

# Macroeconomic Determinants of Remittance for Bangladesh: A Gravity Model Approach

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**Abstract:** A Gravity Model is used in this study to investigate the macroeconomic determinants of remittances for Bangladesh by using panel data of 10 host countries from 2002-2020. This paper not only uses Pooled OLS, REM and FEM models but also uses even more efficient econometric model, namely PCSE and IV regression model to explore the impact of the macroeconomic determinants of remittances for Bangladesh. This study finds that home country's income level has significant impacts on remittances but not the host country's income level. Private sector credit in the host nation affects remittances negatively but home country credit affects remittances positively. The transaction cost of remittances has adverse impact on remittances at the same time Religion affects remittances positively. Larger dependent population in home country reduces remittances similarly political stability in home country reduces remittances. Political instability in the host nation, on the other hand, is linked to an increase in remittances, indicating that migrants tend to send more money home when the host country is in upheaval. Policies aimed at lowering transaction costs, encouraging financial sector growth, and enhancing the business climate should be implemented to encourage remittances and optimize their economic benefit.

**Key Words:** Gravity Model, Bilateral Remittance, Exchange Rate, Instrumental Variable Regression, Domestic Credit

**JEL Classification:** C26, F24, C23, F14, E31

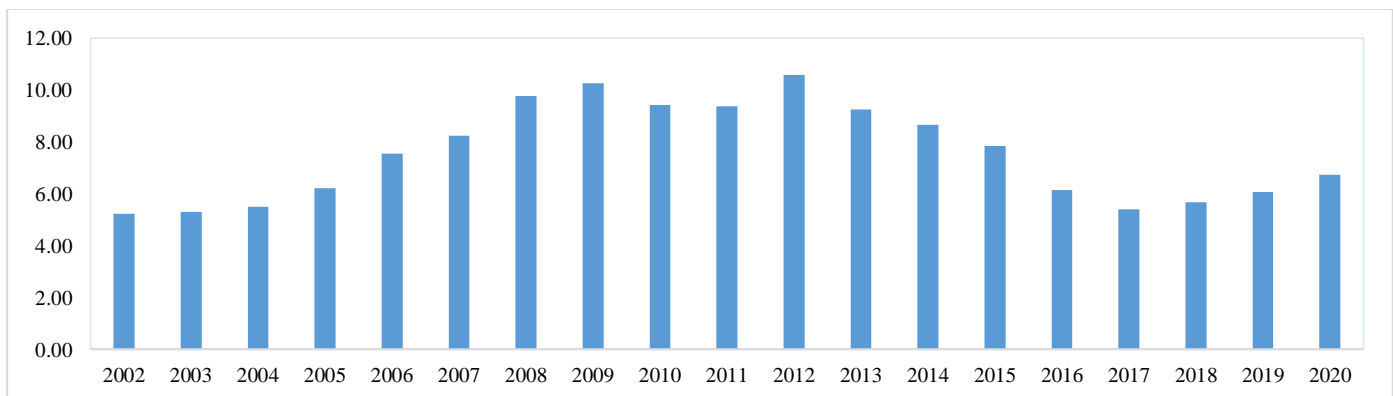
## I. INTRODUCTION

Workers' remittances, which significantly outweigh both official development aid (ODA) and portfolio investment, are the most important source of foreign finance after FDI. According to the World Bank, Bangladesh is the world's eighth largest recipient of remittances. In 2020, officially recorded remittances to Bangladesh amounted to \$18205.01 million. (Bangladesh Bank, 2020).

Developing countries' remittances inflow has climbed by a factor of 10 in the previous ten years amounting \$539.5 billion in 2020, an increase of -1.62 percent over \$548.4 billion in 2019 (World Bank, 2020). In Bangladesh, remittances have increased more than fivefold over the last one and half decades. This amount was \$2848 million in 2002 and this reached \$18205.01 million in 2018. This huge growth in remittance inflow may be attributed to the better monitoring and incentive-based policy to attract migrant remittances.

According to World Bank (Figure 1) shows that remittances peaked as a percentage of GDP in FY 2012 amounting to 10.59 percent of GDP. After 2012, remittances show a declining trend until 2017 and then started to increase as a percentage of GDP.

