase aggregate demand. The study found evidence that in Bangladesh remittances tend to be spent within those sectors which have relatively strong linkage with the rest of the economy. Thus many sectors not directly benefiting from the remittance expenditure would nonetheless experience an increase in demand for their output inducing investment in their sectors and expanding employment. In a theoretical paper not exactly related to Bangladesh but in general applicable to labour exporting Asian labour-surplus economies, Qubria (1997) simultaneously combined migration and remittance in a model to derive and prove a series of propositions. The main theoretical conclusions were that if remittances per capita exceed the source-country wage rate then aggregate GNP of the labour-exporting country will increase and also that if migration is accompanied by sufficient remittances then it will enhance welfare in the source country irrespective of the criteria that is used to measure welfare.

Remittances Utilisation, Micro Finance Institutions (MFI) and Socio-Economic Context

The later studies of remittances flows in Bangladesh were mainly qualitative except some very recent ones. The objectives of these studies had been to identify the nature and dynamics of remittances, recipient households and the remitter in a broader social context. Murshid et al (2002) is one such study. It contained a micro-level survey data methodology to identify the socio economic profiles of migrant family and discussed channels both official and unofficial through which remittances come and various types of remittances. It also discussed the prospects and challenges of channelling remittances via the official way through the national and multinational banks. Murshid et al (2002) also provided a Keynesian type analysis of macroeconomic effects of remittances on the economy. Using a short-run Keynesian structural equation type model this study estimated a remittances multiplier in the economy which equalled 3.33 indicating a one million taka (Bangladeshi local currency) increase in remittances would increase national income by 3.33 million taka. Note that this is just a level effect not a growth effect. This type structural equation type estimation is not without problems because of the assumption of

fixed price and interest, as the model ignores the monetary and the real sector. Nonetheless this is so far the only study in Bangladesh which tried to econometrically estimate some macroeconomic effects of remittances. A major study by Siddiqui and Abrar (2003) used survey data and tried to qualitatively investigate nature and dynamics of people linked through remittances and the linkage between workers' remittances and micro-finance institutions in channelling and transferring remittances in Bangladesh. By surveying one hundred households, this study provided detailed characteristics of remittance receiving households, their socio economic profiles and the different ways remittances are used by them. For example, the study found that more than half the remitters, three quarter of whom are less than thirty five years of age, were married although the highest number of remittances recipient members were the parents who are typically more than fifty years of age, half of whom are illiterate. The study reported that some portion of remittances were invested in land and did not go towards savings while a substantial part of remittances were used to finance migration of other family members. Finally the study discussed how the extended network of the multi finance institutions (MFI) can be used to channel inward remittances and direct them to productive usage. In a similar paper, Azad (2004) discussed various prospects of channelling the huge volume of remittances received in the official way towards the development of micro-enterprises by financing their capital needs. He outlines various diaspora based investment instruments to attract migrants' remittances through official channel and the complementary role that various micro finance institutions can play to expand financial access in rural and remote areas and also finance micro-enterprise activities. In almost the same spirit, Siddidui (2004) identifies the different types of agents and institutions involved in remittances transfer process which include different ministries, training institutes, civil society, commercial banks, Bangladesh Bank (the central bank of Bangladesh), micro-finance institutions, investment instruments, specialized bank accounts, different laws related to govern remittances flows and money laundering etc. The study later gives recommendations on how to coordinate all these factors to make remittances transfers efficient. One major finding of this study is that the general perception that remittances are put to unproductive use has no empirical validity anymore. The study further notes that such observation may have been valid in late 1970

or early 1980s. However in 1990s the migrants families have tried to effectively utilise the remittances they received by investing in nutritious food for the family members, health, education, land purchase and financing migration of other family members. De Bruyn and Kuddus (2005) studied the various impacts that remittances have on households and on the broader community level in Bangladesh and discussed the various means through which government or NGOs can enhance the impact of remittances. In the end they discussed major hindrance and opportunities to efficiently utilize remittances for productive purpose which have an impact on the society as a whole.

