Hochschule für
Wirtschaft und Recht Berlin
Berlin School of Economics and Law

Institute for International Political Economy Berlin

Revisiting the linkage between remittances inflow and economic growth:

A semi-parametric estimation with panel data

Authors: Arafet Farroukh, Manel Mazioued, and Jennifer Pédussel Wu

Working Paper, No. 238/2024

Revisiting the linkage between remittances inflow and economic growth:

A semi-parametric estimation with panel data

Arafet Farroukh
FSEGT, University Tunis El Manar, Tunisia

Manel Mazioued
FSEGT, University Tunis El Manar, Tunisia

Jennifer Pédussel Wu
IPE, Berlin School of Economics and Law, Germany

Abstract:
We investigate the relationship between remittances inflow and economic growth in a sample of 65 emerging countries over the period 1988-2018 using the semi-parametric panel data model with fixed effects as proposed by Baltagi and Li (2002). Our empirical results show that the effect of remittances inflow on economic growth exhibits a highly nonlinear pattern, which sheds new light on the remittances-growth nexus and provides evidence of a nonlinear relationship.

Corresponding author: Jennifer Pédussel Wu, jennifer.pedussel-wu@hwr-berlin.de

Keywords: Remittances; Growth; Nonlinear effects; Semi-parametric regression; Panel data; Emerging countries.

JEL Codes: C14; O15; F43

1. Introduction

Remittances result from migrants sending home a portion of their earnings to support residences in their home countries. Migrant remittances have grown rapidly in the past few years and for many developing countries, represent the largest source of foreign income. While it is difficult to estimate remittance flows since a large portion travel via unofficial methods, remittances are shown to be especially important for low-income countries (Ratha, 2017).

Historically, remittances are considered a very stable financial flow. During the financial crisis in 2009, remittances experienced a downturn of 5 percent, recovering within a year (World Bank Group, 2018), a situation unlikely to result with the COVID-19 pandemic. International remittances are overall the second largest international monetary flow after foreign direct investment (FDI) and it is considered the least volatile and most reliable of all financial flows to developing countries. Economic remittances have therefore become an influential tool for development and economic growth. While remittances can contribute to Dutch Disease if they cause an appreciation in the exchange rate (Fritz et al., 2017), a higher exchange rate makes exports more expensive and imports cheaper, which can also lead to a decline in competitiveness in other sectors of the economy.

The aim of this study is to revisit the linkage between remittances inflow and economic growth by employing the semi-parametric panel fixed effects regression developed by Baltagi and Li (2002). With this approach, a prior parametric shape un-assumed in modeling the relationship between remittances and growth. The semi-parametric panel fixed effects regression is supposed to be more flexible than the parametric approach (Wang et al., 2015; Hamadi and Heinen, 2015) and leads to estimating the true shape of the remittances-growth nexus. We supplement our analysis by employing parametric techniques using the generalized method of moments (GMM) estimators.

In the context of the remittances-growth nexus, the term "nonlinear nature" refers to the fact that the relationship between remittances inflow and economic growth rate is not a straight line or a constant rate of change. Instead, it suggests that the impact of remittances on economic growth may vary depending on the level of remittances inflow. In other words, a small increase in remittance inflows may have a different impact on economic growth than a large increase in remittance inflows. The nonlinear

nature of the relationship suggests that there may be a threshold level of remittance inflows beyond which the positive impact on economic growth starts to decrease or even become negative.[1]

Understanding the nonlinear nature of the remittances-growth nexus is important because it can help policymakers design more effective policies to maximize the positive impact of remittances on economic growth. For example, policymakers may need to consider different policy interventions depending on the level of remittance inflows to ensure that remittances are channeled towards productive investments or sectors that can contribute to economic growth. Our findings, based on data from 68 countries 1988-2018, provide evidence that the effect of remittances inflow on economic growth exhibits a highly nonlinear pattern and thus our results are inconsistent with the findings provided by previous studies that have assumed a linear parametric functional form or those using a conventional polynomial specification.

The rest of the paper is organized as follows. Section 2 presents the literature review, section 3 presents our econometric models, the data and briefly describes the semi-parametric panel model. Section 4 discusses the empirical results and Section 5 concludes the paper.

2. Literature review

The impact of remittances inflow on economic growth has been extensively examined in recent years although the results, are mixed and inconclusive thus leaving the debate open-ended. A first strand of empirical studies seems to support the evidence of a positive relationship between remittances and economic growth (e.g., Imai et al., 2014; Kumar and Stauvermann, 2014; Nsiah and Fayissa, 2013; Jayaraman et al., 2012; Javid et al., 2012; Nyamongo et al., 2012, Jayaraman et al., 2011; Azam and Khan, 2011; Giuliano and Ruiz-Arranz, 2009; Mundaca, 2009; Pradhan et al., 2008), while other studies suggest a negative or an insignificant relationship (e.g., Feeny et al., 2014; Rao and Hassan, 2011; Barajas et al., 2009; Chami et al., 2003). Another strand of this literature suggested a different view in this debate, and has claimed, by using a threshold approach, that the relationship between remittances inflow and the growth rate is nonlinear (e.g., Eggoh et al., 2019; Bettin and Zazzaro, 2009; Hassan et al., 2012; Giuliano and Ruiz-Arranz, 2009).

[1] We do not examine the threshold estimation in the context of this paper and recognize that it should be examined in future work.

Table 1 reports the summary of recent literature on the relationship of remittances and growth. Much of this literature examines the importance of financial development in this relationship further contributing to the endogeneity of the question.

Table 1 Tabular Summary of the Literature Review				
Author/Year	**Sample**	**Variables Employed**	**Methodology**	**Outcomes**
Chami et al. (2003)	113 countries, 1970 to 1998	Remittance /GDP, M2/GDP and GDP per capita	Panel OLS	Negative effects of remittances on growth
Faini (2005)	Europe and USA	Migration figure, Remittances/ GDP and Poverty	Questionnaire	Positive effects of remittances on growth.
Giuliano and Ruiz-Arranz (2005)	100 countries, 1975 to 2002	Remittances/GDP, M2/GDP, private credit to GDP and GDP per capita	Panel OLS	Positive effects of remittances on growth.
Richard et al. (2005)	71 Developing countries 1987 to1996	Gini Coefficient, Per capita GDP and International Migration figure.	Pooled OLS and IV Estimate	International Migration and remittances reduce poverty
Guilano and Ruiz-Arranz (2009)	100 Developing countries	Remittances/GDP Private credit to GDP and Investment	IV Estimate	Positive effects of remittances on Growth.
Karagöz (2009)	Turkey, from 1970 to 2005	Remittances/GDP capital formation/ GDP, FDI, net private flow and FDI.	Cointegration and OLS	Negative effects of remittances on growth.
Siddique et al. (2010)	1976 to 2006 Bangladesh, India and Sri Lanka	Per capita remittances, Export and GDP per capita	VAR Granger Causality test	Two-way causality test existed in Sri Lanka.
Khan and Azam (2011)	1995 to 2010 Azerbaijan and Armenia	GDP and remittance/GDP	Simple Log Linear regression	Positive effects of remittances on growth
Jayaraman, Choong and Kumar (2011)	Samoa and Tonga, 1981 to 2008	Remittance to GDP, M2/GDP, private sector credit to GDP and FDI.	Bound Test	Positive effects of remittances on growth.
Jayaraman, Choong and Kumar (2012)	1970 to 2009, Pacific Island	Remittance/GDP per worker, FDI and private sector credit to GDP	Bound Test	Positive effects of remittances on growth.
Javid et al. (2012)	1973 to 2010 Pakistan	Real GDP, remittance/GDP, investment to GDP, income inequality and trade openess	ARDL	Positive effects of remittances on growth.

