Econometric Analysis of the Relationship Between Domestic Economic Growth and Levels of Inflow of Remittances in Developing Countries

MIHAIL NASKOVSKI

Kalamazoo College[a]

ABSTRACT: The international global migration has produced an exponential growth of remittances, which can be defined as the transfer of funds from one country to another. This study will inspect the macroeconomic impact of remittance inflow on economic growth using panel regression, covering the period from 1981 to 2020 and focusing on a sample of 152 countries, then filtered by 4 geographical regions for additional analysis. Like many studies before, a consensus about an overall effect of the flows on global level could not be reached from his study following the analysis of the general sample. However, on a more specific regional analysis like this study intended to provide, the results have given slightly clearer answers. Finding a positive significant coefficient in the sample regression of the African nations pushes forward the claim of remittances playing an important role for increasing the cap of savings and thus investment options in developing nations. On the other hand, a negative significant coefficient for the Caribbean, Central, and South American countries' sample suggests support for the claim that higher remittance inflows are probable reaction to, not an actual reason for, decreasing domestic output i.e., provides support for their counter-cyclical nature.

Introduction

      International economic development has been often specified as the global challenge to alleviate massive poverty in the developing world and reduce disparities between the Global North and Global South in terms of standards of living. Macroeconomic processes suggested to national economies for this mission have often included establishment of foreign direct investments, private capital inflows, trade liberalization, or receiving foreign aid packages. However, a globalization of the national economies into a more connected international market is pointing to a newer, more robust trend of realizing an intertwined economic development. This trend is based on the multi-decade expansion of the freedom of movement for migrant and capital across the globe.

      Defining the exact concept of remittance inflow among scholars has been a consequence of using the only well-established method of generating macroeconomic data on the topic:

1

analyzing data from international data aggregators such as the World Bank and International Monetary Fund, which work depends on aggregating the often complex and diverse categories of capital flows from the national balances of payments. As pointed out by Chami et al. (2008)[1], the usual balance of payments includes three categories that seem very similar to one another: employee compensation, migrant transfers, and workers' remittances. Employee compensation is defined as funds that have come to the country recipient from seasonal labor only, an example being seasonal agricultural workers. Migrant transfers, on the other hand, are reallocation of entire funds of a current first, second, or third generation migrant to the country of origin due to change of residency status. This is not necessarily associated with a willingness to send this capital to, for example, family members, but more so to establish a residential life in their country of origin. Finally, worker remittances are funds that are specifically sent to the county of origin by a migrant that currently lives and works permanently in the host country. Many studies that have analyzed the impact of the remittances have used either the sum of all three categories, or just a specific combination of them. Chami et al.[2] and Barajas (2009)[3] point to a diversity in the data sets used by every researcher. With the inclusion of every other category except the workers' remittance, the chance for ending up with different interpretations of the data is highly likely.

It should be also noted that the values for remittance inflows differ in transparency from country to country. Informal channels of remittances are estimated to present a significant proportion of unreported inflows, which reach families and probably influence the aggregate demand in a society without a visible effect and acknowledgement of the transferred funds from abroad. In these instances, macroeconomic studies lack an advantage over microeconomic surveys that focus on interacting with families who are recipients of remittances[4] (Clemens and McKenzie, 2018).

The international global migration has produced an exponential growth of remittances, which can be defined as the transfer of funds from one country to another. Remittances have grown due to the increasing labor migrant population's ability to send surplus of funds from their current country of residence and work to their homeland, often referred to as country receiver. The notable fact in this global wave is that majority of these funds have been reallocated from high-income countries to low-income ones, which practically could be defined as a reallocation of funds from wealthier to poorer states. According to the World Bank Remittance Data, the total remittances flow of 2019 reached an all-time high value of $689 billion[5] (Financial Times, 2019), as $558 billion of these transactions ended up in low- and middle-income countries (LMICs)[6] (The World Bank, 2021). These inflows remained consistent even during 2020, a year of a global pandemic, with $550 billion towards the low- and middle-income economies[7] (The World Bank, 2021). The last two annual values surpassed the total amount of foreign direct investment, private capital flow, or foreign aid, all of which are still more popularized as the main methods of reducing global disparities and promoting economic growth in the developing world. In relation to economic development, numerous studies have found that remittances serve as a robust tool for boosting domestic spending on essential needs such as nutrition, education, and other necessary life standards, reducing poverty vulnerability, and acting much faster than any other capital flow due to the agents' own decision-making.

