

Article

# Nonlinear Effects of Remittances on Per Capita GDP Growth in Bangladesh

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**Abstract:** This paper examines the impact of inward remittances flows on per capita gross domestic product (GDP) growth in Bangladesh during 1976–2012. We find that the growth effect of remittances is negative at first but becomes positive at a later stage, evidence of a non-linear relationship. Unproductive use of remittances was rampant in the beginning when they were received by migrant families, but better social and economic investments led to more productive utilization of remittances receipts at later periods. This suggests a U-shaped relationship between remittances and per capita GDP growth. Unlike what is suggested in the literature, that the effect of remittances is more pronounced in a less financially developed economy, our evidence does not show that the effect of remittances on per capita GDP growth in Bangladesh is conditional on the level of financial development.

**Keywords:** remittances; economic growth; Bangladesh; remittances utilization

**JEL Classification:** F0; F4; O1

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## 1. Introduction

The importance of workers' remittances to the economies of developing countries cannot be ignored. With globalization, many developing economies in the world are transmuting towards more open markets with freer flows of goods and factors, including labor 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 needed in developing economies. It is a more stable and less volatile source of external finance when compared to the other forms of flows that include official development assistance (ODA) and foreign direct investment (Ratha 2007). Given the surge in the flows of remittances worldwide (IMF 2005; World Bank 2005; Ratha 2007), especially in the developing countries where remittances are twice the size of 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 labor migration. Like there are externalities (positive and/or

negative) associated with labor 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 by the remittances researchers.

**Table 1.** Possible Positive and Negative Impacts of Remittances.

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

Source: Adapted from [Adams and Page \(2005\)](#).

The development impact of remittances is a broad and complex topic. Since about 2000, there has been a surge in researches on remittances that includes 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 that can be regarded as a sub-section of “development impact of remittances” literature.<sup>1</sup> Further, we focus on a single country, Bangladesh, as a test case. A recent study by [Hassan et al. \(2016\)](#) showed that the remittances-growth relationship in Bangladesh need not be linear. To be specific, they proposed that a U-shaped relationship exists between remittances and long-run total factor productivity (TFP) growth at the macroeconomic level for Bangladesh. The growth effect of remittances is postulated to be negative initially but become positive later on. In this research we argue that such a non-linear relationship may also be present between remittances and gross domestic product (GDP) growth, as in the case of TFP. Consequently, the central motivation of this paper is to empirically verify whether a non-linear U-shaped remittances-GDP growth nexus exists in Bangladesh. In addition, our paper differs from that of [Hassan et al. \(2016\)](#) in respect to the methodological approaches undertaken. Whereas [Hassan et al. \(2016\)](#) uses a production function-based approach to estimate TFP and then gauge the effect of remittances, we estimate growth regressions having real GDP growth rate as our dependent variable in this paper. Another distinction in our approach here is that, while the short-run dynamic analysis was of secondary importance in the [Hassan et al. \(2016\)](#) paper (because TFP measures long-run growth according to [Solow \(1956\)](#) model), in this paper we bring the importance of the short-run analysis in the forefront as our dependent variable measures the year to year fluctuations in economic growth.

This paper is organized as follows. Section 2 discusses the dynamics of remittances flows along with their utilization and other important statistics on Bangladesh. Section 3 will provide a brief literature review of researches on remittances in Bangladesh. Section 4 will present econometric results

<sup>1</sup> 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.

on the impact of remittances on economic growth in Bangladesh during 1976–2012. Section 5 concludes by outlining the main findings of the study.

## 2. Remittances Flows in Bangladesh

We choose Bangladesh as our case study. A brief history of the nation's politics and culture is useful as a prelude to our main topic. With its Muslim majority population, Bangladesh was once a part of the undivided Indian sub-continent. This eastern region of Bengal province was later divided as the eastern wing of Pakistan after the 1947 partition, but eventually became an independent nation in 1971, sharing borders with India and Myanmar. Prior to the partition of the Indian sub-continent, economic stagnation had caused large-scale emigration of Bangladeshis to Assam (the eastern province of India), and to Myanmar (IOM 2005). In 1976 the Bangladesh government embarked on an active policy of exporting cheap and abundant Bangladeshi labor to Middle Eastern countries to fuel their demand for construction workers. This trend later continued to other parts in East and Southeast Asia. Bangladesh is now among the top 10 remittance-receiving (measured in current US dollars) and manpower-exporting countries in the world (World Bank 2011). Given its long history of emigration and the various developmental problems and prospects, we believe that Bangladesh is an ideal country to test the development impact of remittances.

