Impacts of Personal Remittances on Economic Growth: A Panel Data Analysis

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ABSTRACT

Purpose: Remittance has become one of the most important sources of foreign currency inflows toward lower- and middle-income countries. Every year its significance is increasing both in size and in growth rate. Now, as it is evident that this has stumbled amid the worldwide outbreak of the Novel Corona virus pandemic, trying to find out how much this strike may hamper economies, this study attempts to observe the impacts of personal remittances on economic growth using panel data consisting of 102 countries from 1998-2018.
Methodology: To analyze the data collected from World Bank and IMF for this study, the fixed effects multiple regression model has been used.
Findings: For all the countries in the sample there found a weak relationship between remittances and growth, but the coefficients are statistically insignificant. The same goes for the question of whether there is any non-linearity in the effect of personal remittances. Also, the effects of remittances on economic growth don't change with the countries' level of income.
Practical Implications: These outcomes imply that personal remittances don't invariably affect economic growth but need proper policy support and wise usage to be usefully affecting growth which has important practical implications for policymakers and future studies on remittances.
Limitations: Some of the highest remittances receiving countries could not be included in this study due to the unavailability of necessary data.

1. Introduction

Much of the history of human civilization can highly be attributed to human's quest for traveling. There were, and always are, many reasons for these travels. To work and to try a bit of different luck is certainly one of the prominent reasons. The 'foreign workers' are never local, as they belong to and are usually committed to their home countries. So they send their hard-earned money to their home at the very first opportunity they get. And this is the act that gives birth to the sweet-bitter economic word: Remittance. The money sent by the indigenous workers working in a foreign country to their home country is called remittance.

Remittance has become one of the most important sources of foreign currency inflows toward lower- and middle-income countries. Every year its significance is increasing both in size and in growth rate. For many developing countries, remittances are found to be twice as much as official aid they receive and about two-thirds of FDI flow (Meyer and Shera, 2017). And while it's talking about the recorded remittances only, there is always a huge volume of remittances left unrecorded flowing through various informal channels. Aggarwal, Demirgüç-Kunt, and Peria (2006) estimated

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these unrecorded remittances could be almost half to two times the recorded remittances, which testifies that the real effect of remittances is even more influential. According to the World Bank Data Bank, personal remittances have reached $583.53 billion globally with a 5.91% growth in 2017. The next year, in 2018, that growth increased to 7.01% with total personal remittances of $624.45 billion. The reason for this lies in the mechanism of labor economics.

Neoclassical theory of migration states, as Kurekova, L. (2011) found that due to the differences in the magnitude of wages among countries, relatively high-wage countries have labor moved from low-wage countries. And this mechanism has been on the rise in recent years prominently marked by globalization. This increase in the movement of workers from developing countries to the developed ones in the past decades and a reduction in various costs associated due to technological advancement can be thought of as the catalyst triggering the upward trend in remittance flows (Giuliano & Ruiz-Arranz, 2005). There are countries like Tonga, Haiti, the Kyrgyz Republic, and Tajikistan, more than 30% of whose GDP comes from remittance receipts.

Countries like India, Mexico, Indonesia, Bangladesh, Pakistan, Guatemala, and Nepal are rich with surplus manpower having various levels of skills. The number of migrant workers from these countries is increasing almost every year. Accordingly, personal remittances constitute to be an important part of the export income of the like countries. Thus, these countries can make their excess amount of workforce participate in economic development which would otherwise be kept idle. Add to that, remittances can also reduce their shortage of foreign exchange reserves and make them more capable of paying for the imports (Lopez-Cordova & Olmedo, 2006). World Bank & ADB (2018) found personal remittances to provide ways to reduce poverty and foster economic development in the home country. So it is a basic intuition that remittance helps countries have positive economic growth.

But this intuitive role is not unanimously agreed upon by the academicians. Some of them see remittances to be influential for economic growth, i.e., Meyer & Shera, (2017), Pontarollo & Mendieta Muñoz (2018), Nyamongo et al. (2012), Vargas-Silva et. al. (2009), and so on] while some other studies (Topxhiu, R. M., & Krasniqi, F. X., 2017; Glytsos, 2005; Chami et al., 2003) argue that it harms economic growth. Also, there are even thoughts that disapprove of either of these thoughts. They, namely Rahman (2009), Lim & Simmons (2015), Spatafora (2005), Barajas et al. (2009), and Shaikh et al. (2016) declare that there is no significant or well-defined relationship between remittance and GDP. Whatever the direction is, it's believable that inflows of personal remittances do affect economic growth per se, per capita GDP growth.

Standing on this groundwork, under the circumstances of the Coronavirus pandemic, when almost the whole of the world is locked down and the magnitude of personal remittances is going to fall for countries, this paper examines whether and how remittance is a significant factor in determining economic growth within the framework of neoclassical growth theory. To discern any non-linearity in the relationship with a change in time, is also a goal to achieve. Thirdly, the author is trying to find if there is any relativity in the influences of remittances on the growth of an economy. Put differently, whether the effectiveness of remittances is affected by countries' level of income.

Most of the extant literature on the issue deals with merely the impact of remittances on economic growth or poverty reduction. The newness of this research is in its methodology and in its attempt to examine whether the impact varies with the difference in development status.

The paper includes a Literature review briefing the existing research literature on different forms of impact personal remittances found to have on economic growth; Methodology explaining the approach taken to pursue the research, the variables included, the sources of data, and the econometric models applied to test the impact; Results and Findings discussing the empirical results and their interpretation; and then Conclusion presenting policy implications and concluding remarks.