With the increasing levels of remittances across the globe, the new trend begs the questions: could a continual massive increase of money transfers from the Global North to the Global South be the development success that the globalized economy has aimed to achieve? Founded on understanding the current academic consensus and disagreement on the topic of remittances, this study will inspect the macroeconomic impact of remittance inflow on economic growth using

2

panel regression, covering the period from 1981 to 2020 and focusing on a sample of 152 countries, ~~then~~ filtered by 4 geographical regions for additional analysis.

First, this paper provides an overview on the definition of remittance inflows to narrow down the available data, further analyzing proposed theoretical frameworks that include the impact of remittances on Gross Domestic Product growth. The goal of establishing a relevant econometric model continues with highlighting the adoption of control-variables needed for specifying the effect of the inflows, as well as recognition of the endogenous nature of remittances and other econometric challenges from the available data sets. The paper then proceeds in defining the methodology and data used for the econometric analysis, followed by the model results. Conclusion and further research suggestions are provided by the end of the paper.

Literature Review

Theoretical Frameworks Incorporating Macroeconomic Impact of Remittances

The impact of remittances on growth in a domestic economy has been hypothesized via changes in multiple macroeconomic indicators. The idea to include remittances in the macroeconomic model is built on the claim that remittances act as an additional savings inflow account to households in the recipient countries. Families transition their savings account in investment activities and thus accumulate capital that was not possible to be financed from the household's other income sources[8] (Eggoh, Bangake, and Semedo, 2019). Furthermore, in the role of savings accounts, remittance inflows could directly support the removal of numerous obstacles for financing activities in the given country[9] (Barajas, 2009). Remittances can also prevent output volatility[10] (Chami, Hakura, and Montiel, 2009) as they act as safety net for many consumers, maintaining positive expectations in aggregate demand that would on its own condition indirectly prevent fear of financial instability on macroeconomic level. Still, there has been an opposition that this argument is an all-round assessment of impact of remittances on investment. Scholars have argued that remittances indeed alleviate poverty and reduce the lack of consumption levels. However, these effects have been argued to not have any direct links to increase of investment and capital accumulation boost[11] [12] (Barajas, 2009; Sutradhar, 2020) as the ratio of marginal propensity to consume is very high in the developing world.

On the impact on growth through labor force dynamics, remittances have again been seen as polarizing factor of economic growth. On one hand, remittances have been hypothesized as a substitute to earning labor income for some household members. If a recipient obtains funds that are enough to satisfy their basic necessities for life or even more, some economists argue that these individuals accept to trade their ability to gain more wealth to spending more time on leisure activities[13] (Barajas, 2009). On the other hand, using the previous argument centered around lowering the opportunity cost for foregoing active participation in the labor force, many economists indicate that remittance inflows support family youth in focusing longer time on schooling[14] [15] [16](Yang, 2008; Hanson and Woodruff, 2003; Cox and Ureta, 2003). The tendency described could give rise to perhaps shorter lifespan of labor participation, but of a much more highly skilled, highly productive labor force overall.

Another theoretically established concern for remittance inflows relates to their impact on the trade dynamics established in a domestic economy. According to Clemens and McKenzie (2018), there is a significant claim that the transactions occurring with the transfer of funds can appreciate the value of the currency of the recipient country[17]. Eggoh, Bangake, and Semedo further point out to reduction of the optimized total factor productivity and technological

3

innovation that the country has invested for specialization in certain trade sectors[18] (2019).

Finally, aside the different impacts explained, it must be noted that the flows and effects of remittances have a very endogenous nature in the macroeconomic model of determining the domestic output. The most apparent connection is perhaps the one relating the inflows to its source: the migrant labor population of a country recipient. Funds arrive in the domestic economy from abroad, from a portion of the domestic population that has decided willingly or forcefully to not participate directly in the domestic economy by remaining in the country recipient. Therefore, the same emigration that makes remitting possible for the households back home is in a way an opportunity cost for the country recipient as the country cannot rely on that part of its total labor force[19] [20] (Sutradhar, 2020; Clemens and McKenzie, 2018). The claim has been supported by empirical evidence from panel data that suggest strong significant negative value for the relationship between logs of GDP per capita and a certain annual level of remittances-to-GDP ratio[21] (Dujava and Kálovec, 2020). With this theoretical framework, one can easily conclude how remittances magnitude of flow can be already easily defined and assumed to exist in the economic model by referring to the net export of human capital that an economy undergoes, or in the way of representing the mentioned opportunity cost of emigration of the labor force.