Kumar (2012)	Sub-Saharan Africa, 1970 to 2010.	Remittance/GDP, private sector credit to GDP, telephone lines per 100 people, and ODA to GDP.	ARDL Bound Test.	Negative effects of remittances, Financial Development and ICT on growth
Nyamongo et al. (2012)	Africa, 1980 to 2009.	GDP per capita, remittances and financial development.	Pooled OLS fixed effect.	Remittances promote economic growth.
Cooray (2012)	94 Non-OECD, 1990 to 2010	Remittances, financial sector size and government bank ownership.	Pooled OLS and System GMM	Remittances promote financial sector development.
Damnola and Wakili (2013)	Nigeria, 1980 to 2010.	Real GDP per capita, remittance/GDP and M2/GDP	Seemingly unrelated regression (SUR) and ECM	Remittances promotes economic growth.
Akkoyunlu (2013)	Turkey, 1963 to 2009.	Remittances/GDP, bank deposit, private credit/GDP	Toda Yamamoto Non-Granger Causality test.	No causality between financial development and remittances
Koay and Choong (2013)	Malaysia	GDP remittance/GDP and M2/GDP.	ARDL and Granger Causality test.	Remittances promotes growth and causality runs from finance to remittances
Alkhathlan (2013)	Saudi Arabia, 1970 to 2010.	Real GDP, Remittance/GDP and Export.	ARDL	Negative effects of remittances on growth.
Meyer and Shera (2013)	Albania, 1992 to 2012.	GDP, Remittance/ GDP and M2/GDP.	ARDL and ECM	Positive effects of remittances on growth
Goschin (2013)	Romania, 1994 to 2011.	GDP, Remittance/ GDP and M2/GDP.	Multi-factorial regression models	Positive effects of remittances on growth
Kumar (2013)	Guyana, 1982 to 2010	RealGDP, remittances/GDP, ODA/GDP, M2/GDP	ARDL bound Test.	Positive and long run effect of remittances on growth
Kumar and Stauvermann (2014)	Kenya, 1978 to 2010.	Tourism, remittances/GDP and real GDP	Bound Test approach	Positive effects of remittances on growth.
Kumar and Stauvermann (2014)	Lithuania, 1980 to 2012	Real GDP, remittances/GDP and M2/GDP	ARDL	Positive effects of remittances on growth.
Kumar and Stauvermann (2014)	Bangladesh, 1979 to 2012	Real GDP, remittances/GDP and M2/GDP	ARDL Bound procedure	Positive effects of remittances on growth
Imai et al. (2014)	24 Asia and pacific countries, 1980 to 2009.	Real GDP per capita, remittance/GDP, M2/GDP, Volatility of remittance and FDI.	Panel 2 stage Least Square.	Positive effects of remittances on growth
Sarkar and Datta (2014)	Bangladesh, 1975 to 2011	GDP, remittances/GDP, M2/GDP and other control variables	ARDL and Causality	No relationship exists between remittances and GDP
Blouchoutzi and Nikas (2014)	Moldova and Albania, 1990 to 2010.	Remittance/GDP, consumption, GDP, and import.	OLS	Remittances promote growth in both countries.

Feeny et al. (2014)	136 states including 25 SIDS, 1971 to 2010.	GDP per capita, remittance/ GDP and other control variables	GMM Estimates	Positive effects of remittances for SIDS countries.
Sibindi (2014)	Lesotho, 1975 to 2010.	Remittances/GDP, M2/GDP and real GDP.	VECM and Granger causality.	Causality running from remittances to growth.
Adarkwa (2015)	Cameroon, Cape Verde, Nigeria and Senegal, 2000 to 2010.	GDP per capita, remittance inflow and outflow	OLS	Positive effects of remittances on growth in Nigeria and Senegal only.
Coulibaly (2015)	19 sub-Saharan African countries. 1980 to 2010.	GDP per capita, remittances, liquidity liability and FDI	Panel Granger causality test	No evidence of causal relationship in SSA
Sobiech (2015)	54 Developing countries, 1970 to 2010.	Remittances/GDP, M2/GDP, Private credit/GDP and GDP per capita	GMM Panel Analysis.	Negative effects of remittances on growth
Karikari et al. (2016)	50 developing countries, 1990 to 2011	Remittances/GDP, M2/GDP, Private credit/GDP, FDI and GDP per capita	Panel VECM causality techniques.	Remittances promotes financial development.
Nsiah and Fayissa (2013)	1985- 2007 for 64 countries (29 from Africa, 14 from Asia, 21 from Latin America)	Remittances, openness of the economy, capital/labor ratio, economic freedom	Panel Fully Modified OLS (PFMOLS)	Positive relationship between remittances and economic growth.
Mundaca (2009)	Latin American and Caribbean Countries 1970-2002	GDP growth per capita, investment p.c., remittances/GDP, domestic credit/GDP, FDI/GDP	GMM estimation	Positive relationship between remittances and economic growth.
Pradhan et al. (2008)	39 developing countries (1980 – 2004)	Export-GDP-ratio (trade openness), GDP_{t-1}, investment, polity (political regime and authority characteristics)	Standard growth model with fixed-effects and random-effects	Positive relationship between remittances and economic growth.
Eggoh et al., 2019	49 developing countries, 2001 - 2013	GDP p.c. (log), remittances/GDP, economic growth factors,	Panel Smooth Transition Regression (PSTR)	Nonlinear relationship between remittances inflow and economic growth rate.
Bettin and Zazzaro, 2009	66 developing countries 1970 - 2005	Remittances/GDP, financial development, interaction term, financial control variables	Growth regression	Nonlinear relationship between remittances inflow and economic growth rate.
Hassan et al., 2012	Bangladesh 1974 - 2006	Remittances/GDP, gross capital formation/GDP, populations growth government consumption/GDP, M2/GDP, inflation rate (all log)	OLS, Instrumental Variable–Two Stage Least Square (IV-2SLS), and IV-GMM estimators	Nonlinear relationship between remittances inflow and economic growth rate.

Source: Author compilation.

Remittances do not automatically lead to higher long-term growth rates for several reasons. First, endogeneity is an issue and, second, while remittances have important spillover effects, other contributions to growth are equally important. The existing studies in this literature suffer from important limitations. Most of the literature imposes a specific functional form (i.e., a linear relationship) between remittances and economic growth, while other studies, which have supported the existence of nonlinear effect, may suffer from important endogeneity issues related to the choice of the threshold variable. The threshold in the context of the remittances-growth nexus refers to the point at which the positive impact of remittance inflows on economic growth starts to decrease or become negative. In other words, there is a level of remittance inflows beyond which additional remittances may not have a significant, or a positive impact, on economic growth. The exact threshold level may vary depending on a variety of factors such as the economic conditions of the recipient country, the source and type of remittances, and the policy environment. Therefore, it is difficult to determine a universal threshold level for all countries or contexts.