Figure 1: Remittance (Percent of GDP)

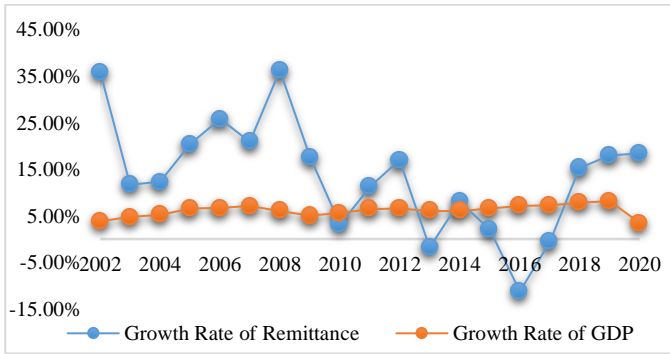


Source: World Bank, 2020

This is probably due to Bangladesh's GDP that grown highly in the last two or three years. That is why although remittance is growing over the last decade but less than the growth of GDP. Remittance plays a crucial role in the development of Bangladesh's economy and this graph shows the evidence.

Figure 2 shows the growth rate of Bangladesh's GDP has remained steady over the last decade but from 2016 to 2019 GDP grows well above 7 percent. The remittance growth rate was volatile but in the last two years, it was well above the growth rate of GDP. This graph shows that remittance plays important role in the ongoing development of Bangladesh's economy.

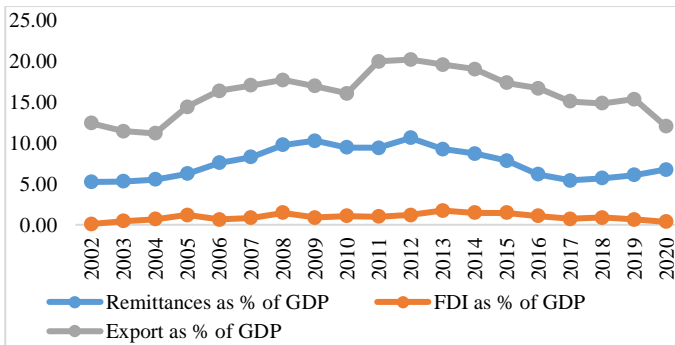
Figure 2: Growth Rate of GDP and Remittance



Source: World Bank, 2020

Bangladesh relies heavily on remittances as a source of foreign currency. In 2002, remittances, export of goods and services, and FDI as a percentage of GDP are respectively 5.22%, 12.41%, and 0.10%. But after 2004 all three indicators have shown an increasing trend and they peaked in 2012.

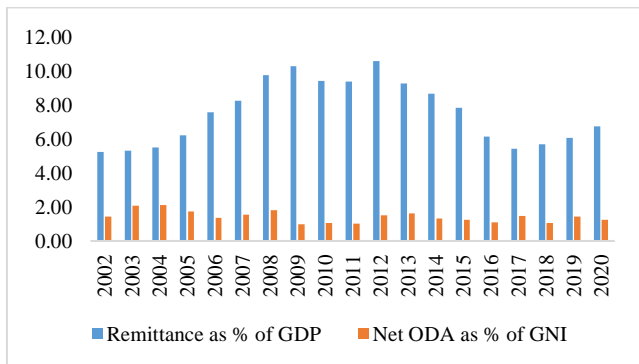
Figure 3: Remittance, FDI and Export (as % of GDP)



Source: World Bank, 2020

Another source of capital inflow to developing countries like Bangladesh is Official Development Assistance (ODA). Personal remittances started from 5.22 percent of GDP in 2002 and it peaked in 2012, afterward, it shows a declining trend but well above the ODA throughout the year 2002 to 2020. Remittances provide revenue, give higher education for children, raise social standing, provide job chances for the jobless, and, most significantly, empower women.

Figure 4: Net ODA as % of GNI and Personal Remittance as % of GDP



Source: World Bank, 2020

Bangladesh is ranked the 8th highest remittance receiving country in the world. After the exports of goods and services, Bangladesh receives the highest amount of foreign capital from workers' remittances. The purpose of this study is to determine which factors have a significant impact in affecting the flow of remittance inflows to Bangladesh.