Overview of Past Econometric Study Results

A significant amount of the research done on the impact of remittances have used different econometric techniques. Although rarer, cross-sectional data sets have been used by Abdih, Chami, Dagher, and Montiel (2010) on a macroeconomic scale[22], and more often on microeconomic scale[23] [24] such as studies by Hanson and Woodruff (2003) and Cox and Ureta (2003). Macroeconomic analyses have included even a time-series for a single case country[25] like the study by Javid et al. (2012). Still, a big portion of research has been completed by establishing a cross-sectional panel data of numerous countries from different regions[26] [27] [28] [29] (Dujava and Kálovec, 2020; Zghidi, Sghaier, and Abida, 2018; Williams 2018; Giuliano and Ruiz-Arranz, 2009) or data sets from specific regions such as Latin American countries[30] (Ekanayake and Moslares, 2020), Sub-Saharan African countries[31] (Olayungbo and Quadri, 2019), or Western Balkans[32] (Bajra, 2021).

Overview of Used Control Variables in Econometric Models

Consumption, savings, and investment levels throughout time periods have served as insightful control variables of the econometric model in numerous studies. In economic theory, these variables are regarded as one of the main potential channels of remittance's exogenous growth effect[33] (Barajas, Chami, Fullenkamp, Gapen, and Montiel, 2009). Many scholars have also established the development level of the financial system in a developing economy as an essential variable for the inflows' effect on output growth[34] [35] [36] (Giuliano and Ruiz-Arranz, 2009; Olayungbo and Quadri, 2019; Aggarwal, Demirgüç-Kunt, and Martínez Pería, 2011).

Another significant control variable to keep the remittances' endogenous nature out of the objective analysis is setting up the trade openness of the studied cases. Lueth and Ruiz-Arranz (2006), Barajas, Chami, Fullenkamp, Gapen, and Montiel (2009), have argued that development of bilateral remittance flows often follow the development of trade flows[37] [38]. Often used variables for this goal include the trade-to-GDP ratio[39] [40] [41] (Olayungbo and Quadri 2019; Eggoh, Bangake, and Semedo, 2019; Javid, Arif, and Qayyum, 2009), which represents the total exported and imported goods and services as a share of GDP. Indicators such as Foreign Direct Investment and Foreign Aid have been also added to econometric models in numerous studies as control variables,

4

although many studies have confirmed their lack of correlation with remittances due to their higher volatility and pro-cyclical nature compared to the flow of remittances[42][43][44] (Dujava and Kálovec, 2020; Gammeltoft, 2002; Ratha, 2003).

  Essential control variables in eliminating the bias in the regression for economic growth are also the size of country's economy, population, and migrant stock. A study needs to control the values of one country's specific geographic and demographic characteristics to level out the field between economies with larger absolute numbers of work force, and consequently absolute number of migrant stock abroad. Finally, remittance effect has been studied not only with control variables that limit the remittances' endogenous nature, but also with an addition of an interaction effect. An example is the interaction between remittances' impact and quality of institutions in a country recipient [45][46][47][48][49] (Abdih et al., 2010; Tyburski, 2014; Zghidi, Sghaier, and Abida, 2018; Ebeke, 2013; Williams, 2018).

Data and Methodology

  Analyzing the effects of remittances on economic growth should involve observing the latest data trends, being inclusive to the questions of endogeneity, as well as differentiating the specific impacts of remittances in different regions in the global economy. With these principal objectives in mind, this study would inspect the macroeconomic impact of remittance inflow on economic growth using panel regression, covering the period from 1981 to 2020 and focusing on a sample of 152 countries, then filtered by 4 geographical regions for additional analysis. The sample covering all 152 cases is referred as the general sample, while each regional sample is noted under the names of the areas covered. Table 1 provides a sum description of the variables used and their data sources.