3. Econometric models, data, and estimation strategy

As a starting exercise and following Mundaca (2009), Bettin and Zazzaro (2012), Fenny et al. (2014) and Giuliano and Ruiz-Arranz (2009), we estimate the following econometric models. The included control variables are standard in the literature and we follow previous protocol. To test the relationship between remittances inflow and economic growth based on prior studies, our baseline parametric model (in a dynamic form) can be illustrated by the following equation:

$$GDPG_{i,t} = \beta_0 + \beta_1 GDPG_{i,t-1} + \beta_2 REMIT_{i,t} + \beta_3 TRADE_{i,t} + \beta_4 INVEST_{i,t} + \beta_5 EXPEND_{i,t} + \beta_6 INFL_{i,t} + \beta_7 POPG_{i,t} + \mu_t + \gamma_i + \varepsilon_{i,t} \quad (\mathbf{1})$$

where GDPG is the annual growth rate of real GDP per capita for country i at time t, REMIT refers to remittances received as a percentage of GDP, TRADE is international trade, defined as the ratio of the sum of exports plus imports of goods to total output, INVEST is the gross fixed capital formation as a percent of real GDP used as a proxy for investment in physical capita, EXPEND is Government spending, measured as the ratio of government consumption to GDP, INFL is inflation measured as the annual percentage change in the consumption price index, POPG measures the average annual

population growth rate, μ_t is a time specific effect, γ_i is an unobserved country-specific fixed effect and $\varepsilon_{i,t}$ is the error term.

As for previous studies, to check if the relationship between remittances and growth is nonlinear, we modify to parametric specification in Equation (1) into different polynomial forms (i.e, quadratic and cubed) on remittances inflow variable. The resulting parametric nonlinear models where the variable is nonlinear and we modify the parametric specification from Equation 1, are given as follows:

$$GDPG_{i,t} = \beta_0 + \beta_1 GDPG_{i,t-1} + \beta_2 REMIT_{i,t} + \beta_3 REMIT^2{}_{i,t} + \beta_4 TRADE_{i,t} + \beta_5 INVEST_{i,t} + \beta_6 EXPEND_{i,t} + \beta_7 INFL_{i,t} + \beta_8 POPG_{i,t} + \mu_t + \gamma_i \varepsilon_{i,t} \quad (\mathbf{2})$$

and

$$GDPG_{i,t} = \beta_0 + \beta_1 GDPG_{i,t-1} + \beta_2 REMIT_{i,t} + \beta_3 REMIT^2{}_{i,t} + \beta_4 REMIT^3{}_{i,t} + \beta_5 TRADE_{i,t} + \beta_6 INVEST_{i,t} + \beta_7 EXPEND_{i,t} + \beta_8 INFL_{i,t} + \beta_9 POPG_{i,t} + \mu_t + \gamma_i + \varepsilon_{i,t} \quad (\mathbf{3})$$

As given in Equations (1), (2) and (3), we use the system generalized method of moments (SYS-GMM) of Arellano and Bond (1991) and Arellano and Bover (1995). This methodology is more valuable than OLS for dealing with endogeneity problems that might occur because of omitted variable bias, reverse causality, as well as measurement error.

In order to estimate the aforementioned parametric models, we rely on a panel data set, which consists of cross-country observations during the period 1988-2018 for 68 countries[2]. The countries included in this study and the sample period are due to data

[2] The countries selected for this study are: Algeria, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cameroon, Central African Republic, Colombia, Congo, Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Egypt Arab Rep., El Salvador, Eswatini (Swaziland), Fiji, Gabon, Gambia, Ghana, Guatemala, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Lebanon, Madagascar, Malaysia, Mali, Mauritania, Mauritius, Mexico, Morocco, Mozambique, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Rwanda, Senegal, Serbia, South Africa, Sri Lanka, Sudan, Syrian Arab, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Vietnam, Yemen Rep., Zambia, Zimbabwe.

availability. All the variables, as defined above, have been extracted from World Bank[3] World Development Indicators (WDI) and International Monetary Fund (IMF) datasets. The descriptive statistics of our variables of interest are given in Table 2.

Table n°2: Summary statistics

Variables	Mean	Stand. Dev.	Minimum	Maximum
Real GDP Growth (GDPG)	0.042	0.032	-0.046	0.114
Remittances (REMIT)	0.027	0.029	0.000	0.130
TRADE	0.623	0.271	0.190	1.287
Investment (INVEST)	0.206	0.054	0.101	0.340
Expenditures (EXPEND)	0.137	0.037	0.068	0.232
Inflation (INFL)	0.094	0.088	-0.002	0.527
Population Growth (POPG)	0.019	0.019	0.000	0.071

Source: Author compilation using IMF (2022) and World Bank (2021).

As indicated in the introduction, many of the previous studies have assumed a specific functional form (i.e., linear) to describe the relationship between remittances inflow and economic growth. However, as argued by Yatchew (1998), the economic theories never imply a specific functional form when relating a response variable to a set of exogenous covariates.

Therefore, to find out the "true" functional form of the remittances-growth nexus and unlike pre-existing studies, we employ the semi-parametric panel model with fixed effects as developed by Baltagi and Li (2002). This approach allows the effect of remittances to be modeled by an unrestricted and more flexible functional form. Formally, the semi-parametric panel model with fixed effects can be described by the following equation:

$$GDPG_{i,t} = \alpha_i + \gamma \boldsymbol{X}_{i,t}^{T} + f\left(REMIT_{i,t}\right) + \varepsilon_{i,t},\ i = 1, \dots, N; t = 1, \dots, T \qquad \textbf{(4)}$$

Where *f(.)* is an unspecified function of $REMIT_{i,t}$, α_i refers to the country-specific fixed effects which are correlated with $REMIT_{i,t}$, $\boldsymbol{X}_{i,t}^{T}$ is a k-dimensional vector of control variables (TRADE, INVEST, EXPEND, INFL, POPG), , and $\varepsilon_{i,t}$ are error terms

[3] The World Bank provides data on remittances through its Migration and Remittances Data portal. This database includes information on remittance flows, the cost of remittances, and migration trends.

assumed to be *i.i.d* with finite variance σ_{ε}^{2} and mean-independent of $REMIT_{i,t}$, namely, $E\left(\varepsilon_{i,t}\middle|REMIT_{i,t}\right) = 0$.

The non-parametric component, *f(REMIT),* is estimated using splines with optimal basis functions, as discussed by Keele (2008). To estimate the model given in equation (4) with panel data, the common procedure used is to eliminate the fixed effects, α_i,, by differentiating equation (4) over time which gives the following expression:

$$\Delta(GDPG_{i,t}) = \Delta\left(\boldsymbol{X}_{i,t}\right)\boldsymbol{\gamma} + f[\Delta(REMIT_{i,t})] + \Delta(\varepsilon_{i,t})$$

(5)

Or

$$\boldsymbol{GDPG}_{it} = \boldsymbol{X_{it}\gamma} + \boldsymbol{F}\left(REMIT_{i,t}, REMIT_{i,t-1}\right) + \boldsymbol{U_{i,t}}$$

(6)

where $\boldsymbol{GDPG}_{it} = GDPG_{i,t} - GDP_{i,t-1}$,$\boldsymbol{X_{it}} = \boldsymbol{X}_{i,t} - \boldsymbol{X}_{i,t-1}$, $\boldsymbol{F}\left(REMIT_{i,t}, REMIT_{i,t-1}\right)$ = $f\left(REMIT_{i,t}\right) - f(REMIT_{i,t-1})$ and $\boldsymbol{U_{i,t}} = \varepsilon_{i,t} - \varepsilon_{i,t-1}$.