## II. LITERATURE REVIEW

Much research has been conducted to investigate the macro and micro factors that influence remittances to both developed and poor nations. The gravity model, fixed-and random effect models, pooled ordinary least squares, autoregressive distributive lag model, panel granger causality, vector error correction model, Granger causality, Johansen and Juselius cointegration technique, ordinary least square regression, binary Logit model, Tobit model, and impulse response function was among the econometric tools they employed. Several studies have used both qualitative and quantitative data to analyze the impact of remittances.

Chitgupi, Aneesha (2018) employs the micro foundation to macro variables and finds that apart from core gravity variables, demographic and risk variables in both home and host countries have a significant impact on remittances.

Martinez-Zarzoso and Ahmed (2014) The authors of the study discovered that remittances are influenced by economic development in the home country, but not by host country output; interest rate differentials also promote remittances, showing that migrants benefit from the receiving country's economic growth.

Ahmed & Martínez-Zarzoso (2016) According to the study findings, remittance inflows rise with the number of migrants in the country. As this paper shows, the decline in transaction costs facilitates remittances, suggesting that if remittance costs increase, migrants either refrain from remitting money to their families or send it through informal channels (hundi, hawala, by hand, through friends, etc.).

According to Lueth and Ruiz-Arranz (2006), a few gravitational factors account for the majority of the volatility in bilateral remittance flows. Although research on the motives for remittances is contradictory, altruism may not play as large a role as previously thought.

El-Sakka & McNabb(1999) highlights the fact that domestic to foreign interest rate differentials played a critical role in encouraging migrants to remit saving through official channels.

Tabit & Moussir(2018) demonstrates that when unfavorable economic shocks reduce income in the nation of origin, migrants are prepared to remit more to defend their families' well-being. The GDP per capita of the host nation has a positive and considerable impact on remittances.

Lueth et al. (2007) demonstrate that important gravity factors (partner nations' GDP, distance, shared border, and same language) may account for more than 70% of the variation in remittances inflows. The reasons for remitting are diverse,

although benevolence appears to play a less role than is often assumed.

According to Rahman and Wadud (2014), the key factors of remittance inflows in South Asian nations include income in the host and home countries, the number of migrants overseas and financial deepening, domestic inflation, and domestic political rights.

Shah & Amir (2011) discovered that GDP at current prices, oil prices, foreign exchange rates, and the number of migrants are key macroeconomic drivers with a consistent long-run and short-run connection.

Barua et al. (2007) show that in all of the regression results, the income gap between the host and home countries is strongly and positively connected with the influx of remittances to Bangladesh.

The panel data estimate approach has been employed in the existing research on remittances to demonstrate the determinants of remittances. Some literature used the gravity model to examine the determinants of remittances. To demonstrate their conclusions in both situations, they employed three-panel data estimation models: Pooled OLS, Random Effect Model, and Fixed Effect Model. This study not only uses these methods of panel data estimation but also uses some more efficient methods that can estimate the panel data more accurately and efficiently.

### III. METHODOLOGY AND VARIABLES DESCRIPTION

#### 3.1 Gravity Model

Using modified versions of Isaac Newton's Law of Gravitation, social scientists have forecast the movement of people, information, and commodities between cities and even continents for decades. The gravity model, often known as the modified law of gravitation by social scientists, takes into account both population size and distance between two points. The gravity model:

$$\frac{\text{population 1} * \text{population 2}}{\text{distance}^2}$$

In international economics, the gravity model of international commerce is a model that estimates bilateral trade flows based on the economic sizes and distance between two units. Walter Israd introduced the approach to the realm of economics in 1954. In the case of trade between two countries (i and j), the basic model is

$$F_{ij} = G \frac{M_i * M_j}{D_{ij}}$$

Here G is a constant, F represents trade flows, D represents distance, and M represents the dimension of economies in the countries being measured. Other bilateral flow data including migration, remittances, and foreign direct investment have also been analyzed using the model.