Remittances constitute the most important external financial flow for Bangladesh, far exceeding foreign aid and foreign direct investments (FDI). Figure 1 plot these three external flows—remittances, foreign aid and FDI—during the period 1976–2010. Beginning with a modest amount of US \$49 million in 1976, remittance flows reached US \$10.8 billion in 2010, an approximately two hundred-fold increase during this period.

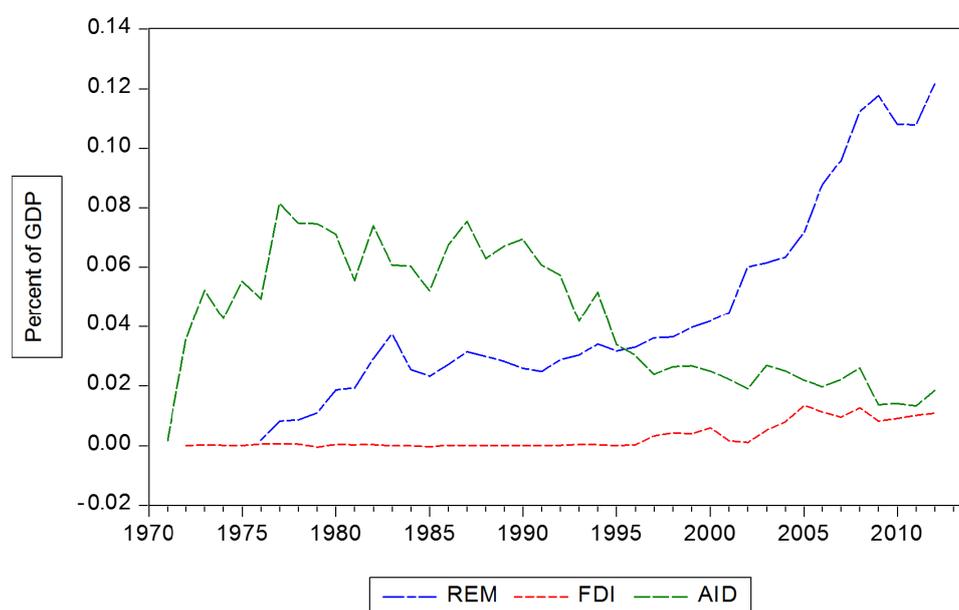


Figure 1. Remittances (REM), foreign aid (AID), and FDI flows in Bangladesh.

Figure 2 presents the growth in remittances from 1976–2010. Looking at the moving average series it can be seen that growth in remittances fell and stabilized during the 1990s. The slight acceleration of remittances between 1990 and 2003 has been followed by a deceleration since then.

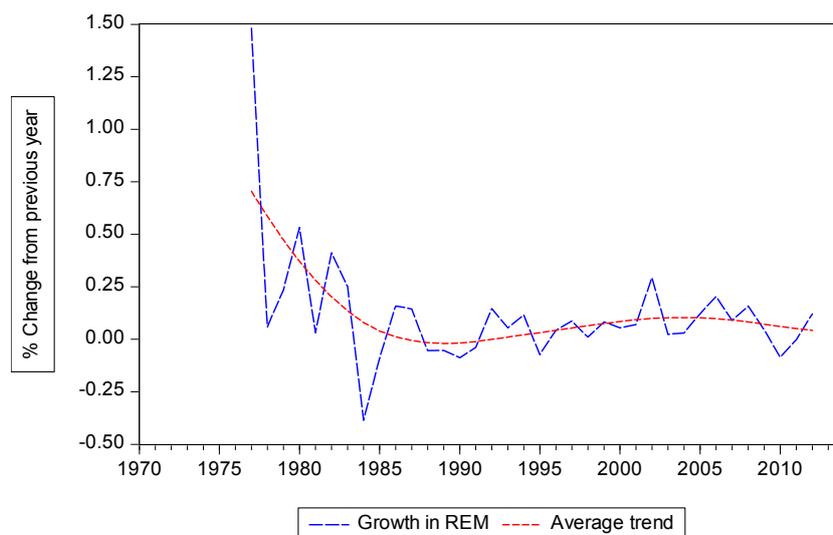


Figure 2. Growth of remittances in Bangladesh.