The main problem here is to estimate consistently the unknown function of remittances inflow variable, REMIT≡ $\boldsymbol{F}\left(REMIT_{i,t}, REMIT_{i,t-1}\right)$= $\left[f\left(REMIT_{i,t}\right) - f(REMIT_{i,t-1})\right]$.

Following Baltagi and Li (2002), we approximate $f(.)$ by series differences $p^{k}(.)$ and therefore approximate $\boldsymbol{F}\left(REMIT_{i,t}, REMIT_{i,t-1}\right)$= $\left[f\left(REMIT_{i,t}\right) - f(REMIT_{i,t-1})\right]$ by $\boldsymbol{p^{k}}\left(REMIT_{i,t}, REMIT_{i,t-1}\right)$= $\left[p^{k}\left(REMIT_{i,t}\right) - p^{k}(REMIT_{i,t-1})\right]$ where $p^{k}(.)$ are the first k terms of a sequence of functions $\left(p_1\left(REMITD_{i,t}\right), p_2\left(REMIT_{i,t}\right), \ldots\right)$. Hence equation (5) becomes:

$$GDPG_{i,t} - GDPG_{i,t-1} = \left(\boldsymbol{X}_{i,t} - \boldsymbol{X}_{i,t-1}\right)\boldsymbol{\gamma} + \left[p^{k}\left(REMIT_{i,t}\right) - p^{k}(REMIT_{i,t-1})\right]\beta + (\varepsilon_{i,t} - \varepsilon_{i,t-1})$$

(7)

Typically, the $p^k(REMIT_{i,t})$ series is a spline, which is a segmented polynomial with components characterized by a sequence of smooth knots. A simple method is to solve using a linear spline of degree m with k knots, which can be represented by:

$S(REMIT) = \sum_{j=0}^{m} \theta_j REMIT^j + \sum_{j=1}^{k} \varphi_j (REMIT - c_j)_+^m$ where $(REMIT - c_j)_+^m = \begin{cases} REMIT - c_j \; if \; REMIT > c_j \\ 0 \qquad otherwise \end{cases}$ and c_j a sequence of k knots where they join smoothly.

The better method is to use splines as a linear combination of a set of basic splines called B-splines which are defined as:

$$B(REMIT, c_1, c_2, \dots, c_{k+1}) = (k+1) \sum_{j=1}^{k+2} \left[\prod_{1 \le h \le k+2, h \ne j} (c_h - c_j) \right]^{-1} (REMIT - c_j)_+^k$$

The model in equation (7) can be estimated using OLS. Once estimated, $\hat{\gamma}$ and $\hat{\beta}$ are obtained, it is straightforward to fit the fixed effects α_i and use equation (4) the error component as follows:

$$\hat{\varepsilon}_{i,t} = GDPG_{i,t} - X_{i,t}\hat{\beta} - \hat{u}_i = f\left(REMITT_{i,t}\right) + \varepsilon_{i,t} \quad \textbf{(8)}$$

The curve of the function $f(REMIT_{i,t})$ can be estimated by spline regressing $\hat{\varepsilon}_{i,t}$ against $REMIT_{i,t}$ using standard non-parametric regression estimator (Baltagi and Li, 2000; Libois and Verardi, 2012).

4. Results and discussion

4.1.Parametric estimates

We start by estimating the parametric models described in Equation (1), (2) and (3) expressed in linear, quadratic and cubic form, respectively. The results of such estimation are reported in Table 3. The regressions satisfy the specification tests (AR1, AR2 and Hansen test). There is strong evidence of a first serial correlation, but there is no evidence of a second serial correlation. Furthermore, the regressions pass the Hansen test and confirm the validity of the chosen instruments. Regarding the linear

specification (column 1 of Table 3), we note that the effect of remittances on economic growth is negative and statistically significant.

This result is in line with the findings of Feeny et al., 2014, Rao and Hassan, 2011, Barajas et al., 2009; Chami et al., 2003. About the quadratic model (column 2 of Table 3), we observe that the remittances variable (REMIT) and its quadratic term ($REMIT^2$) are both significant at 1% level and with opposite sign. This result reveals the existence of an inverted U-shaped relationship between remittances inflow and economic growth. Lastly, the estimation of the cubic polynomial model (column 3 of Table 3) reveals an S-shaped curve between remittances and per capita GDP growth. Overall, these findings are in line with the idea that the effect of remittances on growth rate is not monotonic.

For the control variables and consistent with previous studies, we find strong evidence of a positive and significant effect of trade and gross fixed capital formation variables on economic growth, while we find negative and significant effect of government expenditure, inflation, and population growth.

Table 3: The effect of remittances inflow on economic growth: parametric estimation

	Linear model	Quadratic polynomial model	Cubic polynomial model
	(1)	(2).	(3).
L.GDPG	0.2750***	0.3013***	0.2546***
	(20.97)	*(24.48)*	*(9.89)*
REMIT	-0.0006***	0.0387***	-1.2870***
	(-2.86)	*(6.50)*	*(-12.82)*
$REMIT^2$		-0.0011***	0.0691***
		(-6.45)	*(13.37)*
$REMIT^3$			-0.0012***
			(-13.91)
TRADE	0.0228***	0.0213***	0.0297***
	(7.30)	*(5.59)*	*(5.99)*
INVEST	0.0511***	0.0414***	0.0814***
	(5.88)	*(3.73)*	*(8.02)*
EXPEND	-0.1095*	-0.0975	-0.1191***
	(-1.92)	*(-1.66)*	*(-5.04)*
INFL	-0.0291***	-0.0287***	-0.0438***
	(-5.04)	*(-3.43)*	*(-6.15)*
POPG	-0.1998***	-0.2632***	-0.2940***
	(-4.07)	*(-5.75)*	*(-4.73)*
No. of Obs.	476	476	476
F Statistic	515.064***	372.306***	231.198***
AR1	*0.000*	*0.000*	*0.000*
AR2	*0.527*	*0.655*	*0.532*
P-value Hansen test	*0.816*	*0.794*	*0.934*

Note: (*) and (***) denotes the rejection of null hypothesis at 1% and 10% significance levels, respectively. The values in parentheses represent t statistics

Source: Author compilation of analysis performed using IMF (2022) and World Bank (2021).

4.2. Semi-parametric estimates

In the next stage, we proceed to estimate our baseline model using the semi-parametric approach by allowing the remittances variable (REMIT) to enter non-parametrically into the model as described by the Equation (4). The results are reported in Table 4. We use two estimators: (i) the Robinson (1988) double residual estimator (column 1 of Table 4) and (ii) Baltagi and Li (2002) fixed-effects estimator (column 2 of Table 4). The coefficients estimation of control variables are close to those obtained under the parametric model and they are statistically significant at conventional levels (1%, 5% and 10%).