#### 3.2 Methodology

A variety of methods is used in this study. As a benchmark, the model is first estimated utilizing a pooled OLS model and

found that there is heteroscedasticity in this model. So to overcome this pitfall we take heteroscedasticity corrected standard error that is the robust standard error. Pooling OLS is compatible when unseen fixed effects and independent variables are uncorrelated (Wooldridge, 2002). As a result, instead of using pooled OLS, we used a panel data technique, fixed effect, and random effect model to account for unobserved heterogeneity. Hausman's (1978) specification test is used to choose between vs random effect model. When fitting a linear model to panel data, it is usual to leverage this non-spherical error structure to increase inference and estimate efficiency through a feasible generalized least squares (FGLS) estimator developed by Parks (1967) and popularized by Kmenta (1986). Following that, we employ the panel corrected standard error (PCSE), which is resistant to the potential of non-spherical error as indicated by Katz (1995). The Pagan-Winsten correlated panel corrected standard error (CPCSE) is a version of PCSE that can improve estimating efficiency.

Last but not the least, Instrumental Variable (IV) regression model is used to estimate the gravity model. We employ Hausman and Taylor's (1981) IV technique, which allows us to account for unseen fixed effects while generating consistent estimates of an observed fixed effect. We develop the IV approach in this study suggested by Breusch, Mizon, and Schmidt (1989). IV model is preferred to FE model because of the ability to incorporate time-varying and invariant effects and to resolve the problem of endogeneity.

#### 3.3 Econometric Model Specification

Tinbergen (1962) and Poyhonen (1963) constructed the Gravity model to analyze bilateral trade. According to this model, bilateral trade flows are explained as Newton's universal law of gravitation. The Basic gravity model of trade is as follows;

$$G_{ij} = A \frac{X_i^{\alpha_1} X_j^{\alpha_2}}{D_{ij}^{\alpha_3}} \quad (1)$$

Where  $G_{ij}$  represents the volume of bilateral commerce between the trading partners,  $X_i$  and  $X_j$  denote the trading partner's economic size, and  $D_{ij}$  represents the geographical distance between the respective nations. The linear form of the equation (1) is as follows;

$$\ln(G_{ij}) = \alpha_0 + \alpha_1 \ln(X_i) + \alpha_2 \ln(X_j) - \alpha_3 \ln(D_{ij}) + \varepsilon_{ij} \quad (2)$$

In this work, we use an economic model that contains macroeconomic causes of remittances as well as a focus on particular bilateral factors. The gravity model of remittance can be formed as follows;

$$REM_{ijt} = A \frac{(GDP_{it} * GDP_{jt})^{\alpha_1}}{(DIST_{ij})^{\alpha_2}} Z_{ijt} \quad (3)$$

Where  $GDP_{it}$  denotes income of host country and  $GDP_{jt}$  denotes income of the home country. Bangladesh is considered as the home country and the rest 10 countries are regarded as the host country.  $DIST_{ij}$  Denotes the geographical distance between the capital of the country  $i$ ,  $j$ , and  $Z$  represents the number of control variables.

An empirical model of remittances is constructed by taking the natural logarithm of equation (3). According to the linearized gravity model, money flows from the host country to the home country are expressed as follows;

$$\ln(\text{REM}_{ijt}) = \alpha_0 + \alpha_1 \ln(\text{GDP}_{it}) + \alpha_2 \ln(\text{GDP}_{jt}) + \alpha_3 \ln(\text{DIST}_{ij}) + \alpha_4 \ln(\text{EXRATE}_{ijt}) + \alpha_5 \ln(\text{RCOST}_{ijt}) + U_i + \varepsilon_{ijt} \quad (4)$$

REM<sub>ijt</sub> is modeled as a bilateral remittance (in natural log) between the home and host nation at time t. This model also includes migrant stocks, geographical distance, and the bilateral exchange rate. GDP<sub>it</sub> and GDP<sub>jt</sub> are the nominal GDPs of the home and host nations, respectively, and DIST<sub>ij</sub> is the distance between the host and home countries' capitals. The bilateral exchange rate in the home country's currency is denoted by EXRATE<sub>ijt</sub>. The cost of transmitting money from host nation i to home country j at time t is denoted by RCOST<sub>ijt</sub>. U<sub>i</sub> signify the country's particular influence in controlling for unobservable heterogeneity. The last term  $\varepsilon_{ijt}$  denotes the error term that is assumed to be well-behaved.