  Upon the collection of the complementary data, a robust merging process of the indicators for each country followed in the software R. Combining existing data for all indicators meant also organizing them in the specific longitudinal format to prepare the sample for direct panel data recognition in software like STATA. Once imported in STATA, the dataset was declared as a panel one, with the variable "ISO" (Country Code) being the identification component for the countries i.e., defining every country as a unique group of observations, while the variable "year" being recognized as the time period. Numerous nations have not provided specific data for the variables for every year. The lack of the dependent variable gdp_growth_{it} in some cases therefore caused the general panel of the whole sample to be recognized as unbalanced, where those cases for certain years were excluded.

Specification of Model, Variable Description, and Data Wrangling

  With the specified research question, the following model establishes a function of economic growth:

$$gdp\_growth_{it} = \beta_0 + \beta_1 remittance\_ratio_{it} + \beta_2 trade\_GDP\_ratio_{it} + \beta_3 investment\_rate_{it}$$
$$+ \beta_4 savings\_rate_{it} + \beta_5 fdi\_ratio_{it} + \beta_6 financial\_development_{it}$$
$$+ \beta_7 econ\_freedom_{it} + \beta_8 administration_{it} + \beta_9 migrant\_stock_{it} + \alpha_i + \varepsilon_{it}$$

5

Table 1: Variable Description and Data Sources

Dependent Variable	Description	Source
gdp_growth_{it}	Annual percentage change rate of GDP (measured by PPP standards) by country receiver, expressed as a percentage.	International Monetary Fund - World Economic Outlook Database https://www.imf.org/en/Publications/WEO/weo-database/2021/April

Explanatory Variables	Description	Source
$remittance\_ratio_{it}$	Annual Amount of Remittance Inflow to each country, expressed as a percentage of annual GDP.	The World Bank - Migration and Remittances Data https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data
$trade\_GDP\_ratio_{it}$	Annual aggregate value of imports and exports divided by the gross domestic product. Measure for trade openness of a country. Expressed as a percentage of annual GDP.	International Monetary Fund - Direction of Trade Statistics (DOTS) https://data.imf.org/regular.aspx?key=61013712
$investment\_rate_{it}$	Annual ratio of total investment (the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector) in current local currency to GDP in current local currency, expressed as a percentage of annual GDP.	International Monetary Fund - World Economic Outlook Database https://www.imf.org/en/Publications/WEO/weo-database/2021/April
$savings\_rate_{it}$	Annual ratio of gross national savings (gross disposable income less final consumption expenditure and adjustment for pension funds) in current local currency to GDP in current local currency, expressed as a percentage of annual GDP.	International Monetary Fund - World Economic Outlook Database https://www.imf.org/en/Publications/WEO/weo-database/2021/April
fdi_ratio_{it}	Annual ratio of foreign direct investment net flows (change in assets minus the change in liabilities in each country's balance of payments, where net FDI outflows are assets and net FDI inflows are liabilities) to GDP in current US dollars. Expressed as a percentage of annual GDP. Positive values signify greater quantities of inflows, while negative values signify greater quantities of outflows.	The World Bank Database https://data.worldbank.org/indicator/BN.KLT.DINV.CD

6

$financial\_development_{it}$	Financial Development Index is defined by the IMF as "a combination of depth (size and liquidity of markets), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity of capital markets)" (IMF, 2016). Annually measured from 0 to 1, with 0 representing no financial development to 1 being highest financially developed environment in country.	International Monetary Fund – Financial Development Index Database https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B
$econ\_freedom_{it}$	Economic Freedom Summary Index by Fraser Institute measures economic freedom, ranking countries based on five areas—size of government, legal structure and property rights, access to sound money, freedom to trade internationally, regulation of credit, labor, and business. Measured from 1 to 10, value of 1 being least amount of freedom, while value of 10 signaling most amount of freedom. Data between 1980 and 2000 is available only as estimators of 5-year periods (data for 1980, 1985, 1990, 1995), while most countries have annual data from 2000 onwards.	Fraser Institute Database https://www.fraserinstitute.org/economic-freedom/dataset?geozone=world&year=2019&page=dataset&min-year=2&max-year=0&filter=0
$administration_{it}$	The Impartial Administration Index is part of IDEA's Global State of Democracy Indices, measuring absence of corruption fair public administration. Annually measured from 0 to 1, with 0 representing no performance to 1 being highest performance of democratic and responsible institutional frameworks in a country.	IDEA, Global State of Democracy Indices https://www.idea.int/gsod-indices/#/indices/world-map-table?attr=%5B%22A_04%22%5D
$migrant\_stock_{it}$	Number ("stock") of international emigrants by country, expressed in millions. The data is presented only as estimates of 5-year periods, therefor only value for 1990, 1995, 2000, 2005, 2010, 2015, and 2020.	United Nations - Population Division https://www.un.org/development/desa/pd/content/international-migrant-stock
α_i	time-invariant error term	
ε_{it}	time-varying error term	
i	country observed (1 - 153)	