In order to conceptualize how overseas income from migrant members contribute to welfare within the family, we look at data on how remittances are utilized. Data on the utilization of remittances by recipient households in Bangladesh have been compiled from various studies and summarized by IOM (2005). Remittances utilizations in Bangladesh, according to the IOM study, have been concentrated in five major categories: (i) food and clothing; (ii) home construction and repair; (iii) purchase of land; (iv) repayment of loans; and (v) savings.

Figure 3 shows the minimum and maximum values of these most-mentioned uses of remittance income. The important factor to notice from the data represented in Figure 3 is that for migrant families in Bangladesh, after basic consumption needs have been met, the residual remittance income is mostly used to repay loans and then to accumulate savings. Because saving is small at the outset when more is spent on consumption, it is safe to argue that remittance utilization in Bangladesh has been less than ideal from a growth perspective. This aspect of remittance utilization is elaborated in Section 4.

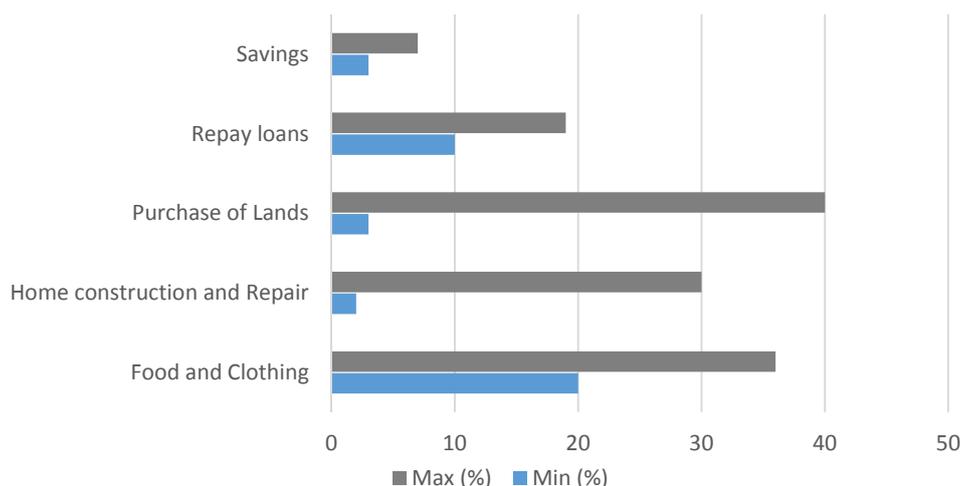


Figure 3. Utilization of remittances in Bangladesh. Source: Compiled from various surveys (IOM 2005).

### 3. Literature Review

The earliest paper on remittances in Bangladesh is a micro-level study by Mahmud and Osmani (1980), who quantitatively modelled expenditure and saving behavior 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 households. They also showed that the savings ratio monotonically increases with income; for the highest remittance receiving income group saving ratio was found to be almost three-fourths of income. One of the central findings of their study is that a large proportion of remittances go into unproductive uses. An early quantitative study at the macroeconomic level of remittances in Bangladesh in comparison to other Asian countries by [Qubria \(1986\)](#) showed that the steady flows of remittances have eased the foreign exchange constraints, improved the balance of payments and augmented national savings.

One of the first studies to estimate the welfare effects of remittances in Bangladesh was conducted by [Stahl and Habib \(1989\)](#). The authors used the computable general equilibrium (CGE) modelling framework to show 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 because remittances tended to be spent within those sectors which had 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 relating to labor exporting Asian economies like Bangladesh, [Qubria \(1997\)](#) simultaneously combined migration and remittances. Their model showed that if migration is accompanied by sufficiently decent per capita remittances that exceeded the source-country wage rate, then it will enhance the growth rate of the labor-exporting country. In this manner remittance works as a pro-growth external flow.