Table 4: The effect of remittances on economic growth: Semi-parametric estimation

Independent variables	Robinson's (1988) Semi-parametric estimator	Baltagi and Li's (2002) Semi-parametric panel fixed effects estimator
	(1)	(2)
REMIT	**See Fig. 1**	**See Fig. 2**
TRADE	-0.0038	0.0546**
	(-0.65)	*(2.10)*
INVEST	0.0587**	0.1660**
	(2.47)	*(2.33)*
EXPEND	-0.1183***	-0.4394***
	(-3.61)	*(-3.31)*
INFL	-0.0401***	-0.0874***
	(-2.98)	*(-4.09)*
POPG	0.0028**	-0.0062*
	(2.19)	*(-1.70)*
N	582	325
$R^2(\%)$	4.90	15.73

Note: (*), (**) and (***) denotes the rejection of null hypothesis at 10%, 5% and 1% significance levels, respectively. The values in parentheses represent t statistics.

Figure 1 and Figure 2 display the impact of remittances (horizontal axis) on economic growth (vertical axis). More precisely, they illustrate the semi-parametric estimation of *f(.)* along with 95% confidence bands (grey shaded area) obtained by using the Robinson's (1988) double residual estimator and Baltagi and Li's (2002) fixed-effects estimator, respectively. The circles in the graphs are partial residual for economic growth (GDPG) in the semi-parametric specification. They are obtained from equation 8. The maroon curve represents the fitted value for adjusted effects of the other covariates in the semi-parametric model. The result for both estimators, in accordance with previous literature, show that remittances has a nonlinear effect on economic growth.

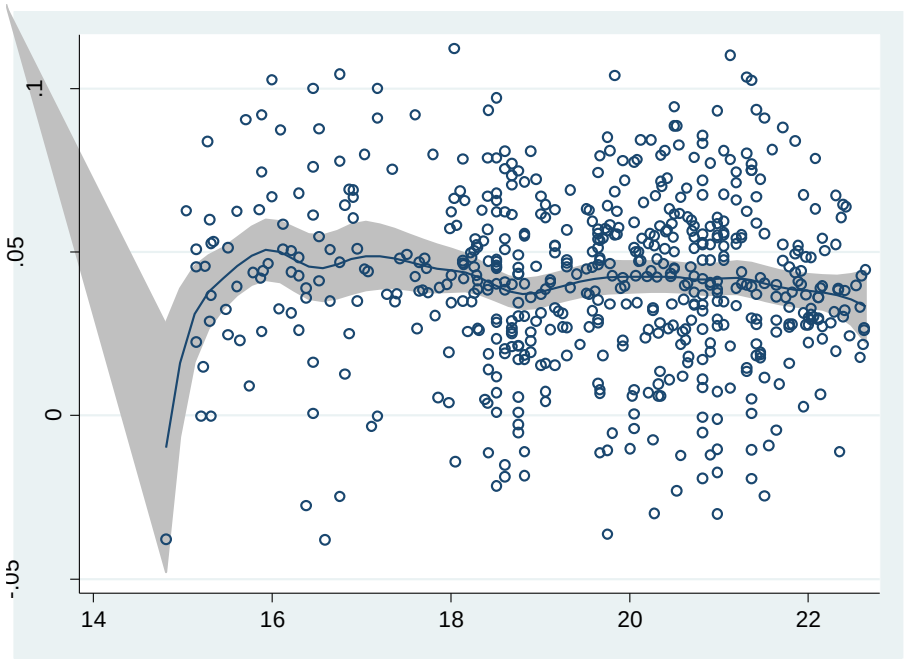

Figure 1. Partial fit of remittances and economic growth nexus. Note: the circles in the graph are estimated partial residuals for economic growth in the semi-parametric model using the Robinsson's (1988) estimator. The blue curve represents the semi-parametric estimation of f(REMIT).95%confidence bands are indicated by shaded areas.

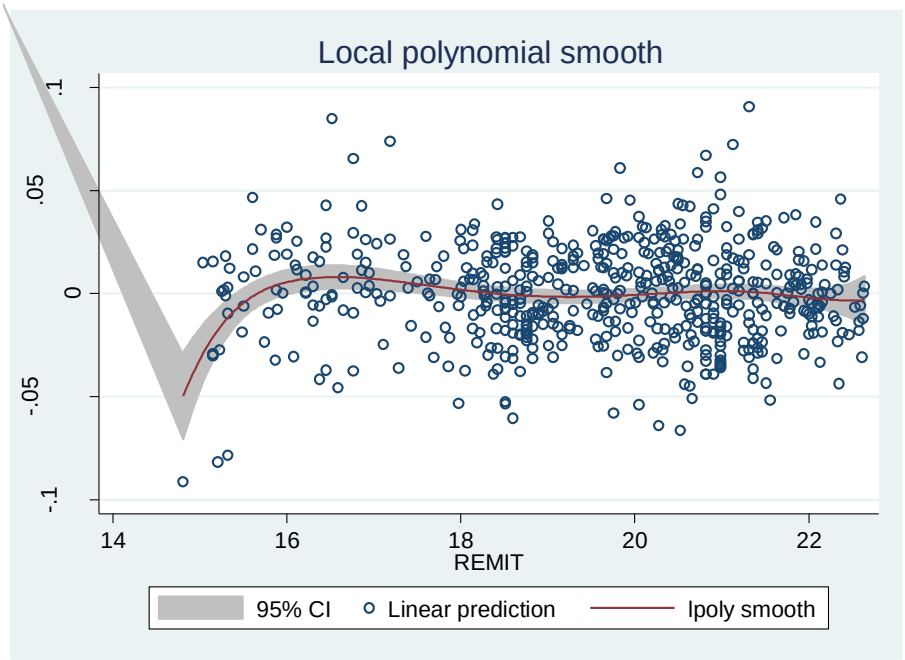

Figure 2. Partial fit of remittances and economic growth nexus. Note: the circles in the graph are estimated partial residuals for economic growth in the semi-parametric model using the Baltagi and Li (2002) estimator. The red curve represents the semi-parametric estimation of f(REMIT). 95%confidence bands are indicated by shaded areas.

5. Conclusion

This paper re-examines the remittances-growth nexus by employing the semi-parametric panel model with fixed effects as developed by Baltagi and Li (2002). We investigate a sample of 68 countries over the period 1988-2018. We find that there is a nonlinear relationship between remittances inflow and economic growth rate, in contrast to most of the literature.

One of the strengths of this paper is that it assumes no prior functional form on the regression model, which helps to reduce the misspecification error that may arise from imposing specific functional forms. This approach increases the robustness of the findings and contributes to a better understanding of the relationship between remittances inflow and economic growth rate. We shed light on the nonlinear nature of the remittances-growth nexus. The results may have important implications for financial and economic regulation, as policymakers can better understand the relationship between remittances inflow and economic growth rate, which can inform policy decisions related to the regulation of remittance flows and their impact on economic growth.

For policymakers, the findings of this paper have several implications. First, the nonlinear relationship between remittances inflow and economic growth rate suggests that the impact of remittances on economic growth is not straightforward and depends on the level of remittances inflow. Policymakers should consider the nonlinear nature of this relationship when designing policies related to remittances inflow.

Second, the results of the study highlight the importance of regulating remittance flows to maximize their positive impact on economic growth. Policymakers should consider implementing policies that encourage remittance inflows to flow into productive investments or sectors, which can contribute to economic growth. Additionally, policies aimed at reducing the costs associated with remittance transfers could help to increase remittance inflows, which may in turn boost economic growth.

Overall, the findings of this study suggest that policymakers should take a nuanced approach when designing policies related to remittance inflows and their impact on economic growth. Understanding the nonlinear nature of the remittances-growth nexus can help policymakers make more informed decisions that can contribute to economic growth and development.