The baseline model is augmented with additional host and home country characteristics that influence remittance.

$$\ln(\text{REM}_{ijt}) = \alpha_0 + \alpha_1 \ln(\text{GDP}_{it}) + \alpha_2 \ln(\text{GDP}_{jt}) + \alpha_3 \ln(\text{DIST}_{ij}) + \alpha_4 \ln(\text{EXRATE}_{ijt}) + \alpha_5 \ln(\text{RCOST}_{ijt}) + \sum_{k=1}^k \alpha_k Z_{ijkt} + U_i + \varepsilon_{ijt} \quad (5)$$

The remaining controls are incorporated as extra repressors Z<sub>ijkt</sub> denoting the vector of all control variables that pertain to both nations, either the host or home country, in the initial extension of the model. The difference between the interest rates in the hosts i and home countries j at time t, as well as the exchange rate between the home and host countries, are included. In the same way, domestic credit to the private sector (as a percentage of GDP) in home and host country, inflation, and difference dependency ratio are also included in the model.

Similarly, political stability in the home and host countries are included to measure the effect of political conditions on remittance inflow. Moreover, Religion is included in the model to measure cultural similarity. Since most of the variables are in natural logs form (except dummy variable) the estimated coefficients can be interpreted as elasticity.

### 3.4 Data and Variable Description

During 2002-2020, we collected information on Bangladeshi remittances from ten host nations. These nations contribute for almost 90% of all remittances to Bangladesh. The presented data is limited in that it most certainly underestimates the number of remittances delivered through informal routes (Hundi).

World Development Indicators (WDI) provides the GDP for the host nation in million US dollars. The host country's economic activity, as measured by GDP, is predicted to be favorable. The second explanatory element is the home country's income level (measured in terms of GDP) (Bangladesh). Religion is taken here to show the cultural similarities between home and host countries. Religion is taken

as a dummy variable where 1 means Islamic host country and 0 means non-Islamic host country. This variable is expected to have a positive sign. Following that, the physical distance and transaction costs of remittances are outlined. Geographical distance is determined as the distance between Dhaka, Bangladesh's capital, and the capital of the sending country. To compute the variable geographical distance, the CEPII database is used. For many years, the geographical distance variable has been employed to estimate the transaction cost of remittances. The transaction cost variable is calculated using data from the World Bank Remittances Prices Worldwide for the key remittance sending corridors to Bangladesh. We make two assumptions in order to get data for each destination and time period. To begin, we will assume that the transaction cost of sending remittances from Saudi Arabia (K.S.A) to Bangladesh is comparable to that of adjacent nations Bahrain, Oman, and Qatar. Second, we assume that the cost of remittances is determined by credit to the private sector as a percentage of GDP in the sending nation, as this represents a country's financial progress. We estimate the transaction cost of remittances for the host nation using three years of data from the United States, Oman, Kuwait, and Qatar from 2017 to 2014 and eight years of data from the United States, United Arab Emirates, Malaysia, the United Kingdom, and Singapore from 2017 to 2010. The expected figures are used to estimate the value of remittances for the remaining years.

WDI provides the bilateral exchange rate of BDT and domestic credit to the private sector as a proportion of GDP for both receiving and sending nations. We utilize interest rate differentials as a proxy for the rate of return on financial assets. These are calculated by subtracting the interest rate in the host nation from the interest rate in the home country. In most circumstances, interest rate refers to the money market rate of a country. We utilize Global Economy.com's political risk indicator as a proxy for institutional quality in the host and home countries. Inflation is used to show the cost of living in host and home countries. This variable is calculated by subtracting host country inflation from home country inflation. The dependency ratio is used as a demographic variable. The dependency ratio is also a crucial factor in influencing remittances inflow (Chitgupi, Aneesha 2018)

## IV. RESULT ANALYSIS

### 4.1 Empirical Results

The Remittance-determination model is estimated using a sample of bilateral remittance flows from ten major host countries of Bangladeshi migrants namely Saudi Arabia, United Arab Emirates (UAE), United States of America (USA), Malaysia, Kuwait, Oman, United Kingdom (UK), Bahrain, Singapore, and Qatar. Bangladesh has been receiving over 90 percent of remittance from these ten countries since 2014. Our estimation of panel data takes into account unobservable variations across cross-sections and periods. We know that panel data permits three models namely Pooled OLS, Random Effect Model (REM), Fixed Effect Model (FEM) and Least Squares Dummy Variables (LSDV) model.