[Murshid et al. \(2002\)](#) investigated the prospects and challenges of officially channeling remittances through the national and multinational banks. They provided a Keynesian-type analysis of the macroeconomic effects of remittances and estimated a simple remittances multiplier equaling 3.33 indicating that a 1 million taka (Bangladeshi local currency) increase in remittances would increase national income by 3.33 million taka. [Siddiqui and Abrar \(2003\)](#) used survey data to qualitatively investigate the nature and dynamics of people linked through remittances and the linkage between workers' remittances and micro-finance institutions in channeling remittances in Bangladesh. By surveying one hundred households, they provided detailed characteristics of the remittance receiving households, their socioeconomic profiles and the different ways remittances are used by them. For example, the study found that more than half the remitters, three quarters of whom are less than thirty five years of age, were married but sent money to their parents who are typically more than fifty years of age, half of whom are illiterate. The study also 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. There was some discussion as to how to extend the micro finance institutions (MFI) network to channel in official remittances and direct them to productive usage. In a similar paper, [Azad \(2004\)](#) outlined the various diaspora-based investment instruments to attract migrants' remittances through official channels. The complementary role that various MFIs can play to expand financial access in rural and remote areas and funding of micro-enterprise activities were highlighted in the research. [Siddiqui \(2004\)](#) scripted the various layers of agents and categories of institutions that are involved in the remittances transfer process. These include government ministries, training institutes, civil society, commercial banks, Bangladesh Bank (the central bank of Bangladesh), MFIs, investment instruments, specialized bank accounts, legal framework governing remittances flows and money laundering vehicles. Formulating policies to improved coordination among these institutions could make remittances transfer more efficient. The study showed that the general perception of remittances going to unproductive use has no empirical validity anymore. While remittances might have been under-utilized by the migrant families in the late 1970s or early 1980s, evidence suggested that in 1990s the migrants families effectively utilized 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.

Barua et al. (2007) studied on major macro determinants of remittances receipts in Bangladesh. Khan (2008) used Household Income and Expenditure Survey 2005 data to infer about the status of poverty in Bangladesh and estimated that remittances receipts lead to an approximately eighteen percent decline in poverty. Buchenau (2008) qualitatively outlined on how the various aspects of migration and remittances in Bangladesh are related. They provided a framework for analyzing the link between migration, remittances and poverty at both the household and macro level.

In general, the international literature investigating the topic on whether remittances contribute to growth and development is divided. The more optimistic group advocate that there exists a direct or indirect positive developmental impact role of remittances. This positivity stems from inflow of remittances that can lead to accelerated investments in physical and human capital, remove households' credit constraints, protect the economy from different types of shocks and thus contribute towards long-run growth (Adams 2005; Yang 2008; Gupta et al. 2009; Giuliano and Ruiz-Arranz 2009; Chami et al. 2008, 2009; Catrinescu et al. 2009; Faini 2006; IMF 2005; Rao and Hassan 2011, 2012a, 2012b; World Bank 2005, 2006, 2008; Siddique et al. 2012). Additionally, remittances can reduce household poverty and aid the accumulation of human capital (see Adams and Page 2005; Hanson and Woodruff 2003; Cox-Edwards and Ureta 2003; Frank and Hummer 2002; Hildebrant and McKenzie 2005). On the other hand, the less optimistic group suggests that remittances can act like a curse and lower the long-run growth of the recipient economies. For instance, Stahl and Arnold (1986) showed that savings from remittances are primarily used for consumption; Chami et al. (2003) showed that remittances receipts can reduce labor force participation in addition to harming the tradable goods sector by appreciating the real exchange rate (Amuedo-Dorantes and Pozo 2004; Chami et al. 2008; Hassan and Holmes 2013).

Recently, Hassan et al. (2016) provided an alternative view on the remittances-growth literature by recognizing that the developmental impact of remittances need not be linear. Specifically, they hypothesized and empirically demonstrated that a U-shaped relationship exists between remittances and long-run total factor productivity (TFP) growth, where the growth effects of remittances are initially negative but become positive later on. The methodology they used based on a production function approach is different from ours in that we estimated a growth regression. Our contribution in this paper is to show whether such a non-linear U-shaped relationship also exists between remittances and real GDP growth in Bangladesh. In addition we employ an instrumental variable framework to control for the reverse causality between remittances and the GDP growth. Hassan et al. (2016) failed to address the issue of the endogeneity of remittances which is controlled for in our study.

#### 4. Remittances and Economic Growth in Bangladesh: Econometric Analysis

In this section we provide a simple econometric analysis of the growth-remittances nexus in Bangladesh. The model estimated 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, respectively.