References

Abida, Z. and Zghidi, N. (2014) "Financial development, trade openness and economic growth in North African countries," The Romanian Economic Journal, J17(53), pp. 91–120.

Abidemi, O. I. and Bidemi, A. S. (2014) "Financial Sector Development and Economic Growth: The Nigeria Experience," Scholarly Journal of Business Administration, 4(5), pp. 124–131.

Adarkwa, M. (2015) "Impact of remittances on economic growth: Evidence from selected West African countries (Cameroon, Cape Verde, Nigeria and Senegal)," African Human Mobility Review, 1(2), pp. 178–202. doi: 10.14426/ahmr.v1i2.741.

Aggarwal, R., Demirgüç-Kunt, A. and Pería, M. S. M. (2011) "Do remittances promote financial development?," Journal of development economics, 96(2), pp. 255–264. doi: 10.1016/j.jdeveco.2010.10.005.

Akkoyunlu, S. (2013) "Remittances and Financial Development: Is there a Direct Link? Evidence from Turkish Data. Presented by Mrs. Sule Akkoyunlu at the Conference on 'Migration: Global Development, New Frontiers', 10 - 13 April 2013, University College London." Available at: https://www.wti.org/research/publications/577/remittances-and-financial-development-is-there-a-direct-link-evidence-from-turkish-data/.

Alkhathlan, K. A. (2013) "The nexus between remittance outflows and growth: A study of Saudi Arabia," Economic modelling, 33, pp. 695–700. doi: 10.1016/j.econmod.2013.05.010.

Arellano, M. and Bond, S. (1991) "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," The Review of Economic Studies, 58(2), p. 277. doi: 10.2307/2297968.

Arellano, M. and Bover, O. (1995) "Another look at the instrumental variable estimation of error-components models," Journal of Econometrics, 68(1), pp. 29–51. doi: 10.1016/0304-4076(94)01642-d.

Azam, M. and Khan, A. (2011) "Workers' Remittances and Economic Growth:Evidence from Azerbaijan and Armenia," Global Journal of Human Social Science, 11(7), pp. 41–46.

Bagehot, W. (1873) Lombard Street - A Description of the Money Market (1962 Edition). Homewood: R.D. Irwin.

Baltagi, B. H. and Li, Q. (2000) "Efficient instrumental variable estimation of semiparametric dynamic panel data models," Working Paper Department of Economics, Texas A&M University.

Baltagi, B. and Li, D. (2002) "Series Estimation of Partially Linear Panel Data Models with Fixed Effects," Annals of Economics and Finance, 3(1), pp. 103–116.

Barajas, A., Gapen, M. T., Chami, R., Montiel, P. J. and Fullenkamp, C. (2009) "Do workers' remittances promote economic growth?," IMF Working Papers, 09(153).

Barua, S. and Rana, R. H. (2015) "Financial development and economic growth: Evidence from a panel study on south Asian countries," Asian economic and financial review, 5(10), pp. 1159–1173. doi: 10.18488/journal.aefr/2015.5.10/102.10.1159.1173.

Bettin, G. and Zazzaro, A. (2009) "Remittances and Financial Development: Substitutes or Complements in Economic Growth," Bulletin of Economic Research , 64(28), pp. 509–536.

Binford, L. (2003) "Migrant remittances and (under)development in Mexico," Critique of anthropology, 23(3), pp. 305–336. doi: 10.1177/0308275x030233004.

Blouchoutzi, A. and Nikas, C. (2014) “Emigrants’ remittances and economic growth in small transition economies: The cases of Moldova and Albania,” Journal of Economics and Business, 17(2), pp. 97–117.

Chami, R., Fullenkamp, C. and S., J. (2003) “Are immigrant remittances flows a source of capital for development,” IMF Working Papers, 03(189).

Chenery, H. B. and Stout, A. (1996) “Foreign assistance and economic development,” American Economic Revue, 55, pp. 679–733.

Chowdhury, M. (2016) “Financial development, remittances and economic growth: Evidence using a dynamic panel estimation,” Margin - the journal of applied economic research, 10(1), pp. 35–54. doi: 10.1177/0973801015612666.

Cooray, A. (2012) “Migrant remittances, financial sector development and the government ownership of banks: Evidence from a group of non-OECD economies,” Journal of International Financial Markets Institutions and Money, 22(4), pp. 936–957. doi: 10.1016/j.intfin.2012.05.006.

Coulibaly, D. (2015) “Remittances and financial development in Sub-Saharan African countries: A system approach,” Economic modelling, 45, pp. 249–258. doi: 10.1016/j.econmod.2014.12.005.

Danmola, R. A. and Wakili, A. M. (2013) “The Impact of Net Migrant Remittance on Economic Growth: Evidence from Nigeria,” International Journal of Humanities and Social Science, 3(8), pp. 303–315.

De Haas, H. (2007) “Remittances, Migration and Social Development: A Conceptual Review of the Literature,” Social Policy and Development Programme Paper. UNRISD Geneva, 34.

De Haas, H. (2010) “Migration and development: A theoretical perspective,” The international migration review, 44(1), pp. 227–264. doi: 10.1111/j.1747-7379.2009.00804.x.

Dickey, D. A. and Fuller, W. A. (1979) “Distribution of the estimators for autoregressive time series with a unit root,” Journal of the American Statistical Association, 74(366), pp. 427–431. doi: 10.2307/2286348.

Eggoh, J., Bangake, C. and Semedo, G. (2019) “Do remittances spur economic growth? Evidence from developing countries,” The journal of international trade & economic development, 28(4), pp. 1–28. doi: 10.1080/09638199.2019.1568522.

Eshenake, S. J. and Oyovwi, O. D. (2013) “Financial openness and economic growth in Nigeria: A vector error correction approach,” African research review, 7(4), pp. 79–92. doi: 10.4314/afrrev.v7i4.6.

Esteves, R. and Khoudour-Casteras, D. (2011) “Remittances, capital flows and financial development during the mass migration period, 1870-1913,” European review of economic history, 15(3), pp. 443–474. doi: 10.1017/s1361491611000037.

Faini, R. (2005) “Migration, Remittances and Growth,” in Poverty, International Migration and Asylum. London: Palgrave Macmillan UK, pp. 171–187.

Fantessi, A. A. and Kiprop, S. K. (2015) “Financial development and economic growth in West African Economic and Monetary Union (WAEMU),” African journal of business management, 9(17), pp. 624–632. doi: 10.5897/ajbm2015.7861.

Fayissa, B. and Nsiah, C. (2010) “Can Remittances Spur Economic Growth and Development? Evidence from Latin American Countries (LACs),” Department of Economics and Finance Working Paper Series, Middle Tennessee State University.

Feeny, S., Iamsiraroy, S. and McGillivray, M. (2014) “Remittances and economic growth: larger impacts in smaller countries?,” Journal of Development Studies, 50(8), pp. 1055–1066.

Freund, C. and Spatafora, N. (2008) "Remittances, transaction costs, and informality," Journal of development economics, 86(2), pp. 356–366. doi: 10.1016/j.jdeveco.2007.09.002.

Fritz, B., de Paula, L.F. and Prates, D.M. (2017) "Developmentalism at the Periphery: Can Productive Change and Income Redistribution Be Compatible with Global Financial Asymmetries?" Working Paper Series 101, Berlin: desiguALdades.net, International Research Network on Interdependent Inequalities in Latin America.