2. Literature Review

2.1 Determinants of Economic Growth

Escalation of per capita GDP is termed by Denison (1962) as economic growth. This growth has its roots attributed to the different resources an economy possesses. These resources are thought to be factors of economic growth, which can primarily be of two types: Direct and Indirect. The factors that determine economic growth directly include human resources, natural resources & capital, and technology. Different forms of institutions, savings & investment, financial sector, policy formulation & implementation, quality of governance, etc. also influence the economic growth of a country. Though there are debates among academicians as to which one of these factors is the most important, majority of them identify four of these factors, i.e., human resources, natural resources, capital formation, and technology, to be most influential as determinants of economic growth. All other factors like government and household consumption, private or public capital formation and investment, the openness of the economy, export-import, exchange rates, unemployment, corruption, socio-political stance, etc. have their ways to affect the growth mechanism. And also, their behavior towards economic growth might be different based on the economy's development status.

2.2 Mechanism of the Remittance Affecting Economic Growth

Intuitively, remittances should affect household consumption, investment, and capital, all of which are important determinants of economic growth and a vast majority of contemporary literature supports this intuition as well. Researchers suggest three different mechanisms as to how personal remittances affect economic growth. In separate ways, remittances affect capital accumulation, labor force growth, and factor productivity growth, all of which consequently affect economic growth. These three are among the four major determinants of economic growth. Barajas, A., et. al, (2009) discussed this process to be initiated with an increase in the accumulation of capital, both physical and human, by the households who are continuously receiving remittances. This notion has further been supported by a study by Jawaid, S. T., & Raza, S. A. (2016), which proves that capital accumulation can also be fostered by remittance as it helps investors raise funds. Secondly, remittance is also believed to be influencing the growth of the labor force. Due to some moral hazards in the recipient households, an increase in the remittance receipts may slow the growth of labor inputs (Barajas, A., et. al, 2009) which is to say remittance affects the domestic labor force negatively. The third-way remittance is affecting the economy is by influencing how prudently the

receiving country manages domestic investment. The mechanism is that efficient investment then affects total factor productivity. Remittance may also bring Dutch Disease effects by appreciating the real exchange rate (Barajas, A., et. al 2009).

2.3 Empirical Evidences

In contemporary literature, there are contradictory opinions as to which way remittance leads to economic growth. There has been evidence of positive, negative, and neutral impacts of remittances on the economy of the receiving countries in the world literature. Those who find remittances to be positively affecting the economies think there are certain direct or indirect relationships between these two and that the relationship is statistically significant. Like Ratha, D. (2013) argues, remittances are often found to be countercyclical and thus work as a sort of insurance leveraging families in times of economic hazards. The paper also credited remittances to having a positive impact on economic welfare as it increases the creditworthiness of the receiving country.

Observing the impacts of remittances on economic growth in six of the highest remittance receiving European countries from 1999 to 2013, Meyer and Shera (2017) found the analogy to be positive. A similar statistically significant positive relationship was observed by Pontarollo, N., and Muñoz, R. M. (2018) studying the relationship between remittance and economic growth in Ecuador, Cooray (2012) investigating the impact of migrant remittances on economic growth in South Asia, and Nyamongo et al. (2012) in 36 African countries over the period 1980–2009, and Kumar (2013) in Guyana.

Investigating data for about twenty Asian countries over the period 1988-2007 samples, Vargas-Silva, C., Jha, S., and Sugiyarto, G. (2009) found that a 1% increase in remittance to GDP ratio leads to a 0.09%-0.12% increase in GDP growth. Giuliano and Ruiz-Arranz (2009) concluded that being an alternative finance route for investment, remittances enhance economic growth in less developed countries. Studying more than Seventy developing countries in 2003, Adams, R. and Page, J. found that remittances can substantially lessen the intensity and propensity of poverty in the developing world. While Glytos (2005) explained the mechanism that remittances being used for children's education and health care, can have a positive impact on labor productivity. It can also enable countries to import required capital goods, the consequence of which can lead to economic advancement. Ziesemer (2006) argues that by influencing citizens' propensity to savings and decreasing interest rates, remittances increase investment and the literacy rate.

On the other hand, the opposite school thinks, the relationship between remittances and economic growth is substantially negative. Topxhiu, R. M., and Krasniqi, F. X. (2017) suggested that the root cause for the existence of personal remittance, the migration of labor to foreign countries, may well be held responsible for damaging the development mechanism. While studying the probable influence that remittances may have on economic growth in The West Balkan countries, they found the home country to suffer from a heavy brain drain losing educated brains and skilled manpower. This can be termed a loss of human capital which may hurt economic growth. Besides discussing the overall positive effects of remittances, Ratha, D (2013) also stated that it may reduce the home country's competitiveness in international trade by appreciating its exchange rate. This type of proof of the negative impact of remittances is not rare there is numerous literature to find this. Das (2012) concludes after studying the behavior of remittances in two Asian

and two middle-east countries over 30 years (1975-2006) that remittances nurture a positive relationship with economic growth in Pakistan and Syria but leave a scar on the economy of Bangladesh and Egypt. Why is that so? Lipton (1980) and Ahlburg (1991) prove that if remittances are mainly spent on foreign goods consumption than on productive investments, it could reduce productivity and growth in low-income countries. Glytsos (2005) investigated remittances' impact on imports, public consumption, savings, and output data from 7 European and African countries over 24 years (1969–1993). He then extended it from 1969 to 1998. Both of these studies revealed remittances to have significantly negative effects on growth. This negativity resembles the findings of Chami et al. (2003), a group of researchers, who observed 113 nations, concluded that remittances harm growth in per capita incomes.