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

$$y_t = \beta_0 + \beta_1 Rem_t + \beta_z Z_t + u_t \quad (1)$$

where  $y$  is the per capita GDP growth,  $Rem$ , our variable of interest is the log of workers' remittances<sup>2</sup>-to-GDP ratio and  $Z$  is a vector of control variables. The control variables are those that are frequently included in the "growth- remittances" regressions in the literature. Here they

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<sup>2</sup> Actually  $Rem$  include "workers' remittances and compensation employees" from the IMF balance of payments statistics.

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*) and 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.

To verify whether the “remittances-growth” nexus is non-linear, our second alternative specification includes the squared term the variable *Rem*:

$$y_t = \beta_0 + \beta_1 Rem_t + \beta_2 Rem_t^2 + \beta_z Z_t + u_t \quad (2)$$

To capture whether the non-linearity effect could also stem from the effect of remittances being conditional on some other control variables included in *Z*, such as financial development, our final specification include an interacting term between remittances and broad money, as follows:

$$y_t = \beta_0 + \beta_1 Rem_t + \beta_2 Rem_t^2 + \beta_3 (Rem \times FD)_t + \beta_z Z_t + u_t \quad (3)$$

where the interaction variable (*Rem × FD*) is the log of remittances to GDP times the log of M2-to-GDP ratio (*lm2rem*).

The econometric results of specifications Equation (1) through Equation (3) are reported in Table 2. We first report an OLS estimation followed by IV-2SLS and IV-GMM estimators. The data for this estimation were taken from World Bank World Development Indicators for the period 1976–2012. Our main objective is to see if remittances affect growth of GDP per capita in Bangladesh non-linearly, keeping the specification simple and intuitive.

From Column 1, the simple OLS results show that, adding a squared term of remittances make the estimated coefficients on the variables remittances (*lrem*) and the squared remittances (*lrem2*) significant, with a negative and positive sign, respectively. The  $R^2$  increases considerably from its previous specification, implying a better fit. Adding an interaction term between remittances and financial development do not cause any significant improvement in the estimation.

Remittances could actually be responding to better home conditions, creating the problem of reverse causality. In addition, there could be measurement problems as a big chunk of remittances could remain unrecorded. These two problems could give rise to the issue of endogeneity bias in the OLS estimation. To minimize such bias we estimate Equations (1)–(3) by instrumental variable (IV-2SLS) estimator. The major portion of remittances being sent by the Bangladeshi migrants usually comes from Middle Eastern countries, out of which the highest proportion is remitted from the Kingdom of Saudi Arabia. Therefore we chose the per capita GDP of Saudi Arabia as an instrument for remittances. Because we have used one instrument for one endogenous variable (*lrem*), our equations are exactly identified. Moreover, it also served as a relevant instrument for all equations, because the F-test on the excluded instrument exceeded the rule of thumb value of 10. Column 2 shows the IV results. Without the squared remittances and interactive term, remittances’ impact on growth is negative but not significant. When the squared remittances variable is added both coefficients of remittances and squared remittances are significant while the former takes on a negative sign and the latter 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 robust estimations of the instrumental variable regressions in Column 3 by using the IV-GMM estimator and applying the same instrument. If the errors in the specifications in Column 2 satisfy all classical assumptions and are i.i.d., then the IV-GMM estimator is merely the standard IV-2SLS estimator. However, that is unlikely in the case of our data. Therefore, the IV-GMM is our preferred approach as this allows us to generate and report standard errors robust to arbitrary heteroskedasticity and autocorrelation. The IV-GMM results with robust standard errors show that there is a non-linear relationship between remittances and per capita GDP growth in Bangladesh that follows a U-shaped pattern. The result is comparable and complementary to the recent findings in Hassan et al. (2016).