Macroeconomic Determinants of Remittances

One recent study on remittances in Bangladesh has been involved with the current issues in remittances literature – determinants of workers' remittances. A macroeconomic paper by Barua, Majumder, Akhteruzzaman (2007) used a balanced panel dataset of bilateral remittances flows from ten major destination countries for Bangladeshi migrants' over the period 1993 to 2005 and identified the major determinants of the inflow of workers' remittances in Bangladesh. Income differential was found as one significant determinant of remittances. High inflation in home country vis-a-vis the host countries exerts negative influence on inward remittances whereas depreciation (or devaluation) of currency leads to increased flow of remittances.

Remittances and Poverty

Khan (2008) used Household Income and Expenditure Survey 2005 data conducted by Bangladesh Bureau of Statistics to carry out a micro-level study on the impact of remittances on household incomes to infer about the status of poverty in Bangladesh. The paper used an advanced statistical technique called *Propensity Score Matching* (PSM). This statistical technique matches remittances-receiving households with other households with similar characteristics but who do not receive remittances. PSM uses statistical criterions to performing such matching and compute the effect of remittances on the probability of being poor. The paper shows remittances account for positive and

significant differences in household income per capita between the remittances recipient and non-recent households. The author computes that remittances receipts lead to an approximately eighteen percent decline in poverty. The most recent paper on remittances in Bangladesh is by Buchenau (2008) which qualitatively outlines the various aspects of migrational and remittances in Bangladesh. It also provides a framework for analysing the link between migration, remittances and poverty at the household level as well as macro level.

4. Review of Literature on Remittances and Economic growth

Remittances can help relax the budget constraint in the recipient economies and increase consumption of both durables and nondurables (IMF 2005). Moreover remittances can lead to higher accumulation of human capital through allowing for education and health care, and also can lead to increased physical and financial investment (IMF 2005). So, theoretically, remittances have the potential to spur growth. IMF (2005) notes that the inflow of remittances on the macroeconomy can lead to accelerated long-run growth as a result of additional investments in physical and human capital. The study further notes that the likelihood of such outcome is strengthened in economies with well-developed financial markets and institutions which allow for effective intermediation of remittances in the financial system.

According to Chami et al. (2008) arrival of remittances can increase growth by increasing investment in physical capital, human capital and by developing the financial system in the recipient country. If there are significant financial constraints in the country that keep out a large group of household from the credit market, remittances may help ease that constraint and lead to increase in domestic investment rate. Significant portion of remittances are spent on acquiring education and nutrition leading to higher rate of human capital accumulation. This leads to total factor productivity and subsequent growth. In addition to increase in higher accumulation physical and human capital, remittances can have a positive impact on growth by affecting the recipient countries' financial system. Remittances can lead to increase in the demand for money and expand the supply of funds into the recipient countries' banking system. This contributes to the financial development of the remittance recipient economies and subsequently causes higher economic growth. According to (World Bank 2005) remittances should have a positive impact on growth because it finance household investment in education and health, and entrepreneurship to help capital formation.

However, the effect of remittances on long term economic growth could also be negative. For instance inward remittances are by products of outflows of work force—often skilled

or semi skilled—that should be negatively affecting growth (World Bank 2005). Chami, Fullenkamp, and Jahjah (2003) argue that a substantial amount of remittances are motivated by altruism and arrive in the economy to compensate for any income losses incurred by the migrants' family members due to bad economic condition at home. This creates a moral hazard problem as the migrant would not know whether income loss is due to genuine bad economic condition or not. As a result this may encourage the recipient households who participate in local labour market to choose more leisure over work and cause an aggregate reduction in labour supply which may negatively affect economic growth. Another way remittances can negatively affect growth is by diminishing technological capacity of the economy through appreciating the real exchange rate (Chami et al 2008). Usually an economy's technical capacity will largely depend on the size of its tradable goods sector. Production in some component of the traded goods sector such as non-traditional manufactures intended for export can spur technological diffusion and increase the technological capacity for other firms in the economy. Arrival of remittances inflow can appreciate the economy's real effective exchange rate and render the tradable sector uncompetitive. This "Dutch disease" effect will shrink tradable goods sector and allow resources to shift to the non-tradable goods sector and thus diminish the growth of technological capacity of the whole economy and subsequently reducing economic growth.

Relatively recently there has emerged a substantial empirical literature to measure the impact of remittances on GDP growth. These papers are discussed below.