Lying between these opposing thoughts, some researchers found almost no significant relationship between remittances and economic development. An IMF study (Spatafora N., 2005) concerning more than a hundred developing countries found no relationship between remittances and output growth whatsoever. A similar kind of `no-direct-link' was also found by Lim and Simmons (2015), Spatafora (2005), and Barajas et al. (2009). The same result put differently, Rahman (2009) explained that remittance seems to have insignificant and ambiguous effects on GDP. The work of Shaikh et al. (2016) also falls into this category of thoughts as they identified no relation between personal remittances and economic growth while analyzing a 35-year-long time series dataset covering a period starting from 1980 to 2014 in Pakistan.

2.3.1 Overview of the Literature and Hypothesis Development

In a nutshell, it is observed that optimistic groups find the direct or indirect positive developmental impact of remittances to be existent. Whereas, according to many other researchers, remittances do not affect the growth of the recipient country. A school of thought is also there to declare that there is no well-defined and significant relationship between remittance and economic growth. On the premise of this understanding, the current study proposes hypothesis 1 (H1) as follows.

> **H_1:** $\beta_1 \neq 0$; *Personal Remittances affects, positive or negative, economic growth.*

Although there have been numerous studies on the relationship, there are still scopes for newer studies as to find whether the effect, if any, is linear or non-linear, that is, whether the effect changes with a change in time. Only a few research attempts have taken place to answer the question of non-linearity. For example, Hassan and Shamim (2017) found a non-linear relationship between remittances and growth while studying the case of Bangladesh. But that was done with the data of a single country and through time series analysis. Considering more than a hundred countries and using panel data regression approach to find overall non-linearity instead of any country-specificity should be a valuable addition to academia. So, the current study caters hypothesis 2 (H2) as follows:

> **H_2:** $\beta_6 \neq 0$; *Remittance has a non-linear relationship with economic growth.*

Lastly, the research tries to find if the effect of remittances, if any, changes to countries with their level of income. To do so, this study examines the third hypothesis (H3) as follows:

> **H_3:** $\beta_1 \neq 0$; *Personal Remittances' effect on economic growth changes with the country' income level.*

The third attempt here to find out whether the effect of remittance on economic growth is affected by the level of income is relatively a newer approach to studying this relationship, and trying so with instrument variables to check for possible biases from simultaneous causality is believed to be complementary to the array of existing literature concerning remittances to economic growth relationship.

2.4 Research Objective

The objective of this study is to find out the nature of the impacts personal remittances have on annual economic growth. It will also attempt to find whether that impact depends on the economy's income level.

The followings are the specific objectives set for this study.
   i.   To ascertain the relationship, if any, between remittances and economic growth
   ii. To find out whether the relationship is non-linear
   iii. To find out whether the effect depends on the level of income

3. Research Models

3.1 Theoretic Model

This section discusses how the empirical models used in this paper have been implemented and the way the relevant tests have been performed.

As discussed in the introduction and literature review sections, there have been numerous researches on the relationship between remittances and economic growth most of which focus merely on the relation's existence and nature. There are also numerous works in this area trying to discern the effect on individual economies. But, whether the relationship differs in terms of time, put differently whether the relationship is non-linear has not been addressed much in contemporary literature. That's the question this paper asks and tries to find out the probable answer. To do so, the relationship between economic growth and remittances is expressed with the help of the Solow model of economic growth.

Barro and Sali-Martin discussed the basis of growth accounting in their book, Economic Growth. They say famous economist Solow suggested (1957) the standard production function to be $Y = F(T, K, L)$, where Y is total output; T takes value for the level of technology; K stands for physical capital, and L denotes human capital or labor. Jorgenson and Griliches (1967) disaggregated Capital and labor further into types or qualities. This production function makes us understand that gross domestic product grows as a consequence of the growth in productive inputs, e.g., technological advancement, increase in capital stock, and growth in the labor force.

In their empirical framework for capturing the factors affecting economic growth, Barro and Sali-Martin used education and health as the explanatory variables to absorb the effect of the stock of capital and labor. They also included government consumption to GDP ratio, household investment to GDP ratio, international openness, export-import, average inflation rate (to capture the level of macroeconomic stability), and the efficiency of democracy and governance, and fertility rate as control variables. Finding useful some of the variables from this list, i.e., per capita GDP growth, government consumption to GDP ratio, gross capital formation growth, international

openness, and movement in trade (export), have been incorporated in this study. Other variables, personal remittances to GDP ratio, exchange rate, export growth rate, etc. used in this research are obtained as many of the contemporary studies in the 'remittance-growth' area have repeatedly used them to extract the intended effects. Pradhan, K. C. (2016), Ferdaous, J. (2016), and Sutradhar, S.R. (2020) can be mentioned to name a few.

In total, seven relevant numerical variables, i.e., Per Capita GDP growth, Personal Remittances to GDP ratio, International Openness, Export Growth, Gross Capital Formation growth, Government Consumption to GDP ratio, and exchange rate growth have been employed for testing and analyzing the intended effects under this research. Here, per capita GDP growth is the dependent variable which is supposedly explained by remittance growth. To assist in this study, to be more specific, to control for possible omitted variable biases, export growth, international openness (the ratio of export plus import to GDP), gross capital formation growth, government consumption to GDP ratio, and exchange rate growth have been used as per the literature. Collecting the data from secondary sources, the author has personally performed the necessary transformations in the dataset for it to be ready to be used in the regression.