7

Optimizing Robustness of Estimators

Initial panel regressions pointed to a significant decrease of observations included in the results, namely due to the absence of data for many cases, specifically for the variables $econ\_freedom_{it}$ and $migrant\_stock_{it}$. Although this first regression model would have been the most comprehensive one, regressing for only handful of years of entire data due to the limit of the above-mentioned variables does not provide the best insight for a panel data. Thus, the initial model needed to be further edited by excluding the two challenging variables and thus creating the following function:

$$gdp\_growth_{it} = \beta_0 + \beta_1 remittance\_ratio_{it} + \beta_2 trade\_GDP\_ratio_{it} + \beta_3 investment\_rate_{it} + \beta_4 savings\_rate_{it} + \beta_5 fdi\_ratio_{it} + \beta_6 financial\_development_{it} + \beta_7 administration_{it} + \alpha_i + \varepsilon_{it}$$

After the model was reiterated, the Hausman Test - determining the best estimation technique - was used on the general sample as well as on all 4 regional subsets. The Hausman test helped establish whether a preferred regression model is a fixed effects model or a random effects model, based on the presence or absence of a correlation between the errors and the regressors in the model. The null hypothesis states that the preferred model is random effects where there is no correlation between the errors and the regressors. The alternative hypothesis claims the opposite, where the preferred model is a fixed effects one, in order to adjust to the present correlation. The test results suggested that the general sample, as well as the sample covering the African countries, South/South-East Asia, and Europe should proceed being regressed with the fixed-effects approach, while the subset for countries in the Americas should proceed being regressed with a random-effects approach. Thus, with the adoption of fixed-effects estimation for majority of the samples, the Hausman Test showcased that there is significant statistical evidence to reject the null hypothesis that the unobserved time-invariant component is unrelated to the regressors. On the contrary, for the sample covering the Americas, the assumption that the unobserved time-invariant component is unrelated to the regressors was supported by the test, leaving the random-effects estimation as the better technique.

To further eliminate the possible unequal variance of the residuals, an occurrence referred to as heteroskedasticity, the regression techniques also include cluster robust standard errors for controlling the unevenness of residuals. Serial correlation can also pose a problem in panel data, as the error terms in our model could be correlated either along a time period for each individual group observation or across numerous groups of observation. With the use of robust standard errors in the estimation, autocorrelation is aimed to be eliminated as well.

Model Results

Summary Statistics

The summary statistics unveil the challenges of merging complementary data for numerous cases. As seen from Table 1, which describes the general sample, the presence of data ("Observations") for each variable is very diverse. While the more established variables have more total observations (N) and more unique groups of observations (n) for a longer average time period (T-bar) overall, other complimentary variables lack the same presence and frequency. For example, the total observations for the dependent variable gdp_growth_{it} is 5395, with every country being present (n = 152), while the average amount of years of present data -T-bar - standing

8

at 35.4934 years. The essential independent variable $remittance\_ratio_{it}$ is accounted less, but with still significant presence, with every country being accounted (n = 152) in total of 4489 observations (N = 4489) and significant average amount of years being recorded (29.5329) for the general sample. On the other hand, variables $econ\_freedom_{it}$ and $migrant\_stock_{it}$ have a significantly lower presence, with $econ\_freedom_{it}$ being observed only in 2298 cases and average amount of years for every case being 18.5323, while $migrant\_stock_{it}$ having only 981 observations with average of 6.49669 years. These variables have lacked data as both include multiple or only 5-year estimators instead of an annual data, leaving the model to be optimized further below in the next section.