Chami, Fullenkamp, and Jahjah (2003)

Chami, Fullenkamp, and Jahjah (2003) (henceforth CFJ) use aggregate remittance data for a sample of 83 countries over the 1970 - 1998 period to examine the relationship between workers remittances and per capita GDP growth. The study used panel regressions of growth of real GDP per capita on workers' remittances to GDP conditional on initial per capita income, investment to GDP ratio, inflation rate, regional dummy and the ratio of net capital flows to GDP. Later the study replaced workers' remittances to

GDP variable with a *change* in that ratio as a regressor to incorporate the dynamic nature of private transfers. Overall, Chami et al (2003) found that, the investment to GDP and net private capital flows to GDP ratio were positively affecting growth but workers' remittances to GDP ratio either was not significant or negatively related to growth. In order to test whether the relationship could be non-linear, CFJ used a squared term of the remittances to GDP ratio and still found the same result. However, when *change* in the ratio was added to replace the variable in levels, it was found that annual *change* in remittances to GDP ratio negatively and significantly affects growth. To account for possible endogeneity problem such that the main causes of remittances are also affected by it, CFJ used some instruments for remittances and also conducted a two stage instrumental variable technique to estimate the relationship. In the first stage each workers' remittances to GDP ratio was estimated as a function of each country's income gap and real interest gap relative to the United States. Having estimated this equation, the fitted values of remittances to GDP are obtained. In the second-stage per capita GDP growth regression is estimated using fitted values of remittances to GDP ratio from stage one as regressor conditional on the same variables as before. Here too the *changes* in remittances to GDP ratio are found to be negatively related to growth.

IMF (2005)

The IMF (2005) undertook a similar cross-country growth regression like Chami et al (2003) by taking a sample of 101 countries with data ranging over 1970 – 2003 periods. However, unlike Chami et al (2003), IMF (2005) took an aggregate measure of remittances which include the sum total of three components – workers' remittances, compensation of employees and migrant transfers – of the balance of payments whereas Chami et al (2003) only took the workers' remittances component. The IMF study performed cross-sectional growth regression of real GDP growth per capita on ratio remittances to GDP. The additional control variables included log of initial income, education, log of life expectancy, investments, inflation rate, budget balance, trade openness and financial development. The study also used two instruments for remittances. These include distance between the migrants' home and main destination

country, and a dummy measuring whether the home and the main destination country shared a common language. Since these instruments are time invariant, a panel estimation was not undertaken rather a cross-sectional estimation over the averages of 1970 – 2003 was done. Using this cross-country growth regression framework, no significant link was found between real par capita GDP growth and remittances.

Faini (2006)

Faini (2006) estimated cross-sectional growth regressions on a sample of 68 countries where the dependent variable is per capita GDP growth. Using aggregate measure of remittances data in IMF (2005) the study did not include investment in the list of regressors. Faini (2006) notes that the positive impact of remittances on growth usually work through investments. So including it in the regression may render the effects of remittances insignificant as the investment's coefficient could be capturing some of the effects. Along with remittances to GDP ratio, the control variables used were initial per capita GDP, secondary school enrolment (as a measure of human capital), the number of telephone lines per 1000 inhabitants (as an indicator of physical capital) and the International Country Risk Guide index as an indicator of institutional quality. The estimated coefficient on the remittances to GDP ratio was found to be positive and significant in the OLS regressions of the study. Later foreign aid to GDP ratio was included as additional control variable and remittance was still found to be positively affecting growth. In order to encounter the endogeneity problem, the study also used an instrumental variable estimation procedure. Remittances to GDP ratio were instrumented by distance from the home country to the main destination country. The result was still in support of a positive impact of remittances on per capita GDP growth but the estimated coefficient in remittances to GDP became insignificant. Finally, in order to see how the impact of remittances interacts in deferential policy environment, the study added two additional regressors: black market exchange premium and inflation. These variables measure the overall stability of the macroeconomic system. Higher values of these variables would imply weak macro policy environment. In such a environment the incentive to use remittance income for investment purpose will be relatively weak. To

test this hypothesis, the study included two interacting terms as regressors. Such as remittances to GDP interacted with black market exchange premium and with inflation rate. The estimated coefficient on the interacting terms was found to be negative and significant meaning that the positive impact of remittances on growth gets diluted when the macroeconomic policy environment is unstable and unsound.