Gazdar, K. and Kratou, H. (2012) "Institutions financial development and the remittances growth nexus in Africa," Journal of Economic Literature.

Giuliano, P. and Ruiz-Arranz, M. (2005) "Remittances, Financial Development, and Growth," IMF Working Papers, 05(234).

Giuliano, P. and Ruiz-Arranz, M. (2009) "Remittances, Financial Development, and Growth," Journal of Development Economics, 90(1), pp. 144–152.

Goschin, Z. (2013) "The remittances as A potential economic growth resource for Romania," Annales Universitatis Apulensis, 2(15), pp. 655–661. doi: 10.29302/oeconomica.2013.15.2.29.

Hamadi, M. and Heinen, A. (2015) "Firm performance when ownership is very concentrated: Evidence from a semiparametric panel," Journal of empirical finance, 34, pp. 172–194. doi: 10.1016/j.jempfin.2015.07.004.

Hassan, G. M. and Shakur, S. (2012) "Nonlinear growth effect of remittances in recipient countries: an econometric analysis of remittances-growth nexus in Bangladesh," MPRA Paper 40086. doi: 10.20944/preprints201607.0062.v1.

Ie, M. S. (2011) "The role of remittances in financial development in Lesotho: Evidence from alternative measures of financial development," Journal of Development and Agricultural Economics, 3(6), pp. 241–251.

Im, K. S., Pesaran, M. H. and Shin, Y. (2003) "Testing for unit roots in heterogeneous panels," Journal of Econometrics, 115(1), pp. 53–74. doi: 10.1016/s0304-4076(03)00092-7.

Imai, K.S., Gaiha, R., Ali, A. and Kaicker, N. (2014) "Remittances, growth and poverty: New evidence from Asian countries," Journal of policy modeling, 36(3), pp. 524–538. doi: 10.1016/j.jpolmod.2014.01.009.

International Monetary Fund (2022) Macroeconomic and Financial Data available at: https://data.imf.org/?sk=388dfa60-1d26-4ade-b505-a05a558d9a42&sid=1479329132316

Javid, M., Arif, U. and Qayyum, A. (2012) "Impact of Remittances on Economic Growth and Poverty," Academic Research International, 2(1), pp. 433–447.

Jayaraman, T. K., Choong, C. K. and Kumar, R. R. (2012) "Role of remittances in India's economic growth," Global business & economics review, 14(3), p. 159. doi: 10.1504/gber.2012.047802.

Jayaraman, T. K., Choong, C.-K. and Kumar, R. R. (2011) "Financial sector development and remittances in Pacific island economies: How do they help the world's two most recipient-dependent countries?," Perspectives on global development and technology, 10(3–4), pp. 386–405. doi: 10.1163/156914911x610376.

Kao, C. (1999) "Spurious regression and residual-based tests for cointegration in panel data," Journal of Econometrics, 90(1), pp. 1–44. doi: 10.1016/s0304-4076(98)00023-2.

Karagöz, K. (2009) "Workers' Remittances and Economic Growth: Evidence from Turkey," Journal of Yasar University, 4(13), pp. 1891–1908.

Karikari, N. K., Mensah, S. and Harvey, S. K. (2016) "Do remittances promote financial development in Africa?," SpringerPlus, 5(1), p. 1011. doi: 10.1186/s40064-016-2658-7.

Keele, L. J. (2008) Semiparametric Regression for the Social Sciences. West Sussex, England: John Wiley & Sons.

Kindleberger, C. P. (1965) Europe's postwar growth: The role of labor supply. Oxford, England: Oxford University Press.

Koay, Y.-Y. and Choong, C.-K. (2013) "The Nexus Between Worker Remittances and Economic Growth in Malaysia," Prosiding Perkem, Jilid, 8(1), pp. 507–515.

Kratou, H. and Gazdar, K. (2016) "Addressing the effect of workers' remittance on economic growth: evidence from MENA countries," International journal of social economics, 43(1), pp. 51–70. doi: 10.1108/ijse-08-2013-0189.

Kumar, R. R. (2012) "Exploring the interactive effects of remittances, financial development and ICT in Sub-Saharan Africa: an ARDL bounds approach," African Journal of Economic and Sustainable Development, 1(3), pp. 214–242.

Kumar, R. R. (2013) "Remittances and economic growth: A study of Guyana," Economic systems, 37(3), pp. 462–472. doi: 10.1016/j.ecosys.2013.01.001.

Kumar, R. R. and Stauvermann, P. J. (2014) "Exploring the effects of remittances on Lithuanian economic growth," Engineering Economics, 25(3), pp. 250–260. doi: 10.5755/j01.ee.25.3.6421.

Kumar, R. R. and Vu, H. T. T. (2014) "Exploring the nexus between ICT, remittances and economic growth: A study of Vietnam," Southeast Asian Economies, 31(1), pp. 104–120. doi: 10.1355/ae31-1g.

Levin, A., Lin, C.-F. and James Chu, C.-S. (2002) "Unit root tests in panel data: asymptotic and finite-sample properties," Journal of Econometrics, 108(1), pp. 1–24. doi: 10.1016/s0304-4076(01)00098-7.

Levine, R., Loayza, N. and Beck, T. (2000) "Financial intermediation and growth: Causality and causes," Journal of monetary economics, 46(1), pp. 31–77. doi: 10.1016/s0304-3932(00)00017-9.

Libois, F. and Verardi, V. (2012) "Semiparametric fixed-effects estimator," Working Papers Unviersity of Namur, Department of Economics, 1201.

Lipton, M. (1980) "Migration from rural areas of poor countries: The impact on rural productivity and income distribution," World development, 8(1), pp. 1–24. doi: 10.1016/0305-750x(80)90047-9.

Mamingi, N. and Perch, J. (2013) "Population growth and economic growth/development: an empirical investigation for Barbados," Journal of Economics and Sustainable Development, 4(4), pp. 93–105.

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A. and Taylor, E. (1993) "Theories of international migration: A review and appraisal," Population and development review, 19(3), p. 431. doi: 10.2307/2938462.

McKinnon, R. I. (1973) Money and capital in economic development. Washington, D.C., DC: Brookings Institution.

Metzger, M. and Wu, J.P. (2020) "Moving Minds and Money: The Political Economy of Migrant Transfers," ICDD Working Papers, Paper No. 33. https://kobra.uni-kassel.de/handle/123456789/12370.

Meyer, D. and Shera, A. (2013) "Remittances and their impact on Economic Growth," Periodica Polytechnica Social and Management Sciences, 21(1), pp. 3–19.

Mundaca, G. (2009) "Remittances, Financial Market Development, and Economic Growth: The Case of Latin America and the Caribbean," Review of Development Economics, 13(2), pp. 288–303.

Ndikumana, L. and Baliamoune-Lutz, M. (2007) "The Growth Effects of Openness to Trade and the Role of Institutions: New Evidence from African Countries," MPRA Paper No. 6189 University of Massachusetts Amherst.

Nsiah, C. and Fayissa, B. (2013) “Remittances and economic growth in Africa, Asia, and Latin American-Caribbean countries: a panel unit root and panel cointegration analysis,” Journal of Economics and Finance, 37(3), pp. 424–441. doi: 10.1007/s12197-011-9195-6.