Firstly the baseline model is estimated using Pooled OLS. Then we extend our model by adding other control variables. In Pooled OLS we pool all 190 observations together and run the regression model neglecting the cross-section and time-series nature of the data. After estimating Pooled OLS the model is tested by using Breusch Pagan/Cook-Weisberg test for heteroscedasticity and found that there is heteroscedasticity in this model. The best way to deal with heteroscedasticity is to take robust standard error. After doing this the model is estimated by Random Effect and Fixed Effect model. According to the Hausman test Fixed Effect model is appropriate here but the results of the Fixed Effect model are not good at all because all the gravity variables are insignificant in this model. This fixed-effect regression model shows evidence of heteroscedasticity when it is tested for group-wise heteroscedasticity with the modified wald test. Searching for better results, we estimated the model by Panel Corrected Standard Error (PCSE). This model corrects heteroscedasticity and provides better results than the previous model.

Correlated Panel Corrected Standard Error (CPCSE) model corrects both heterogeneity and serial correlation of this model. The dynamic Panel Data Estimation (DPDE) model shows the long-run relationship between remittance and key gravity variables as well as other macroeconomic variables. Finally, the model is estimated using the Instrumental Variable (IV) regression model. Instrumental Variable refers to such variable that does not directly affect the dependent variable but affects the dependent variables indirectly through affecting explanatory variables. The relationship between core gravity variables and remittances for Bangladesh is estimated using Pooled OLS estimation and is presented in the first column. All variables are expressed in the logarithmic form except religion so the estimated coefficient represents elasticity i.e. they show percentage change. All gravity variables are statistically significant and have desired signs except distance. The significant positive coefficient of per capita income differential indicates an altruistic motive i.e. with an increase in the host country's per capita income the remittances increase.

Table-1: Regression Results

Variables	Models									
	Pooled OLS	Pooled OLS	Pooled OLS	FE	RE	FGLS	PCSE	CPCSE	DPDE	IV REG
LnGDPe	0.410*** (6.76)	0.014 (0.10)	0.014 (0.10)	-0.039 (-0.07)	0.014 (0.10)	0.014 (0.10)	0.014 (0.09)	0.332* (2.33)	0.485** (2.76)	0.091 (0.71)
LnGDP	0.964*** (8.78)	0.191 (0.34)	0.191 (0.31)	0.724 (1.26)	0.191 (0.34)	0.191 (0.36)	0.191 (0.58)	0.765*** (2.91)	0.237 (0.56)	1.793*** (6.99)
Religion	1.532*** (8.32)	0.853* (2.45)	0.853* (2.23)	0 (.)	0.853* (2.45)	0.853* (2.15)	0.853* (2.15)	1.140*** (3.89)	1.225* (2.38)	0.776* (2.29)
LnDIST	0.433* (1.99)	1.810*** (4.23)	1.810*** (3.67)	0 (.)	1.810*** (4.23)	1.810*** (4.51)	1.810** (2.91)	1.485** (2.69)	-0.106 (-0.19)	1.576*** (4.09)
LnGDPpc	0.125 (1.24)	-0.168 (-0.73)	-0.168 (0.74)	0.072 (0.08)	-0.168 (-0.73)	-0.168 (-0.78)	-0.168 (-0.83)	-0.068 (-0.48)	0.593* (1.98)	-0.258 (-1.13)
LnCREDITe		-1.237*** (-3.57)	-1.237*** (-4.58)	-0.610 (-0.93)	-1.237*** (-3.57)	-1.237*** (-3.81)	-1.237*** (-5.40)	-0.376 (-1.68)	0.002 (0.01)	-1.464*** (-4.20)
LnCREDIT		3.879* (2.12)	3.879* (2.21)	2.547 (1.39)	3.879* (2.12)	3.879* (2.26)	3.879*** (3.44)	0.611 (0.82)	0.097 (0.08)	
LnEXRATEe		0.291* (2.33)	0.291* (2.61)	-2.255* (-1.99)	0.291* (2.33)	0.291* (2.48)	0.291** (2.96)	0.028 (0.30)	-0.226 (-0.97)	0.243* (2.10)
LnEXRATE		-0.055 (-0.03)	-0.055 (-0.03)	-0.655 (-0.37)	-0.55 (-0.03)	-0.55 (-0.03)	-0.055 (-0.05)	0.966 (1.33)	-0.402 (-0.38)	
LnPRISKe		-0.645 (-1.45)	-0.645 (-1.77)	-0.368 (-0.53)	-0.645 (-1.45)	-0.645 (-1.55)	-0.645* (-2.31)	0.500 (1.94)	0.259 (0.65)	-0.818 (-1.86)
LnPRISK		-0.071 (-0.12)	-0.071 (-0.10)	-0.255 (-0.43)	-0.071 (-0.12)	-0.071 (-0.12)	-0.071 (-0.20)	-0.855*** (-4.28)	-0.801* (-2.32)	-1.165*** (-3.06)
LnDINF		0.030 (0.21)	0.030 (0.23)	-0.060 (-0.44)	0.030 (0.21)	0.030 (0.23)	0.030 (0.38)	-0.012 (-0.23)	-0.054 (-0.60)	0.098 (0.74)
LnRCOST		-1.289*** (-5.38)	-1.289*** (-5.89)	-0.480 (-1.19)	-1.289*** (-5.38)	-1.289*** (-5.74)	-1.289*** (-9.28)	-0.424** (-2.83)	-0.431 (-1.43)	-1.202*** (5.25)
LNdDRATIO		-0.122 (-0.73)	-0.122 (-0.96)	-0.020 (-1.12)	-0.122 (-0.73)	-0.122 (-0.78)	-0.122 (-1.13)	-0.106 (-1.15)	-0.011 (-0.07)	-0.008 (-0.05)
LnDINT		-0.090 (-1.12)	-0.090 (-1.10)	-0.028 (-0.36)	-0.088 (-1.12)	-0.090 (-1.19)	-0.090 (-1.63)	-0.063 (-1.73)	-0.071 (-1.35)	-0.085 (-1.11)
L.LnREM									0.413*** (5.35)	
_Cons	-35.16*** (-12.13)	-18.25 (-1.75)	-18.25 (-1.80)	-12.77 (-1.07)	-18.25 (-1.75)	-18.25 (-1.87)	-18.25*** (-3.39)	-37.81*** (-6.58)	-18.20* (-2.19)	-42.28*** (-8.34)
N	190	132	132	132	132	132	132	132	132	132