**Table 2.** Remittances and Economic Growth in Bangladesh. *Dependent Variable: Per capita gross domestic product (GDP) growth.*

Explanatory Variables (All in logs)	OLS (1)			IV-2SLS (2)			IV-GMM (3)		
	Equation (1)	Equation (2)	Equation (3)	Equation (1)	Equation (2)	Equation (3)	Equation (1)	Equation (2)	Equation (3)
Remittances to GDP ( <i>lrem</i> )	−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 (−2.23) **	3.655 (0.46)
Remittances to GDP squared ( <i>lrem2</i> )		2.515 (3.16) **	7.759 (2.27) *		2.316 (3.05) **	6.764 (1.82) *		2.316 (4.22) **	6.764 (2.05) *
Gross capital formation to GDP ( <i>lgcf</i> )	−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 ( <i>lpop</i> )	−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 ( <i>lgov</i> )	−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 (−0.07) **	−1.947 (−0.51)
M2 to GDP ( <i>lm2</i> )	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 ( <i>linf</i> )	−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 * M2) to GDP ( <i>lm2rem</i> )			−8.166 (−1.58)			−6.535 (−1.12)			−6.535 (−1.29)
	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.58	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.72	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.75	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.16 Wald chi <sup>2</sup> = 22	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.72 Wald chi <sup>2</sup> = 71	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.75 Wald chi <sup>2</sup> = 87	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.16 Wald chi <sup>2</sup> = 14	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.71 Wald chi <sup>2</sup> = 204	<i>n</i> = 34; <i>r</i> <sup>2</sup> = 0.75 Wald chi <sup>2</sup> = 205

Notes: Numbers in parenthesis are *t*-statistics. \* and \*\* indicate significance of the *t*-statistics at 10% and 5%, respectively. Estimation of Equations (1)–(3) are carried out using ordinary least square (OLS) in Column 1; using the 2SLS estimator and adopting Saudi Arab's GDP as instrument for remittances (*lrem*) in Column 2. Robust standard errors are reported in Column 3 with the aid of the IV-GMM estimator and adopting Saudi GDP as instrument. For estimations in Columns 1 & 2, the equation is exactly identified with a *F*-stat on excluded instruments exceeding 10.

## 5. Conclusions

There are many useful findings that follow from this research. We establish that there exists 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 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 utilized for more productive purposes (Siddiqui 2004). In the early periods (before the 1980s) remittance recipients in Bangladesh could not have utilized these funds properly as there were fewer opportunities to put them to productive use. There was a relative shortage of financial instruments or investment opportunities in the initial phase of Bangladesh's development. After 1990, the nation witnessed a proliferation of NGOs, micro-finance institutions (MFI) and other private banks offering increased varieties of income generating financial products and services. This led to increased efficiency of remittances utilization. For instance, in 1997, BRAC, a Bangladesh-based NGO that is also the largest NGO in the world, initiated the Micro Enterprise Lending and Assistance (MELA) program which provided 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. Around same time, Grameen Bank started offering Grameen Mutual Fund investment plan, where a person depositing 1000 taka per month could double that amount after ten years. The proliferation of such financial products by MFIs in the later part of the data period 1976–2012 may have caused migrant households' preferences from consuming out of remittances income to investing in health, education and financing of micro enterprises.

This shift from consumption to investment could also have stemmed from the overall macroeconomic situation. In the early 1970s to late 1980s, the Bangladesh economy was plagued with protectionist policies with high tariffs and a repressed financial sector. The initiation of structural adjustment programs and reforms in the real and financial sectors of the economy in the early 1990s meant these constraints had been gradually relaxed. Hence it is possible that the lack of activities of MFIs and NGOs, accompanied by an unfavorable 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 a favorable macroeconomic environment conducive to productive use of the 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, that is, the Dutch disease effect, by squeezing the tradable goods sector and reducing technological capacity in the overall economy. This reduced growth in the early phase. In the later phase the situation could have exacerbated due to diminishing returns combined with the Dutch disease effect. However, due to favorable investment climate, relative openness of the economy and proliferations of MFIs and NGOs in channeling remittances into productive investments, the Dutch disease and diminishing return effects were perhaps outweighed through 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.

Finally, overall deepening of the financial sector does not matter for the effect of remittances to become more significant. The literature suggests that the effect of remittance on growth become positive when remittances are interacted with financial development. That is, the growth effect of remittances is more pronounced for a financially less developed country. While Bangladesh falls under such category, we find no evidence that effect of remittances is conditional on financial development (broad money-to-GDP ratio).