Nwosu, C. and Ga, M. A. (2015) “Financial development and economic growth nexus in Nigeria,” IOSR Journal of Economics and Finance, 6(4), pp. 49–56.

Nyamongo, E. M., Misati, R.N., Kipyegon, L. and Ndirangu, L. (2012) “Remittances, financial development and economic growth in Africa,” Journal of Economics and Business, 64(3), pp. 240–260. doi: 10.1016/j.jeconbus.2012.01.001.

Nzotta, S. M., Ezeabasili, V. N. and Alajekwu, U. B. (2013) “Trade openness, stock market development and economic growth of Nigeria: empirical evidence,” Research Journal of Finance and Accounting, 4(3), pp. 120–127.

Olayungbo, D. O. and Quadri, A. (2019) “Remittances, financial development and economic growth in sub-Saharan African countries: evidence from a PMG-ARDL approach,” Financial innovation, 5(1). doi: 10.1186/s40854-019-0122-8.

Oluwafemi, A. and Ayandibu, A. O. (2014) “Impact of remittances on development in Nigeria: Challenges and prospects,” Journal of sociology and social anthropology, 5(3), pp. 311–318. doi: 10.1080/09766634.2014.11885635.

Pearce, O. T. and Pelesai, A. N. (2013) “Financial development and economic growth in Nigeria,” European Journal of Business and Management, 5(19), pp. 69–81.

Pedroni, P. (1999) “Critical values for cointegration tests in heterogeneous panels with multiple regressors,” Oxford bulletin of economics and statistics, 61(s1), pp. 653–670. doi: 10.1111/1468-0084.0610s1653.

Pesaran, M. H. (2004) “General Diagnostic Tests for Cross Section Dependence in Panels.” Apollo - University of Cambridge Repository. doi: 10.17863/CAM.5113.

Pesaran, M. H. (2007) “A simple panel unit root test in the presence of cross-section dependence,” Journal of applied econometrics (Chichester, England), 22(2), pp. 265–312. doi: 10.1002/jae.951.

Pesaran, M. H. and Shin, Y. (1995) “An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis,” Cambridge Working Papers in Economics 9514. Faculty of Economics, University of Cambridge.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001) “Bounds testing approaches to the analysis of level relationships,” Journal of applied econometrics (Chichester, England), 16(3), pp. 289–326. doi: 10.1002/jae.616.

Pesaran, M. H., Shin, Y. and Smith, R. P. (1999) “Pooled mean group estimation of dynamic heterogeneous panels,” Journal of the American Statistical Association, 94(446), pp. 621–634. doi: 10.1080/01621459.1999.10474156.

Phillips, P. C. B. and Perron, P. (1988) “Testing for a unit root in time series regression,” Biometrika, 75(2), pp. 335–346. doi: 10.2307/2336182.

Pradhan, G., Upadhyay, M. and Upadhyaya, K. (2008) “Remittances and economic growth in developing countries,” European journal of development research, 20(3), pp. 497–506. doi: 10.1080/09578810802246285.

Praise, G. and Precious, C. (2014) “Impact of financial liberalization on economic growth: A case study of South Africa,” Mediterranean journal of social sciences, 5(23), pp. 238–245. doi: 10.5901/mjss.2014.v5n23p238.

Rao, B. B. and Hassan, G. M. (2011) “A panel data analysis of the growth effects of remittances,” Economic modelling, 28(1–2), pp. 701–709. doi: 10.1016/j.econmod.2010.05.011.

Ratha, D. (2013) “The impact of remittances on economic growth and poverty reduction,” Migration Policy Institute: Policy Brief, 8.

Ratha, D. (2017) What are Remittances?, IMF Publications - Finance & Development. Available at: https://www.imf.org/external/pubs/ft/fandd/basics/pdf/ratha-remittances.pdf.

Richard, H., Adams, R. H. and Ja, P. (2005) “Do international migration and remittances reduce poverty in developing countries?,” World development, 33(10), pp. 1645–1669. doi: 10.1016/j.worlddev.2005.05.004.

Robinson, P. M. (1988) “Root-N-Consistent Semiparametric Regression,” Econometrica: journal of the Econometric Society, 56(4), pp. 931–954. doi: 10.2307/1912705.

Rubenstein, H. (1992) “Migration, development and remittances in rural Mexico,” International migration (Geneva, Switzerland), 30(2), pp. 127–153. doi: 10.1111/j.1468-2435.1992.tb00690.x.

Russell, S. S. (1992) “Migrant remittances and development,” International migration (Geneva, Switzerland), 30(3–4), pp. 267–287.

Sarkar, B. and Datta, K. (2014) “Relationship between remittances and economic growth in Bangladesh: An econometric study,” SSRN Electronic Journal. doi: 10.2139/ssrn.2375991.

Schumpeter, J. (1911) Theory of economic development. Cambridge, USA: Harvard University Press.

Sibindi, A. B. (2014) “Remittances, financial development and economic growth: Empirical evidence from Lesotho,” Journal of governance and regulation, 3(4), pp. 116–124. doi: 10.22495/jgr_v3_i4_c1_p4.

Siddique, A., Selvanathan, E. A. and Selvanathan, S. (2012) “Remittances and economic growth: Empirical evidence from Bangladesh, India and Sri Lanka,” The journal of development studies, 48(8), pp. 1045–1062. doi: 10.1080/00220388.2012.663904.

Sobiech, I. (2015) “Remittances, finance and growth: does financial development foster remittances and their impact on economic growth?,” FIW Working Paper Series, 158.

Todaro, M. P. (1969) “A Model of Labor Migration and Urban Unemployment in Less Developed Countries,” The American Economic Review, 59(1), pp. 138–148.

Todaro, M. P. and Ca, S. S. (2012) Economic Development 11th Edition. New Jersey, USA: Pearson Education Limited.

United Nations Department of Economic and Social Affairs (2015) International Migration Report 2015. Available at: https://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2015.pdf.

Wang, S., Wang, X. and Dai, J. (2015) “Statistical diagnosis for non-parametric regression models with random right censorship based on the empirical likelihood method,” Journal of applied statistics, 42(6), pp. 1367–1373. doi: 10.1080/02664763.2014.999656.

World Bank (2014) Migration and Development Brief 22.

World Bank (2017) World Development Indicators. Washington, D.C., DC: World Bank. Available at: https://databank.worldbank.org/source/world-development-indicators.

World Bank (2021) Migration and Remittances Data portal. Available at: https://data.worldbank.org/indicator/BX.TRF.PWKR.CD.DT

World Bank Group (2018) “Migration and Remittances: Recent Developments and Outlook - Transit Migration,” Migration and Development Brief No. 29. Washington DC, USA. Available at: http://hdl.handle.net/10986/29777.

Yaseen, H. S. (2012) “The Positive and Negative Impact of Remittances and Economic Growth in MENA Countries,” Journal of International Management Studies, 7, pp. 7–14.

Yatchew, A. (1998) “Nonparametric Regression Techniques in Economics,” Journal of Economic Literature, 36(2), pp. 669–721.

Imprint

Editors:
Sigrid Betzelt, Eckhard Hein, Martina Metzger, Martina Sproll, Christina Teipen, Markus Wissen, Jennifer Pédussel Wu (lead editor), Reingard Zimmer

ISSN 1869-6406

Printed by
HWR Berlin

Berlin, August 2024