t statistics in parentheses

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

One interesting result here is that the distance coefficient is positive which is opposite to the assumption of the gravity model. Distance is used as a proxy variable for transaction cost of remittances but distance is not significant which means distance is a defective proxy for transaction cost of remittance. The commonality of religion (which is also an indicator of ease of living for migrants) between home and the host country has a positive impact on remittance. In the second specification, the model has been extended by including the transaction cost of remittance and other controlled variables and this result is shown in column 3. The transaction cost of remittance has negative impacts on remittances inflow to Bangladesh, which supports the assumption of the gravity model of remittances. Domestic credit to the private sector in the host nation depresses remittance inflows to Bangladesh, indicating the self-

interest motive of migrant remittances, i.e. a rise in credit to the private sector in the host country. Bangladeshi migrants contribute fewer remittances to their home country.

Similarly, domestic credit to the private sector in the home country i.e. Bangladesh has positive impact on remittances inflow which also indicates self-interest motive i.e. an increase in credit to private sector migrants tend to send more remittances. The host country's exchange rates indicate an altruistic motive. The significance of the positive coefficient means that as the host country's exchange rate depreciates (against US\$) increasing remittances inflow which indicates altruism. The inclusion of risk variable (Political risk in home and host country) in column 3 shows that political risk in the host country impacts remittances.

Table -2: Test of Regression Results

	Pooled OLS	Pooled OLS	Fixed & Random Effect Model	Fixed Effect Model	Instrumental Variable Regression	Instrumental Variable Regression	Instrumental Variable Regression
	Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	Wooldridge test for autocorrelation in panel data	Hausman Test	Modified Wald test for group wise heteroskedasticity in fixed effect regression model	Tests of endogeneity	First-stage regression summary statistics	Tests of overidentifying restrictions
F Statistics P-Value		0.079 0.7850			7.1371 0.0076	264.626 0.0000	
Chi2 P-Value	9.78 0.0018		38.00 0.0003	1312.10 0.0000	6.6877 0.0109		Sargan 0.0408 0.8398 Basmann 0.0362 0.8490
Null Hypothesis	Constant variance	No first-order autocorrelation	Random Effect Model is Appropriate	Homoskedasticity (or constant variance)	Variables are exogenous	Instruments are weak	Model is not over identified
Alternative Hypothesis	Non Constant variance	First-order autocorrelation	Fixed Effect Model is Appropriate	Heteroskedasticity	Variables are endogenous	Instruments are strong	Model is over identified