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**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

- Adams, Richard, Jr., and John Page. 2005. Do International Migration and Remittances Reduce Poverty in Developing Countries? *World Development* 33: 1645–69. [[CrossRef](#)]
- Adams, Richard, Jr. 2005. *Remittances, household expenditure and investment in Guatemala*. Policy Research Working Paper Series 3532; Washington, DC: The World Bank.
- Amuedo-Dorantes, Catalina, and Susan Pozo. 2004. Workers' Remittances and the Real Exchange Rate: A Paradox of Gifts. *World Development* 32: 1407–17. [[CrossRef](#)]
- Azad, Abul Kalam. 2004. Migrant Workers' Remittances: Can it be a Source of Finance for Micro-Enterprise Development in Bangladesh? Paper presented at Asia Pacific Regional Micro Credit Summit Meeting of Councils, Dhaka, Bangladesh, February 16–19.
- Barua, Shubhasish, M. Majumder, and M. Akhtaruzzaman. 2007. *Determinants of Workers' Remittances in Bangladesh: An Empirical Study*. Working Paper No. WP 0713; Dhaka: Policy Analysis Unit, Bangladesh Bank.
- Buchenau, Juan. 2008. *Migration, Remittances, and Poverty Alleviation in Bangladesh: Report and Proposal*. Dhaka: Preparatory Assistance for Pro Poor Trade, UNDP.
- Catrinescu, Natalia, Miguel Leon-Ledesma, Matloob Piracha, and Bryce Quillin. 2009. Remittances, Institutions, and Economic Growth. *World Development* 37: 81–92. [[CrossRef](#)]
- Catrinescu, Natalia, Miguel Leon-Ledesma, Matloob Piracha, and Bryce Quillin. 2006. *Remittances, Institution and Growth*. IZA Discussion Paper No. 2139; Bonn: IZA.
- Chami, Ralph, Adolfo Barajas, Thomas Cosimano, Connel Fullenkamp, Micheal Gapen, and Peter Montiel. 2008. *Macroeconomic Consequences of Remittances*. Occasional Paper No. 259; Washington, DC: International Monetary Fund.
- Chami, Ralph, Connel Fullenkamp, and Samir Jahjah. 2003. *Are Immigrant Remittance Flows a Source of Capital for Development?* IMF Working Paper 03/189; Washington, DC: International Monetary Fund.
- Chami, Ralph, Dalia Hakura, and Peter Montiel. 2009. *Remittances: An Automatic Output Stabilizer?* IMF Working Papers 09/91; Washington, DC: International Monetary Fund.
- De Bruyn, Tom, and Umbareen Kuddus. 2005. *Dynamics of Remittance Utilization in Bangladesh*. Geneva: International Organization for Migration (IOM).
- Cox-Edwards, Alrjandra, and Manuelita Ureta. 2003. International Migration, Remittances and Schooling: Evidence from El Salvador. *Journal of Development Economics* 72: 429–61. [[CrossRef](#)]
- De Bruyn, Tom, and Johan Wets. 2006. Remittances and Development. In *Conference Report on Migration and Development*. Geneva: International Organization for Migration (IOM).
- Faini, Riccardo. 2006. Migration and Remittances: The impact on the Country of Origin. Paper presented at EUDN-AFD Conference on Migration and Development, Paris, France, 8 November.
- Frank, Reanne, and Robert Hummer. 2002. The Other Side of the Paradox: The Risk of Low Birth Weight among Infants of Migrant and Nonmigrant Households within Mexico. *International Migration Review* 36: 746–65. [[CrossRef](#)]
- Giuliano, Paola, and Marta Ruiz-Arranz. 2009. Remittances, Financial Development, and Growth. *Journal of Development Economics* 90: 144–52. [[CrossRef](#)]
- Gupta, Sanjeev, Catherine Pattillo, and Smita Wagh. 2009. Effect of Remittances on Poverty and Financial Development in Sub-Saharan Africa. *World Development* 37: 104–15. [[CrossRef](#)]
- Hanson, Gordon, and Christopher Woodruff. 2003. *Emigration and Education Attainment in Mexico*. Mimeo. Riverside: University of California.
- Hassan, Gazi, Mamta Chowdhury, and Mohammed Bhuyan. 2016. Growth Effects of Remittances in Bangladesh: Is there a U-shaped Relationship? *International Migration* 54: 105–21. [[CrossRef](#)]
- Hassan, Gazi, and Mark Holmes. 2013. Remittances and the Real Effective Exchange Rate. *Applied Economics* 45: 4959–70. [[CrossRef](#)]
- Hildebrant, Nicole, and David McKenzie. 2005. *The Effect of Migration on Child Health in Mexico*. World Bank Policy Research Working Paper 3573; Washington, DC: The World Bank.
- IMF. 2005. Two Current Issues Facing Developing Countries. In *World Economic Outlook*. Washington, DC: International Monetary Fund.