Catrinescu, Leon-Ledesma, Piracha and Quillin (2006)

The study by Catrinescu, Leon-Ledesma, Piracha and Quillin (2006) (henceforth CLPQ) incorporated institutional variables in their study covering 114 countries in their sample over the 1991 – 2003 period. The authors doubted that the results obtained in Chami et al (2003) are not tenable for two reasons – misspecified econometrics method and failure to use the correct sets of controlled variables. According to CLPQ Chami et al (2003) did not address the problems associated with panels estimations when the errors are autocorrelated. And also the endogeneity problem was not properly tackled. Though CFJ used an instrumental variable regression estimation with income and interest rate gap as instruments, these were not enough in eliminating the endogeneity bias. To overcome these methodological problems, CLPQ suggested a superior but more rigorous Dynamic Panel Data (DPD) estimator method. The second is the control variables issue. According to CLPQ, Chami et al (2003) obtained a negative correlation between GDP growth per capita and remittances because a correct sets of control variables were not included in their specification. The authors in the CLPQ paper further argued that the fundamental way to increasing the growth impact of remittance is to promote the right *institutions* in the economy that support a sound business environment and a secured financial sector that encourage households to invest in both physical and human capital of any income that exceeds their basic subsistence. Hence they suggest a conditioning role of institutions. CLPQ consider role of remittance receiving countries' institutions in conditioning the dynamics of the growth – remittances relationship. That is whether remittances matter for long term economic growth depends on whether the receiving countries have the correct economic, political and governance institutions. CLPQ conducted OLS cross-sectional and various static and dynamic panel data estimator

regressions of per capita GDP growth on the log of total remittances to GDP. The control variables include initial GDP per capita, ratios of gross capital formation (investment) and net private capital flows to GDP and the following institutional variables: a) United Nations Human Development Index (UNHDI), b) corruption perception index (CPI), c) six governance indicators and d) International Country Risk Guide (ICRG) political risk indicators. Overall the CLPQ study found robust and positive relationship between growth and investment as well as between growth and some of the institutional variables. The study also found evidence of a positive relationship between growth and remittances though the magnitude of this relationship was a little weak.

Guiliano and Ruiz-Arranz (2006)

The study by Guiliano and Ruiz-Arranz (2006) (henceforth GRA) took a sample of 73 countries during the 1975 – 2002 period. Aggregate measure of remittances was chosen as sum of all three categories on the balance of payments as in IMF (2005). In the paper of GRA remittance was found to strongly and robustly affecting growth *through* its interacting effect with the financial sector of the economy. According to authors the relationship between remittances, financial development and growth is a-priori ambiguous but it is clear that the *impact* of remittances on growth can depend on the *level* of financial development. In this case authors suggest two scenarios. Either remittances and financial development are *substitutes*. That is inward remittances work as a substitute for low level of financial development and supply the much required funds for investments which otherwise would have remained unrealized due to credit constraint. The second scenario is, remittances and financial development are *complements*. Which means remittances enhance economic growth in an economy with a well developed financial markets. The study conducted OLS as well as fixed-effects panel estimates and used system generalized methods of moments (SGMM) estimator that uses internal instruments to account for endogeneity. At first the study regressed per capita GDP growth on total remittances to GDP ratio. The control variables include initial level of GDP per capita, the investment to GDP ratio, population growth, the government fiscal balance as a ratio of GDP, years of education, measure of openness to trade, and

inflation. The estimated coefficient on remittances to GDP ratio was found to be insignificantly related to growth in this specification. Later to test the hypothesis whether remittances might enhance growth by relaxing credit constraints, the study included financial development and its interaction term with remittances variables as additional controls in the regression. The measures for financial development used were M2 over GDP ratio, total deposit over GDP ratio, loan to private sector over GDP ratio and credit to public and private sector GDP ratio. Significantly negative interactions terms between remittances and measures of financial development were found and the estimated coefficients on the remittances to GDP ratio variable turned positive, significant and robust among alternative specifications. This lead to the conclusion remittances appeared to have positive impact on growth in those countries which are faced with credit constraints with small financial sectors. Thus remittances work as a substitute for low level of financial development and help promote growth.