3.2 Instrument Variable

In academia, there is a concern about whether economic growth and personal remittances simultaneously affect each other, i.e., the independent variable causes the dependent variable, and at the same time, the dependent variable is also causing independent variables. If this happens, the phenomenon can be termed simultaneous causality bias, which is an obstacle in finding out the effect remittances have on economic growth. There might also be other biases like omitted variable bias, i.e., a variable being unobserved cannot be incorporated in the regression leaving present control variables to be inadequate to capture the true effect; and error-in-variables bias if the independent variable is measured with an error harming the reliability of the estimates by the econometric model employed. Variables free from these biases are called exogenous variables and produce reliable estimates. But if a variable is biased in any of these ways, it is called to have endogeneity, and cannot estimate efficiently. Endogeneity can be eliminated using instrument variable regression. According to Pearl (2000, p. 247), a variable (Z) can be an instrument variable relative to the dependent (Y) and independent variable (X), if (i) Z is correlated with X and (ii) not correlated with any other variables including error terms that have influences on Y that is not mediated by X. That means, being uncorrelated with the outcome (Y) and correlated with the explanatory variable (X), the instrument variable (Z) remains not directly or indirectly causally affected by X, Y, or the error term U.

Barro and Sali-Martin introduced lagged values of the explanatory variables as instruments to deal with the likely endogeneity of the explanatory variables. They argued in favor of the lagged variables being acceptable instruments as the error term in the equation for PCGR displays negligible serial correlation. Following their footsteps, the author here uses lagged value of Remittance to GDP ratios, the explanatory variable of the current study, to eliminate possible simultaneous causality, omitted variable bias, or an inadvertent measurement error.

The methodology used in this research is similar to that of the works of Sutradhar, S.R. (2020), Meyer and Shera (2017), and Topxhiu, R. M., and Krasniqi, F. X. (2017). They have tried to find

the impact of remittances along with some other variables on the per capita GDP growth which is also done in this paper. To find out the true effect, or to avoid two-way causality and omitted variable bias, an instrument variable has also been incorporated into the model. But the main difference between this paper and those is that here special concentration has been given to discern whether the impact is different based on the development status of countries. If it's found to vary according to the income status of countries, this might be a tool for policymakers in setting effective policies regarding the proper usage of inflows of personal remittances. The followings are the panel data models used in this paper for the sake of using ordinary least square (OLS) regression.

3.3 Econometric Model

The first question this research is trying to answer through this paper is, to which direction and what extent a country's economic growth is affected by remittance. In accomplishing so, panel data have been used to get results and analyze that. Pooled Ordinary Least Square regression, Fixed Effects Regression Model and Random Effects Regression model have been implemented here. After many trials, the following regression models which have been estimated using Ordinary Least Square estimators were chosen. The first specification of the model to investigate whether remittances affect growth is as follows:

$$PCGDPG_{it} = \beta_0 + \beta_1 REMIGDP_{it} + \beta_2 GCFG_{it} + \beta_3 EXPG_{it} + \beta_4 OPENS_{it} + \beta_5 EXCRG_{it} + \beta_6 GOVCONS_{it} + u_{it} \quad (1)$$

Where

$I = 1, 2,....,102; t = 1,2,.. .., 21;$

PCGDPG- Per Capita GDP growth,

REMIGDP- remittances to GDP ratio, the variable of interest

　　　The rests are control variables used to help the model better predict the effect of remittances on growth. The control variables have been chosen to be used in this model according to similar research literatures which frequently include the variables in the "remittance-growth" regressions. These explanatory variables are;

GCFG- Gross Capital Formation growth,

EXPG- Export Growth,

OPENS- International Openness,

GOVCONS- Government consumption to GDP ratio, and

EXCRG- Exchange Rate Growth

β_1 is the coefficient of interest throughout this paper which measures the effect of remittances to GDP ratio on per capita GDP growth. And

u_{it} represents an error term which is independently and identically distributed (IID) that is, the mean of the error term is zero and their variance is constant. This model has actually attempted to test the first hypothesis set (*H_1: $\beta_1 \neq 0$; Personal Remittances affect economic growth*)

3.3.1 *Fixed Effects Regression Model Specification:*

$PCGDPG_{it} = \beta_0 + \beta_1 REMIGDP_{it} + \beta_2 GCFG_{it} + \beta_3 EXPG_{it} + \beta_4 OPENS_{it} + \beta_5 EXCRG_{it} + \beta_6 GOVCONS_{it} +$

$\mu_i + \theta_t + u_{it}$ (2)

Where, with the previously defined variables, two new effects have been incorporated. μ_i is used to capture the effects that are supposed to be changing over the individual countries but keeping constant over the different time periods, where the effects that are constant over individual countries but changes over time is captured by θ_t.