      Regarding the dispersion of data, insight from the overall, between, and within variations for the general sample need to be noted. The overall approach includes all datapoints for a variable for every case. The estimation of between variation focuses on calculating the variation among the means of every unique group of observations. By focusing on plotting the means of each of these unique groups, between variation controls the potential significance of time and inspects only the variation coming from the uniqueness of the cases themselves. On the contrary, the within variation of the sample controls for the differences between every group of observations and focuses on explaining the variation of the data regarding the passing of the time period.

Table 2: Summary Statistics for Variables' Value of General Sample

Variable	Mean overall	Std. Dev	Min	Max
gdp_growth	5.809728	6.27037	-55.78	85.16
remittance_ratio	2.246202	4.24623	0	69.49
trade_GDP_ratio	38.0772	198.088	0	7726.02
investment_rate	23.83878	10.6233	-8.629	116.063
savings_rate	18.71393	11.7941	-93.872	120.552
fdi_ratio	1.619819	3.89698	-56.66	92.7
financial_development	0.202232	0.13877	0	0.8
econ_freedom	6.440283	1.00701	2.52	9.02
administration	0.426453	0.14104	0	0.84272
migrant_stock	1.078889	1.90377	0.0012	17.8695

      Although the sample mean of response variable gdp_growth_{it} is approximately 5.8 % change of domestic output, a significant variability exists among the 152 countries for the 40-year period. This is evident by the overall standard deviation value, which simply puts 68 % of the data between approximately -0.5 % and 12.1 % change, a large space for interpreting between economic stagnation and growth for the developing world for large time period. The within estimation showcases similar results with 68 % of the data located between -0.20 % and 11.8 % change of output. On the other hand, plotting each country's mean of growth rates across the time period and thus holding time constant, the between deviation indicates a lesser spread. Its value puts 68 % of the data approximately between 3.7 % and 7.91 % change. By comparing the three deviations, the variation of data for economic growth is higher across time rather than across the countries

9

observed. The standard deviation of all cases along the time period is also higher compared to the between deviation for the variables $investment\_rate_{it}$, fdi_ratio_{it}, and $savings\_rate_{it}$.

The opposite trend is present for the remaining variables. The statistics for the main exploratory variable $remittance\_ratio_{it}$ show that the average percentage of remittance inflows to GDP is approximately 2.25 %, while the overall deviation approach calculates that 68 % of the data is located approximately between 0 % and 6.5 %. However, the between estimation is higher in comparison to the within one, with the values of the standard deviation being 3.71 % and 2.26 % respectively. Thus, remittance data variability across countries has been greater than the one organized along the time period covered. Although very general, this finding can be explained by the steady change of remittances over time in many countries, while the inflows not becoming a significant portion of domestic output in all cases due to different developments of economies.

Furthermore, the data on the variable $remittance\_ratio_{it}$ was able to be analyzed when extracting 4 specific regions out of the general sample: a. South/South-East Asia, b. Caribbeans, Central, and South America c. Central, Eastern, and South-Eastern Europe and d. majority of African countries. It is firmly noticeable that the variability in the newly created data subsets is often significantly lower than the one in the general sample across all types. The finding strengthens the idea to proceed investigating the remittance effect individually for each region. The only exception is the data of majority of African countries, where the deviation is higher than the general sample. This result confirms that although many African countries may share similar economic conditions for remittances to appear significant, there is still a large variability among states in terms of remittance's portion of domestic output. A run of the Hausmann test in optimization of the model would continue this claim similarly by basing some of the samples on random-effects regression, while the others on fixed-effects estimation.

Table 3: Summary Statistics for Variable $remittance\_ratio_{it}$ Across Samples

Region	Variable	Mean overall	Std. Dev.	Min	Max
General Sample	remittance_ratio	2.246202	4.246228	0	69.49
South/South-East Asia	remittance_ratio	1.229389	1.436916	0	8.31
Caribbeans, Central, and South America	remittance_ratio	1.807569	2.472924	0	10.87
Central, Eastern, and South-Eastern Europe	remittance_ratio	1.978725	2.076645	0	12.09
Africa	remittance_ratio	2.074159	5.822346	0	69.49