The more stable the host country the more desire to continue to stay in the host country and thereby reducing remittances. One of the significant demographic variables is the dependency ratio. Though Bangladesh has experienced a shift in its age structure profiles, it is observable that concerning remittances, a lower difference between the dependency ratios of home (Bangladesh) and host country leads the remittances to increase. Hence, the lower dependent population in Bangladesh attracts more remittances, which indicates a self-interest motive. Among economic variables, interest rate differential has negative and significant impacts on remittances inflow to Bangladesh, which suggests that an increase in home country interest rate over host country interest rate leads to decrease remittances implying remittances are altruistic. One of the gravity variables, the transaction cost of remittance is added here and shows that transaction cost has a negative impact on remittances.

The results in column (7) reveal that the level of domestic income, as measured by GDP, has a positive impact on

remittances. When heterogeneity and serial correlation are addressed using Correlated Panel Corrected Standard Error (CPCSE), the results demonstrate that both home and host nation GDP levels have a beneficial influence on remittances. Political risk in the home country has a significant impact on remittances shown in column (8). The significance of the negative coefficient is that the higher the political risk in the home (Bangladesh) the higher will be the remittances inflow, which indicates altruism. The result of column (9) shows the long-run relationship between remittances and other dependent variables. Lagged value of remittances has a significant positive impact on remittances i.e. if the previous year's remittances show an increasing trend then the present year's remittances will also increase and vice versa. The result of column (10) shows that domestic income level has the same impact as column (8) and column (9) but the rate of change has changed dramatically. Column (8) and column (9) show that 1% change in income, changes remittances by 0.77% and 0.24% respectively. But column (10) shows that a 1% change in income brings a 1.79% change in remittances.

## V. CONCLUSIONS AND POLICY IMPLICATIONS

This article examines the influence of various host and home country factors on remittances flow to Bangladesh from ten host countries over the period 2002-2020 using bilateral remittances data from Bangladesh Bank migration and Remittances data. Panel estimates emphasize the importance of charity and self-interest motives in determining the flow of remittances to Bangladesh. Aside from fundamental gravity variables like income, distance, and religion, different host and home country characteristics were considered, with financial development, host country exchange rate, demographic, and risk variables having a greater influence than core economic variables. The study highlights some key areas that can be looked into to amplify and assist the flow of remittances to Bangladesh. According to our findings, the transaction cost of remittances affects remittances negatively, so remittances can be enhanced by reducing the cost involved in remitting. Modern and efficient technologies, such as Mobile Banking or even better technology Bitcoin and Stellar, can be introduced to make remittances easier and cheaper. Already, Beam is making it easier for people to send money to Ghana from overseas.

Domestic credit to the private sector in Bangladesh as a proportion of GDP has a favorable effect on remittances inflows; hence, Bangladesh Bank should take efforts to facilitate domestic credit so that remittances inflows can rise. The study shows that Islamic host country has significant influences on remittances inflow. The Government of Bangladesh (GoB) can enhance diplomatic relations with Islamic host countries so that Bangladeshi migrants can get easy access to employment in these Islamic countries. The more dependent population in Bangladesh compared to the host country, the lower will be the remittance, which is opposite to the previous literature that a more dependent population in South Asia brings more remittances (Chitgupi, Aneesha 2018). So GoB can take steps to reduce the dependent population to attract more remittances.

Interest rate differential is found to be negatively related to remittances inflow to Bangladesh. So BB can reduce the interest rate to make an investment-friendly environment that will attract migrants to invest more in homes. The compensatory aspect of remittances (Chami et al. 2005) and host country variables (Swamy; 1981, Straubhaar; 1986, El-Sakka and McNabb; 1999, and others) have gained high emphasis in previous macroeconomic studies. This study finds that remittances inflow to Bangladesh is not purely compensatory or altruistic but both self-interest and altruism have mixed effects on remittances, which supports the result of the previous study (Chitgupi, Aneesha 2018). Similarly, both host and home country macroeconomic variables have significant impacts on remittances in Bangladesh.

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