And the third alternative specification is used to discern whether any non-linearity exists in the influences of remittances on growth, or vice versa. This specification includes the squared term of the variable *REMIGDP,* as follows:

$PCGDPG_{it} = \beta_0 + \beta_1 REMIGDP_{it} + \beta_2 GCFG_{it} + \beta_3 EXPG_{it} + \beta_4 OPENS_{it} + \beta_5 EXCRG_{it} + \beta_6 GOVCONS_{it}$
$+ \beta_7 REMIGDP_{it}^2 + \mu_i + \theta_t + u_{it}$ (3)

Where $i = 1, 2... \ 30$; $t = 1, 2... \ 20$; *PCGDPG, REMIGDP,* and all other variables are the same like in 1st specification except for *REMIGDP^2* which is the squared term of remittance-to-GDP ratio included to capture any non-linearity in the relationship. This has helped testing the 2nd hypothesis, namely, *(2) H$_2$: $\beta_6 \neq 0$; Remittances have a non-linear relationship with economic growth.*

Apart from these, dividing the data into 'Low-income', 'Middle-income', and 'High-income' group of countries, the third objective has been attempted to accomplish. All the model specifications discussed above, have been used to show how much the remittance's effect changes based on the groups' income level. Which has tested the 3rd hypothesis as such, *(3) H$_3$: $\beta_1 \neq 0$; Personal Remittances' effect on economic growth changes with the country's income level*

And for instrument variable regression, the same models have been used incorporating lag values of *REMIGDP*. Lag values of Remittances to GDP ratio has been taken as instrument variable to address the likely biases due to mutual causality, omitted variable, and error in measuring the variables. With the help of this instrument, it is hoped that, an unbiased and reliable estimate of the true effect of remittances on per capita GDP growth has been captured.

3.4 Empirical Analysis

For the purpose of this research, the relationship between economic growth and capital accumulation has been used in accordance with Solow, R. M. (1956), and Swan, T. W. (1956)'s contribution to the neoclassical growth model which has been accredited to be the basis for further theories of growth.

In this study, remittance means personal remittances received by a country from its citizen staying and earning in a foreign country. GCF shows the net change in fixed assets and in inventories where fixed assets include Plant & Machinery, Buildings and capital Equipment used for production and inventory means finished goods, work-in-process, and raw materials to be used in producing final products. Export shows the country's total earnings from exporting goods and services. International openness has been calculated as the ratio of export plus import and GDP of the countries. The government consumption ratio is the percentage of GDP governments spend every year. And National Currency per US Dollar, the period average has been used as the exchange rate.

3.4.1 *Data Source and Summary*

To accomplish the objective of the study 21-year data covering the period 1998-2018 on 102 of the remittance earning countries have been used to construct a panel dataset. The source of this dataset includes mainly The World Bank data bank, International Financial Statistics of IMF, and the Chinese Bureau of Statistics.

Countries with the highest volume of remittances and remarkable dependence on remittance have been thought to be the ideal entities to examine for this study. Many of these countries' GDP is heavily dependent on remittance. There are countries whose Remittances-to-GDP ratios are very impressive. But there were also some countries like Tonga, Tajikistan, and Nepal despite being highly ranked in terms of their Remittances-to-GDP ratio, or remittance earning track record, couldn't be included in this study because of unavailability of data. It would be interesting to see the effect if they could be included in the study. But still, the countries selected for the study are either one of the largest recipients of remittances or one of the countries having the most impact of Remittances on their GDP.

The concentration of the study was intended to distribute amongst different continents of the world. The categorization specified by the World Bank has been followed in selecting the sample countries. According to The World Bank categories, countries are divided into five regional zones based on their capacity to be a destination for personal remittances. Followings are the countries worked on according to their zonal identities.

Table 1. List of countries included in the sample of the study

East Asia and Pacific	Australia, China, Indonesia, Japan, Cambodia, Korea, Rep., Malaysia, New Zealand, Philippines, Thailand
Europe and Central Asia	Albania, Armenia, Austria, Belgium, Bulgaria, Belarus, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Iceland, Italy, Kazakhstan, Kyrgyz Republic, Lithuania, Luxembourg, Latvia, Moldova, North Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, Sweden, Ukraine
Latin America and the Caribbean	Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Haiti, Mexico, Nicaragua, Peru, Paraguay, El Salvador, Venezuela, RB
South Asia	Bangladesh, India, Pakistan, Sri Lanka
Sub-Saharan Africa	Benin, Burkina Faso, Botswana, Cameroon, Comoros, Ethiopia, Gabon, South Africa
Middle East & North Africa	Algeria, Egypt, Arab Rep., Iran, Islamic Rep., Israel, Jordan, Morocco, Malta, West Bank and Gaza, Tunisia
North America	Canada, USA

Source: World Bank Databank

In summary, the dataset is a panel with 102 countries (N) and the time period (T) is to be 21 years starting from 1998 to 2018. The source of these data is, as mentioned earlier, metadata bank of World Bank statistics. A summary of the dataset used is as follows:

Table 2. Data summary (STATA produced)

Variable	No. of Observations	Mean	Std. Dev.	Minimum	Maximum
Per Capita GDP Growth	2142	2.42	3.57	-18.17	23.98
Remittances to GDP Growth	2142	3.64	6.22	0.00	67.98
Gross Capital Formation Growth	2142	4.62	26.98	-772.55	435.62
Export Growth	2142	5.56	10.45	-45.89	118.39
Exchange Rate Growth	2142	3.75	22.66	-99.99	440.45
International Openness	2142	0.79	0.46	0.00	3.79
Lag of Remittances to GDP	2142	3.59	6.39	0.00	87.55
Govt Consumption to GDP	2142	16.10	5.79	0.00	47.19

Source: World Bank Databank and International Monetary Fund

Note: It's a balanced panel; with a total number of observations is NT: 102*21 = 2142.