Regression Results

Regression results came in with great variability in size of observation, coefficients' values, and significance levels, depending on the sample discussed. Namely, the fixed-effects regression of the general sample included ultimately only 3080 observations from 109 countries that consisted of the entire data analyzed. Overall R-squared value is significantly low, with a value of 0.0413. Regarding the coefficient for the essential independent variable $remittance\_ratio_{it}$, value of 0.0054628 is positive yet very small. This would suggest that with a 1% increase of remittance's ratio in the domestic output, there might be an approximately 0.006 % increase in GDP. Aside the minimal value, the coefficient of this regressor is not suggested to be significant, as the p-value is far greater than even the 10% level of significance with 0.867. On the other hand, significant coefficients were suggested for $investment\_rate_{it}$, $savings\_rate_{it}$, and $financial\_development_{it}$, all of which p-values were below the 1% level of significance. While

10

results for $investment\_rate_{it}$ and $savings\_rate_{it}$ suggested positive coefficient values, the value for the variable $financial\_development_{it}$ implied a strongly negative impact on GDP growth when this variable increases.

Significant values for the main explanatory variable $remittance\_ratio_{it}$ were suggested in the fixed-effects regression on the sample of the chosen African countries, as well as in the random-effects regression on the sample with Caribbean, Central, South American countries. In the case of former, number of total observations was 1109 with 41 countries included, though with once again small R-squared value of just 0.0162. The coefficient value for the $remittance\_ratio_{it}$ was 0.0680714 and had a p-value of 0.014, thus significant at 5% level of significance. The result suggests that with an increase of 1% of remittance's ratio to domestic product, a country's GDP would grow by approximately 0.07 %. Positive significant coefficient on 1% level was also present for $savings\_rate_{it}$, while a negative significant coefficient on 1% level was again suggested for $financial\_development_{it}$.

The random-effects regression of the sample with Caribbean, Central, South American countries included 721 observations from 21 countries. Overall R-squared value is higher than other regressions but still low with value of 0.1172. The coefficient for the variable $remittance\_ratio_{it}$, value is -0.23383, which would suggest that with a 1% increase of remittance's ratio in the domestic output, the country of the sample might be met with an approximately 0.23% decrease in GDP. On the other hand, significant positive coefficients were suggested for $trade\_GDP\_ratio_{it}$ and $investment\_rate_{it}$, while a negative significant sign was provided once again for the variable $financial\_development_{it}$. All three significant coefficients' p-values were taken on a 1% level of significance.

Regarding the fixed-effects estimations for both the samples covering Asian and European countries, there was no sign of significance for the coefficients for the main explanatory variable presenting remittance inflows. The regressions continued the trend of results with low R-squared values, with 0.0707 for the estimation of the sample with the South/South-East Asian countries, while 0.1666 for Central, Eastern, and South-Eastern Europe. Aside the big p-values for the most important regressor, the former estimation suggested a positive coefficient of 0.329909 while the latter yielded a negative sign and a value of -0.51954. Other significant coefficients for the first sample were present for $investment\_rate_{it}$ (positive, 5% level), $savings\_rate_{it}$ (negative, 10% level), fdi_ratio_{it} (negative, 5% level), and $financial\_development_{it}$ (negative, 1% level). As for the second estimation, significance was suggested for $trade\_GDP\_ratio_{it}$ (positive, 5% level), $investment\_rate_{it}$ (positive, 1% level), $savings\_rate_{it}$ (positive, 5% level), fdi_ratio_{it} (positive, 1% level), and $financial\_development_{it}$ (negative, 1% level).

Conclusion and Further Research Suggestions

The regression results point to a continuation of the current status quo in the debate about remittance inflows. With the basic econometric models analyzed in this study, their impact seems to shape a diverse range of outcomes with different set of conditions established. Like many studies before, a consensus about an overall effect of the flows on global level could not be reached in this study following the analysis of the general sample. However, on a more specific regional analysis like this study intended to provide, the results have given slightly clearer answers. Finding a positive significant coefficient in the sample regression of the African nations pushes forward the claim of remittances playing important role for increasing the cap of savings and thus investment options in developing nations. On the other hand, a negative significant coefficient for the Caribbean, Central, and South American countries' sample suggests support of the claim of higher

11

remittance inflows being a probable reaction to, not an actual reason for decreasing domestic output i.e., provides support for their counter-cyclical nature. Nevertheless, the other two regions in Asia and Europe are leaving the conclusion without significance in their estimation of remittances, thus opening space for understanding the ways how the regional studies can be improved.