World Bank (2006)

The World Bank (2006) study conducts a panel data estimates on the impact of remittances and growth using a sample of 67 countries measured over the period of 1991 – 2005. The control variables used were (all in logs) initial GDP per capita, secondary school enrolment ratio, the private domestic credit to GDP ratio, ICRG political risk index, real export and import to GDP ratio, inflation rate, real exchange rate overvaluation, government consumption, and time period dummies. A SGMM estimation procedure was performed with the use of external as well as time varying instruments to control for the endogeneity of remittances. These instruments were formed by multiplying the share of a country's migrants to its top five OECD destinations and a measure of the respective OECD country's economic performance, such as GDP per capita, GDP growth rate or unemployment rate. The other instruments were average output per capita of the top country destinations across the world weighted by the inverse of the distance between remittance sender and recipient country. Instrumented this way, the regression specifications found a positive and significant relationship between remittances to GDP ratio and per capita GDP growth. The magnitude of the estimated

effect of remittances on growth was found to relatively small in economic terms. Increase in remittance to GDP ratio from 0.7 percent to 2.3 percent is estimated to have led to an increase in 0.27 percent increase in GDP growth. However, when the investment to GDP ratio is included along with the rest of control variables, the estimated coefficient on remittances to GDP loses significance. This led the study to conclude that one of the main channels through which remittances work is through increasing domestic investment.

World Bank (2008)

According to this World Bank (2008) study what impact remittances have on growth will depend on the policies being implemented by the home country. This study found out a number of areas that are complements to remittances in the matter of enhancing economic growth. This study included interaction terms with for remittances and education, remittances and financial depth, remittances and institutional qualities, and remittances and macroeconomic policy distortions. This study used a GMM instrumental variable procedure to estimate four growth regressions for each of the complementary sector outlined above. The instruments used were the time varying one in World Bank (2006). All regressions used the same control variables as in World Bank (2006) but each included a remittances and the respective complementary terms as additional control. The argument is remittances augments growth in the presence of complementary policies that encourage education, increase financial depths, improve institutional qualities and reduce macroeconomic policy distortions. The study found a negative and significant coefficient on the total remittances to GDP ratio, but positive and significant coefficients on each of the interaction terms. This, the argued, implied a net positive impact of total remittances on GDP.

5. Does Remittances Affect Economic Growth in Bangladesh? Econometric Results

In this section we are going to provide an econometric analysis of the growth impact of remittances in Bangladesh. Firstly we will discuss the basic model. The basic model has three alternate specifications. Each of these specifications will be estimated using an OLS, Instrumental Variable–Two Stage Least Square (IV-2SLS), and IV-GMM estimators. In the end we will discuss some limitations of our results.

Econometric Model

Our basic model for the analysing whether remittances affect growth in Bangladesh is:

$$y_t = \beta_0 + \beta_{l_t} \text{Rem}_t + \beta_z Z_t + u_t \quad [1]$$

where y is the per capita GDP growth, our variable of interest is Rem which is log of remittances³ to GDP ratio and Z is a vector of control variables. The control variables were those which were frequently included in the “growth – remittances” regressions in the literature. Here they are (all in logs) gross capital formation to GDP ratio ($lgcf$), populations growth ($lpop$), government consumption to GDP ratio ($lgov$), M2 to GDP ratio ($lm2$), inflation rate ($linf$). The last three controls are included as a proxy to the capture effects of government size, financial development and relative macroeconomic stability.

Next we recognise the fact that the “growth – remittances” relation in Bangladesh may be non-linear. As a result we provide an alternative specification of [1] by including the squared term of our variable of interest Rem :

$$y_t = \beta_0 + \beta_{l_t} \text{Rem}_t + \beta_{2t} \text{Rem}_t^2 + \beta_z Z_t + e_t \quad [2]$$

³ Actually Rem include “workers’ remittances and compensation employees” from the IMF balance of payments statistics

all the variables here are same as [1], only exception is Rem_t^2 which is squared term of the variable Rem ($lrem2$).

Finally, to capture the interactive effect, if there is any, between remittances and some other control variable included in Z , we will modify the specification [2] further. As it is found in the literature, remittances could be affecting economic growth via its interacting effect with the level of financial development. To capture this interaction between remittances and financial development we will include an interacting term in [2] and provide our third and final specification:

$$y_t = \beta_0 + \beta_{1t} \text{Rem}_t + \beta_{2t} \text{Rem}_t^2 + \beta_{3t} (\text{Rem} \times FD)_t + \beta_z Z_t + \varepsilon_t \quad [3]$$

where the interaction variable ($\text{Rem} \times FD$) is the log of remittances to GDP times log of M2 to GDP ratio ($lm2rem$).