To find out the answer to the question set in the objective 3, that is, whether the effect of remittances on economic growth depends on the income level of the host country, the overall panel dataset is divided into three subgroups: low, middle, and high-income group, based on the `Current Classification by income' made by the World Bank. Because this status is a continuous process, and a country can advance from its lower status to upper status based on its improvement in earning capacity, it's very unusual to expect every country to attain the same level throughout the 21 years, the time period for this study. So, close consideration has been given to decide which country to sit where. For example, Bangladesh is currently a middle-income country. But the country has attaine this level only recently, before that it was regarded as a low-income country, and as the study has been undertaken for the whole 21 years, for this type of case, the level. a country has been attaining for the majority of years among this 21-year-period has been considered to be that country's level So, Bangladesh has been given in the low-income country group. A similar case has happened to five more countries, and this `majority principle' has been employed for the purpose of relatively fitter judgment. The final group wise list of countries according to the income level is as follows (Data summary and graph for the subgroups are in appendix):

Table 3. List of countries making up the sub-groups according to their level of income

Low income	Bangladesh, Benin, Burkina Fuso, Cameroon, Cambodia, Haiti, Kenya, Kyrgyz Republic, Madagascar, Mali, Mozambique, Rwanda, Senegal, Tanzania, Togo
Middle Income	Argentina, Armenia, Belarus, Belize, Bolivia, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Arab Rep. Egypt , El Salvador, Eswatini, Gabon, Guatemala, Honduras, India, Indonesia, Iran, Islamic Rep., Jordan, Kazakhstan, Lesotho, Malaysia, Mauritius, Mexico, Moldova, Morocco, Namibia, Nicaragua, Nigeria, North Macedonia, Pakistan, Paraguay, Peru, Philippines, Romania, Russian Federation, South Africa, Sri Lanka, Sudan, Thailand, Tunisia, Turkey, Ukraine, Venezuela, RB, West Bank and Gaza

Source: World Bank Databank

3.4.2 *Estimation Methods*

Estimation starts with a simple pooled OLS model (equation 1) without considering any effect. Then two regressions are run with the 2nd specification, one with fixed effects and the other for random effects. Done with these, Hausman Test has been employed to find out the appropriateness of either fixed effects regression or random-effects regression for the panel dataset under use. The test set

H0: Random Effect model is Appropriate and H1: Fixed Effect model is Appropriate. And the test statistic is 89.46 with a p-value of 0.000 which tells us to reject H0, that is, the result is in favor of fixed effects regression to be used for this study.

But, before going through these procedures, it has to be Certain whether the data to be used are appropriate for the study. For a dataset, to be appropriate, stationarity is one of the most important traits to have. So, all the variables are checked by Fisher ADF (Augmented Dickey-Fuller) unit root test, to examine whether these are stationary or not. And per capita GDP growth rate, remittances to GDP ratio, export growth rate, gross capital formation growth rate, and exchange rate growth have been confirmed, by the test result, to have the required level of stationarity. To be specific, the variables underuse are integrated of degree 0, I (0).

Table 4. Results for unit root test, Fisher type (ADF)

Variables	At Level	
	Fisher Type (ADF)	
	Intercept only	Intercept and Trend
Per Capita GDP Growth	-23.12***	-19.23***
Remittances to GDP Ratio	-5.30***	-3.34*
Gross Capital Formation Growth	-33.4***	-27.76***
Export Growth Rate	-32.79***	-29.01***
Exchange Rate Growth	-37.64***	-22.11***
Openness	-2.40	-2.51

Source: Authors Calculation.

Note: *** significant at p<0.01, ** significant at p<0.05, * significant at p<0.1

Among others, tests for Heteroscedasticity, and multicollinearity have also been worked out.

4. Empirical Results

This section has been dedicated to discuss the test results in details. All the specifications set for the econometric model constructed under this research have been run into STATA software and the resulting outputs are presented here. The econometric results of specifications are reported below:

In the first model, regression has been run without adding fixed effects and second regression models was run with entity fixed effects only. The difference is minimal, and they are statistically insignificant as well. These two model specifications are just for checking the results and not for the study. As specified in the `Econometric Model' section, the 3rd and 4th specifications are supposed to give answer to the first two study questions: if remittances affect economic growth and whether the impact of remittances on economic growth is non-linear. So, these models need to be analyzed in detail. The 3rd specification is fixed effect regression incorporate with time fixed effects and entity fixed effects. This model deals with the dependent, independent, and other control variables with a view to estimate the effect independent variable (remittances growth rate) has on dependent variable (per capita GDP growth rate). Apparently, the results show that, there is no relationship between these variables. The regression model (3) where both entity and time fixed effects have been incorporated can be stated as an equation for better understanding as follows:

$$pcgdpg = 1.66 - 0.03\,remigdp + 0.03gcfg + 0.09expg - 0.02\,excrg - 0.07\,opens + 0.01\,govcon$$
$$(0.96) \qquad (0.03) \qquad (0.02) \qquad (0.02) \qquad (0.01) \qquad 0.39 \qquad 0.05$$
$$R^2 = 0.334$$