- IOM. 2005. *Dynamics of Remittance Utilization in Bangladesh*. Geneva: International Organisation for Migration.
- Kapur, Devesh. 2004. *Remittances: The New Development Mantra?* Available online: [http://unctad.org/en/Docs/gdsmdpbpg2420045\\_en.pdf](http://unctad.org/en/Docs/gdsmdpbpg2420045_en.pdf) (accessed on 15 July 2017).
- Khan, M.W.R. 2008. *The Micro Level Impact of Foreign Remittances on Incomes in Bangladesh: A Measurement Approach Using the Propensity Score*. Dhaka: Centre for Policy Dialogue.
- Mahmud, Wahiduddin, and Siddiq R. Osmani. 1980. Impact of Emigrant Workers' Remittances on the Bangladesh Economy. *Bangladesh Development Studies* VIII: 1–28.
- Murshid, K., Kazi Iqbal, and Meherun Ahmed. 2002. *A Study on Remittance Inflows and Utilization*. Geneva: International Organization for Migration (IOM).
- Qubria, Muhammad G. 1986. Migrant Workers and Remittances: Issues for Asian Developing Countries. *Asian Development Review* 4: 78–99.
- Qubria, Muhammad G. 1997. International Migration, Remittances and Income Distribution in the Source Country: A Synthesis. *Bulletin of Economic Research* 49: 29–46. [[CrossRef](#)]
- Rao, Bhaskara, and Gazi Hassan. 2011. Determinants of the long-run growth rate of Bangladesh. *Applied Economics Letters* 18: 655–58. [[CrossRef](#)]
- Rao, Bhaskara, and Gazi Hassan. 2012a. Are Direct and Indirect Growth Effects of Remittances Significant? *The World Economy* 35: 351–72. [[CrossRef](#)]
- Rao, Bhaskara, and Gazi Hassan. 2012b. An Analysis of the Determinants of the Long-Run Growth Rate of Bangladesh. *Applied Economics* 44: 565–80. [[CrossRef](#)]
- Ratha, Dilip. 2007. Leveraging Remittances for Development. In *Policy Brief, June*. Washington, DC: Migration Policy Institute.
- Siddiqui, Tasneem, and Chowdhury R. Abrar. 2003. *Migrant Worker Remittances and Micro-Finance in Bangladesh*. Working Paper No. 38; Geneva: Social Finance Programme, International Labour Office.
- Siddiqui, Tasneem. 2004. *Efficiency of Migrant Workers' Remittances: The Bangladesh Case*. Metro Manila: Asian Development Bank.
- Siddique, Abu, E. Anthony Selvanathan, and Saroja Selvanathan. 2012. Remittances and Economic Growth: Empirical Evidence from Bangladesh, India and Sri Lanka. *The Journal of Development Studies* 48: 1045–1062. [[CrossRef](#)]
- Solow, Robert. 1956. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics* 70: 65–94.
- Stahl, Charles, and Fred Arnold. 1986. Overseas Workers' Remittances in Asian Development. *International Migration Review* 20: 899–925. [[CrossRef](#)] [[PubMed](#)]
- Stahl, Charles W., and Ahsanul Habib. 1989. The Impact of Workers' Remittances on Indigenous Industries: Evidence from Bangladesh. *The Developing Economies* 27: 269–285. [[CrossRef](#)]
- World Bank. 2011. *Migration and Remittances Factbook 2011*. Washington, DC: The World Bank.
- World Bank. 2008. *Remittance and Development*. Washington, DC: World Bank.
- World Bank. 2006. Detailed Findings (Chapter 3, Section V). In *The Development Impact of Workers' Remittances in Latin America*. Vol. 2. Report No. 37026; Washington, DC: World Bank.
- World Bank. 2005. *Global Economic Prospect 2006*. Washington, DC: World Bank.
- Yang, Dean. 2008. International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks. *The Economic Journal* 118: 591–630. [[CrossRef](#)]