Econometric Results

We present the econometric results of our models outlined in equations [1] through [3]. We report an OLS estimation followed by an IV-2SLS and a GMM-IV estimators. The results are presented at Table 2. The data for this estimation were taken from World Bank World Development Indicators 2008 for the period over 1974 – 2006. Because remittances data are recorded from 1976, we loose 2 observations. So in the whole exercise the sample size equals 29. An ideal methodology would have been to test for unit roots of each of the series and check for the order of integration and then do a test for a co integrating relationship among the variables. Since it is just the beginning of my thesis and the sample size is only 29, I plan to do all these tests later on. Here our objective is to simply see if remittances positively or negatively affect growth of GDP per capita in Bangladesh over the period 1974 – 2006.

Table 2. Remittances and Economic Growth in Bangladesh (Model Estimation)⁴*Dependent Variable: Per capita GDP growth*

Explanatory Variables (All in logs)	OLS			IV-2SLS			GMM-IV		
	Eq. [1]	Eq. [2]	Eq. [3]	Eq. [1]	Eq. [2]	Eq. [3]	Eq. [1]	Eq. [2]	Eq. [3]
Gross capital formation to GDP (lgcf)	- 4. 291 (-1.01)	0.527 (0.14)	7.038 (1.26)	12.134 (1.03)	-0.429 (-0.12)	5.992 (1.13)	12.134 (1.18)	-0.429 (-0.16)	5.992 (1.19)
Population growth (lpop)	- 17.57 (-2.35)	- 8.36 (-1.21)	2.523 (0.26)	6.241 (0.35)	-9.931 (-1.53)	0.763 (0.08)	6.241 (0.45)	-9.931 (-2.09)*	0.763 (0.10)
Government consumption to GDP (lgov)	-3.731 (-1.43)	- 6.161 (- 2.64)*	-0.897 (-0.22)	1.973 (0.40)	-6.171 (3.10)**	-1.947 (-0.46)	1.973 (0.48)	-6.171 (-3.07)**	-1.947 (-0.51)
M2 to GDP (lm2)	0.501 (0.24)	0.256 (0.15)	11.718 (-1.57)	7.421 (1.45)	0.033 (0.02)	9.487 (1.16)	7.421 (1.65)	0.033 (0.02)	9.487 (1.35)
Inflation rate (linf)	-0.042 (-0.14)	-0.397 (0.181)	-0.121 (-0.37)	0.363 (0.78)	-0.383 (-1.56)	-0.181 (-0.59)	0.363 (1.03)	-0.383 (-2.40)*	-0.181 (-0.85)
Remittances to GDP (lrem)	-0.498 (- 0.29)	-6.235 (-2.69)*	6.372 (0.77)	-8.666 (1.53)	-5.495 (-2.34)*	3.655 (0.38)	-8.666 (1.72)*	-5.495 (-3.23)**	3.655 (0.46)
Remittances to GDP squared (lrem2)		2.515 (3.16)**	7.759 (2.27)*		2.316 (3.05)**	6.764 (1.82)*		2.316 (4.22)**	6.764 (2.05)*
(Remittances * M2) to GDP (lm2rem)			-8.166 (-1.58)			-6.535 (-1.12)			-6.535 (-1.29)
	<i>n</i> = 29 <i>r</i> ² =0.58	<i>n</i> = 29 <i>r</i> ² =0.72	<i>n</i> = 29 <i>r</i> ² =0.75	<i>n</i> = 29 <i>r</i> ² =0.16 Wald <i>chi</i> ² =22.66	<i>n</i> = 29 <i>r</i> ² =0.72 Wald <i>chi</i> ² =70.14	<i>n</i> = 29 <i>r</i> ² =0.75 Wald <i>chi</i> ² =86.74	<i>n</i> = 29 <i>r</i> ² =0.16 Wald <i>chi</i> ² =14.00	<i>n</i> = 29 <i>r</i> ² =0.71 Wald <i>chi</i> ² =204.5	<i>n</i> = 29 <i>r</i> ² =0.75 Wald <i>chi</i> ² =205.5

⁴ The Stata output of all these estimations are available on request.