Table 5. Results of the regression analysis

Variables	Per Capita GDP Growth (pcgdpg)			
	No FE(1)	Entity FE(2)	Entity+Time(3)	FE+Squared(4)
Remittance to GDP Ratio (remigdp)	-0.020 (0.016)	-0.036 (0.038)	-0.027 (0.0329)	-0.004 (0.087)
Gross Capital Formation Growth (gcfg)	0.033*** (0.020)	0.032 (0.020)	0.028 (0.018)	0.028 (0.018)
Export Growth Rate (expg)	0.125*** (0.006)	0.121*** (0.021)	0.093*** (0.020)	0.093*** (0.020)
Exchange Rate Growth (excrg)	-0.025*** (0.003)	-0.027*** (0.008)	-0.023*** (0.008)	-0.023*** (0.008)
International Openness (opens)	0.278 (0.211)	0.015 (0.342)	-0.073 (0.388)	-0.073 (0.388)
Government Consumption to GDP (govcon)	-0.022 (0.016)	-0.008 (0.044)	0.013 (0.045)	0.009 (0.045)
Squared term of remigdp (remigdp2)				-0.001 (0.002)
Constant	1.883*** (0.0322)	1.958** (0.931)	1.655* (0.955)	1.685* (0.972)
Number of Observations	2,142	2,142	2,142	2,142
R-squared	0.261	0.263	0.334	0.334
Number of country	102	102	102	102
Time Period	1998-2018	1998-2018	1998-2018	1998-2018
Entity Fixed Effects?	No	Yes	Yes	Yes
Time Fixed Effects?	No	No	Yes	Yes
Clustered Standard Errors?	Yes	Yes	Yes	Yes

Source: Authors Calculation.

*Note: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$*

The result states that with an increase of one percent growth in personal remittances to GDP ratio, per capita GDP will decrease by 0.027 percent keeping all other variables constant. But important is this estimation is not statistically significant as t-statistic for the coefficient of *REMIGDP* is 0.33 with p-value -0.81. That means, though Remittances have very small negative relation with per capita GDP, the relationship is not proved to be statistically significant. So, the first Hypotheses, $\beta_1 \neq 0$, that states that *remittances affect economic growth,* cannot be accepted.

4.1 Objective ii: Non-linearity

Similar insignificant results are found even with the square term in the 2ⁿᵈ specification (regression result 4). The result in equation form is as follows:

$$Pcgdpg = 1.69 - 0.001\ remigdp^2 + 0.03gcfg + 0.09expg - 0.02\ excrg - 0.07\ opens + 0.09\ govcon$$
$$(0.97) \quad (0.002) \quad (0.02) \quad (0.02) \quad (0.01) \quad 0.39 \quad 0.05$$
$$R^2 = 0.334$$

When the squared term of remittance growth rate, remigdp2, is introduced to test the regression's non-linearity, the coefficient of *REMIGDP* becomes even more negligible (coefficient is negative 0.004). And again, the coefficient is statistically insignificant. On the other hand, with an increase of one percent in the squared term of Remittance to GDP ratio, per capita GDP will decrease by 0.001 percent keeping all other variables constant. These two coefficients interpret that

remittances actually reduce per capita GDP growth rates in the initial stage, and increase the growth rate at a later stage. That says, Remittance decreases the per capita GDP, and the magnitude lessens in the long run. Again, the t-statistic for the co-efficient of the linear term is 0.05, while the t-statistic for the coefficient of the non-linear term is 0.34. Observable that, the R squared values are the same for both the linear and non-linear specification 3 and 4 is 33.4%. Which implies that, introducing a non-linear term doesn't increase the data variability. So, the 2nd Hypothesis, (2) H_2:

$\beta_6 \neq 0$, [*remittance has a linear relationship with economic growth*] doesn't hold either.

4.2 Relativity to Income level

To see whether the results vary in terms of the countries' status of being 'low-income', or 'middle-income' or 'high-income', both the specification 3 and 4 were run with the data pertaining to each of the group of the countries. And the results are as follows:

Table 6. Results of the regression analysis (Low and Medium Income Group)

Dependent Variable Per Capita GDP Ratio	Low-income			Middle Income		
	Entity FE	Entity+Time	FE+Sqrd	Entity FE	Entity+Time	FE+Sqrd
Explanatory Variables	(5)	(6)	(7)	(8)	(9)	(10)
Remittance to GDP Ratio (remigdp)	0.019 (0.033)	-0.021 (0.026)	0.058 (0.122)	-0.038 (0.0514)	-0.040 (0.046)	-0.165 (0.123)
Gross Capital Formation Growth (gcfg)	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)	0.061[*] (0.033)	0.055[*] (0.029)	0.055[*] (0.029)
Export Growth Rate (expg)	0.053[**] (0.024)	0.051[**] (0.022)	0.050[**] (0.022)	0.106[***] (0.030)	0.084[***] (0.029)	0.084[***] (0.028)
Exchange Rate Growth (excrg)	-0.023[**] (0.009)	-0.011 (0.008)	-0.010 (0.008)	-0.025[**] (0.011)	-0.018[*] (0.009)	-0.018[*] (0.009)
International Openness (opens)	-0.726 (0.736)	-1.693 (1.070)	-1.723 (1.054)	2.077[*] (1.238)	0.671 (1.115)	0.667 (1.112)
Government Consumption to GDP (govcon)	0.068 (0.039)	0.042 (0.045)	0.048 (0.050)	0.050 (0.055)	0.061 (0.055)	0.088 (0.064)
Squared term of remigdp (remigdp2)			-0.002 (0.003)			0.003 (0.002)
Constant	1.609[**] (0.696)	1.845 (1.138)	1.642 (1.297)	-0.089 (1.381)	-0.245 (1.273)	-0.377 (1.291)
Observations	315	315	315	1,050	1,050	1,050
R-squared	0.117	0.221	0.222	0.334	0.406	0.409
Number of country1	15	15	15	50	50	50
Time Period	1998-18	1998-18	1998-18	1998-18	1998-18	1998-18
State Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects?	No	Yes	Yes	No	Yes	Yes
Clustered Standard Errors?	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors Calculation

Note: Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Again, coefficients of remittances to GDP ratio are more or less the same for low-income and middle-income countries from the sample, and they are statistically insignificant. Yet, in terms of magnitude of effect of remittances on economic growth, the specifications for middle income countries (specification 5, 6, and 7) seem to be bigger than those for low income countries (specifications 8, 9, and 10). The coefficients for squared term to test non-linearity of the effect are

also statistically insignificant. So, it's almost apparent that, at least from the dataset used for the current studies, remittances affect economic growth negatively and these results are statistically insignificant. Also, the effects are not different in case of the country's variability of income earning or development status. So, the 3ʳᵈ Hypothesis, (3) H₃: *β₁ ≠0 [Personal Remittances' effect on economic growth changes with the country's income level]* also doesn't hold.