If we look at Table 2, we can see that, when simple OLS estimation is carried out on Equation [1], remittances seem to negatively affect growth but the estimated coefficient is statistically insignificant. This prompt us to assume that the “growth – remittance” relationship might be non-linear. Adding a squared term of remittances we estimate Equation [2]. This time the estimated coefficient on the remittances variable is negative and significant, and the estimated coefficient on the squared remittances term is positive and highly significant. In this specification the R^2 increases from the previous one implying a better fit. Lastly we assume that remittances could be affecting growth through its interacting effect on financial development. This is why we include a interaction term between remittances and M2 to GDP ratio, and provide our estimation result of Equation [3]. We see that this remittance and growth relationship has a positive sign though insignificant. The coefficient on the squared remittances term is positive and highly significant. The R^2 also increases slightly.

In a similar way, we estimate equations [1] to [3] using an alternative estimator IV-2SLS. Her we take account for the fact that remittances could be endogenous, hence we use an instruments for this variable. Since the major portions of remittances that are sent by the Bangladeshi migrants usually come from Middle Eastern Asian Countries, we chose the GDP per capita of Saudi Arabia as an instrument for remittances. The result is almost similar to the OLS estimates. Without the squared remittances and interactive term, remittances’ impact on growth is negative but not significant. When squared remittances variable is added both coefficients of remittances and squared remittances are significant while the former has a negative sign and the latter has a positive. After the interaction term is added onto the regression, remittances seem to positively affect growth though the estimate is statistically not significant.

Finally we provide estimations of equation [1] to [3] using GMM-IV estimator. The instrument used for remittances is same as before – per capita GDP of Saudi Arabia. The estimated coefficients are identical to those of IV-2SLS however there seem to have been improvements in terms of reductions in standard errors of the estimates. The t-ratios improved for some estimates. Hence some estimates which were insignificant previously

are now significant. Remittances negatively affect growth when neither squared remittances term nor the interaction terms are added. When the squared remittances term is added, remittance still negatively and significantly affects growth but the estimated coefficient on the squared remittances term is positive and significant as usual. When the interaction term is added, remittances positively affect growth but the estimated coefficient is not significant.

The main findings are

- a) There is strong evidence that there is a non-linear relationship between flows of inward remittances and economic growth in Bangladesh. The estimated coefficient on the squared remittances variable is positive and significant in all six specifications where it is included. This implies that inflows of remittances during 1974 – 2006 in Bangladesh reduce per capita GDP growth rates in the initial phase but enhance growth rates at a later phase. This could be due to the fact that in the early periods remittances were put to unproductive use (Mahmud and Osmani 1980) whereas in the later periods remittances were utilised for more productive purpose (Siddidui 2004). In the early periods of 1974 – 2006, remittances recipients in Bangladesh could not have utilised the flows properly as there were less opportunities to put them into productive use. This could be due to the relative shortages of financial instruments or investment opportunities in the initial phase of development. In the later phase the proliferations of NGOs, Micro-Finance Institutions (MFI) and other private Banks may have caused the increased efficiency of remittances utilisation through offering increased varieties of income generating financial products and services. For instance in 1997 BRAC – the largest NGO in Bangladesh – initiated the Micro Enterprise Lending and Assistance (MELA) programme which provides loans to individuals for both working capital and capital investment. Migrant workers or their families who live within the fifteen miles radius of the project could apply for MELA's assistance if they have viable investment projects. Grameen Bank also has several products that remittances receiver or sender may choose. Such as in one scheme the amount saved doubles in seven years. In another scheme for every deposit of 100,000 taka, a 5000 taka dividend is provided. In Grameen Mutual Fund investment

plan, a person depositing 1000 taka per month will get more than double that amount invested after ten years. The proliferations such financial products by MFIs in the later part of the period 1974 – 2006, may have led to the shift in Bangladeshi households' preferences from consuming out of remittances incomes to investing in health, education and financing micro enterprises. The consumption to investment shift could also stem from overall macroeconomic situation. In the early part of the 1974 - 2006 periods, especially from early 70s to late 80s, the economy was plagued with distortions with a relatively closed economy coupled with high tariffs and a repressed financial sector. Through the initiation structural adjustment programmes and reforms in the real and financial sectors of the economy in the early 1990s these constraints have gradually relaxed. The consequences of such changes in the economic policies mean that the overall macroeconomic situation was conducive to investment and private sector growth in the latter part of the time frame whereas in the earlier part it was not so. Hence it can be argued that the lack of activities of MFIs and NGOs accompanied by an unfavourable investment climate during the earlier phase led the households to put their remittances into unproductive use or into conspicuous consumption. But at the later stage this trend was reversed because of increased MFI and NGO activities along with a favourable macroeconomic environment conducive to investment motivated households towards productive use of their remittances receipts.

There could also be a productivity based explanation for the non-linear effect. Inflow of remittances might have led to the real effective exchange rate appreciation i.e. the Dutch disease effect by squeezing the tradable goods sector and reducing technological capacity in the overall economy and thus reducing growth in the early phase. In the later phase the situation should have been exacerbated due to diminishing returns combined with Dutch disease effect. However, due to favourable investment climate, relative openness of the economy and proliferations of MFIs and NGOs in channelling remittances into productive investments, the Dutch disease and diminishing return effects were perhaps outweighed thru overall productivity gains in the economy at the later phase which contributed to growth. Thus remittances may have a non-linear effect on per capita GDP growth in Bangladesh with growth falling first and then rising later on.

b) Out of the nine estimates, remittances' effects on growth had been negative six times. Of these six estimates, four had been statistically significant. A firm conclusion that remittances negatively affect growth cannot be reached from here because three of these four times, the negative effect remittances had been neutralised by positive effect of the squared remittances variable added in the regression. That is in these four significant estimates, three times the squared remittances variable was included in the speciation whose estimated coefficient was positive and significant. So considering equation [2], the total effect of remittances on growth when both remittances and squared remittances

variables are included, is $\frac{\partial y}{\partial \text{Re } m} = \beta_{1t} + 2\beta_{2t} \text{Re } m$. A negative and significant estimate

of β_1 can be neutralised or even outweighed by a significant positive estimate of β_2 .

Another reason why a firm conclusion cannot be reached if remittances negatively effect growth, is when we include the interaction term, the sign of estimated coefficient on the remittances variable become positive.

c) Most likely the positive effect of remittances on the growth rate of the economy is channelled through its interaction with the financial sector. Because only when the remittances and financial development interaction term is added the estimated sign on coefficient on remittances variable is positive in all three alternative specifications.

However these estimates are not significant.

Conclusion and Further Research

This paper consists of a part of my Ph.D. thesis which is macroeconomic impact of remittances on the Bangladesh economy. The “growth – remittances” relationship is a part of the macroeconomic impact of remittances. However the results of this paper have some severe limitations. Firstly, this study is severely constrained by limitation of data. Only 29 observations based on annual data were available to perform the econometric study. In order for the econometric exercise to be meaningful at least more than 30 observations are required. In later part on my Ph.D. thesis I may have to include other similar economies of South Asia and perform a panel study using country specific

dummies to make analysis more informative and meaningful. Secondly, due to unavailability of human capital formation data (gross enrolment ratio) for the time period 1974 – 2006, this important conditioning variable was not included in our regression. Thus we have not adequately controlled for the other factors which are important in the growth regressions. These also include macroeconomic volatility, exchange rate misalignment, and institutional quality. In later part on my thesis I will estimate the macroeconomic volatility and exchange rate misalignment in Bangladesh. There is evidence in the literature that remittances reduce macroeconomic volatility and induce real exchange rate appreciation. Once these channels are included in the growth analysis along with the financial development measure, the true nature and effects of remittances on growth can be unveiled. Based on whatever information, data and model we have now, we can conclude that the effect of remittances on per capita GDP growth of Bangladesh is at best inconclusive. Nonetheless there is strong evidence that this “growth – remittances” effect is non-linear. At early stages of the economy, remittances reduce growth rates but increase growth rates at a later stage. This could be due to unproductive use of remittances in the beginning followed by productive utilization later on. Any negative impact that remittances may have on growth might be potentially mitigated by this non-linearity. On the other hand, it may be possible that remittances positively affect per capita GDP growth in Bangladesh when the complementarity between remittances and financial development is incorporated into the analysis. But firm conclusions can only be made when other important control variables are added onto the analysis and also when the current data set can be expanded either with quarterly frequency or by including panel of other similar South Asian economies.

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