4.3 Instrument Variable Regression Result

To eliminate the biases due to mutual causality, omitted variable, and error in measuring the explanatory variable, remittance to GDP ratio, the lagged values of *REMIGDP* were introduced as instrument variable. Following table shows the detailed results of the specifications in which the instrument variable has been incorporated.

Table 7. Results of the regression analysis with Instrument Variable

VARIABLES	Per Capita GDP Growth		
	Low-Income (11)	Middle-Income (12)	Overall (13)
Remittance to GDP Ratio	0.0121	-0.0164	0.00238
(remigdp)	(0.0375)	(0.0462)	(0.0348)
Gross Capital Formation Growth	0.0018	0.0550*	0.0276
(gcfg)	(0.0039)	(0.0290)	(0.0177)
Export Growth Rate	0.0506**	0.0833***	0.0925***
(expg)	(0.0220)	(0.0287)	(0.0198)
Exchange Rate Growth	-0.0105	-0.0176*	-0.0228***
(excrg)	(0.0078)	(0.0090)	(0.0075)
International Openness	-1.790*	0.585	-0.116
(opens)	(1.023)	(1.098)	(0.382)
Government Consumption to GDP	0.0438	0.0688	0.0199
(govcon)	(0.0447)	(0.0546)	(0.0460)
Constant	1.801	-0.408	1.497
	(1.103)	(1.289)	(0.964)
Observations	315	1,050	2,142
Number of country1	15	50	102
Instrument Variable?	Yes	Yes	Yes
Time Period	1998-18	1998-18	1998-18
State Fixed Effects?	Yes	Yes	Yes
Time Fixed Effects?	Yes	Yes	Yes
Clustered Standard Errors?	Yes	Yes	Yes

Source: Authors Calculation

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

5. Discussion

As already discussed, the extant literature is full of debates on the effects of personal remittances on the economic growth of countries as to which direction, positive and negative, it affects the economy. The current study turns out to show a statistically insignificant and weak relationship between remittances and economic growth. The anticipated non-linearity of the effect has also not been statistically proved. And the effect doesn't depend on the country's income-earning status either. Might there be any biases from an omitted variable, mutual causality, or measurement error,

which are hindering the model from producing reliable results? That is also not the case here; no satisfactory reliability was found in the results even after trying with an Instrument Variable.

It might be because the actual amount of remittances cannot be recorded. That means the remittance being dealt with here is far less in amount than what it is actually. So, the true implication of remittance cannot be predicted with this econometric model. The second possibility is that there are recipients of remittances who become highly dependent on easy money and thus reduce their participation in economic activities. If the money is spent on unproductive investments like purchasing land and building houses, then remittance cannot help economies grow. Due to this imprudent and unproductive use, remittance cannot play the role it is perceived to play. So, it is very compelling to conclude that if it is not used in proper economic usage, it doesn't affect economic growth. Ensuring productive and prudent use of remittances may help economies be better off.

5.1 Limitation and Future Direction

For both the specifications, the R2 is around 30% which means the models have a chance to be suffering from omitted variables or mutual causality bias. Maybe, trying to introduce some more explanatory variables to the model would improve the situation. There can still be the case of mutual causality working in the remittance-growth relation. Introducing a more proper instrument variable might fix the model to come with more reliable results. Maybe then a proper conclusion can be reached about the true effect of personal remittances on economic growth.

6. Conclusion and Implication

6.1 Policy Implications

Though the outcomes of this research may give a notion that countries need not be worried about remittance as it doesn't necessarily affect economic growth, there are countries more than 20% of whose GDP's come from remittance receipts. There is always a concern for developing countries like Bangladesh if the remittance is enough to leverage the fiscal budget every year. A substantial increase in the amount or magnitude of remittance is big news in Bangladesh and countries alike. Now, with all the social hazards and economic disorientation created by the recent Covid19 outbreak, a drastic fall in remittances has also been a headache for these countries.

The literature implies, individually, there are many countries where remittance has been able to bring good fortune, whereas there are still countries that are negatively affected by this inflow. This contradiction lies in the utilization of remittance. It should not be misleading if one argues that remittance acts differently depending on how well a country manages it. So, developing and implementing relevant policies to make sure the proper and prudent use of remittances could make remittances work in favor of economic growth.

6.2 Conclusion

Attempting to measure the influences of remittances on Economic growth, this study seems to produce an outcome that is not very expected. The findings of this study show that there is a relationship between remittances and GDP; but that the relationship is not statistically significant. The same goes for the case of the study's 2nd objective, i.e., the non-linearity of the effects of remittances on economic growth. Also the effect of remittances on economic growth does not statistically significantly depend on the income level of the countries.

But does that disallow the economic significance of one of the most important sources of foreign currency for many of the low-income and middle-income countries in the world? While there are possibilities that a huge amount of remittances cannot be officially recorded because they are transmitted through un-structured and unofficial channels, it might be too early and unwise to expel the possibility of a relationship.

Acknowledgement

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