Despite an inclusion of the most recent time period and unique analysis for different regional economies, it has to be pointed out that the investigation ran into challenges for providing significant amount of observations for two potentially important variables: $econ\_freedom_{it}$ and $migrant\_stock_{it}$. The two variables could have assessed further the engine of international flows by providing an additional interacting microeconomic understanding of a remittance receiver by the former variable, and a macroeconomic labor flow in the domestic economy by the latter. Still, the variables' estimates of 5-year cycles turned out to reduce the sample observations significantly, nullifying the potential analysis of longer time period and more cases for the remaining variables. A strategy to include these two conditions more successfully in future studies should thus be one priority.

Finally, the current use of only the basic panel-data regression estimation techniques leaves space for conducting an even better econometric model with even the same status of observations and variables. An application of specific dynamic models providing differences and lags of the dependent and independent variables could possibly suggest results whether one year's remittances are indeed impacting the growth rate of a domestic output in subsequent years. Estimation techniques such as the Arellano–Bond dynamic panel-data model could not only provide intertemporal aspects of effects of remittances but also strengthen the instruments used to control for external factors on economic growth and thus specify the remittance impact on domestic output increase. A detailed process of creating this kind of a dynamic model with the goal of resolving potential endogeneity and crystalizing further the correlations between the variables studied should be a follow-up to this research.

12

Appendix

Table A1: Summary Statistics for Variables' Value of General Sample

Variable		Mean	Min	Max	Obs.	
gdp_growth	overall	5.809728	-55.78	85.16	N	5395
	between		-8.63333	11.63075	n	152
	within		-56.9766	81.40382	T-bar	35.4934
remittance_ratio	overall	2.246202	0	69.49	N	4489
	between		0.01	26.94075	n	152
	within		-18.9046	44.79545	T-bar	29.5329
trade_GDP_ratio	overall	38.0772	0	7726.02	N	5373
	between		2.331154	2060.687	n	152
	within		-1932.16	5703.41	T-bar	35.3487
investment_rate	overall	23.83878	-8.629	116.063	N	4504
	between		9.830075	46.05158	n	132
	within		-12.2458	94.30711	T-bar	34.1212
savings_rate	overall	18.71393	-93.872	120.552	N	4625
	between		-3.39608	48.47083	n	134
	within		-99.7948	117.9687	T-bar	34.5149
fdi_ratio	overall	1.619819	-56.66	92.7	N	4418
	between		-1.663	15.1025	n	148
	within		-53.3772	85.30597	T-bar	29.8514
financial_development	overall	0.202232	0	0.8	N	5076
	between		0.033846	0.635385	n	143
	within		-0.20469	0.44454	T-bar	35.4965
econ_freedom	overall	6.440283	2.52	9.02	N	2298
	between		4.239545	8.853636	n	124
	within		2.12801	8.380737	T-bar	18.5323
administration	overall	0.426453	0	0.842724	N	4386
	between		0.147012	0.765463	n	124
	within		0.149963	0.634249	T-bar	35.371
migrant_stock	overall	1.078889	0.0012	17.8695	N	981
	between		0.002586	11.18094	n	151
	within		-4.13278	7.767446	T-bar	6.49669

13

Table A2: Summary Statistics for remittance_ratio in General and Regional Samples

Region	Variable		Mean	Std. Dev.	Min	Max	Obs.	
General Sample	remittance_ratio	overall	2.2462	4.2462	0.0000	69.4900	N	4489
		between		3.7049	0.0100	26.9408	n	152
		within		2.2557	-18.9046	44.7955	T-bar	30
South/South-East Asia	remittance_ratio	overall	1.2294	1.4369	0.0000	8.3100	N	475
		between		1.0974	0.1565	3.8757	n	15
		within		1.0068	-2.4663	5.6637	T-bar	32
Caribbeans, Central, and South America	remittance_ratio	overall	1.8076	2.4729	0.0000	10.8700	N	835
		between		1.8691	0.0104	6.1150	n	23
		within		1.6414	-3.6174	7.8386	T-bar	36
Central, Eastern, and South-Eastern Europe	remittance_ratio	overall	1.9787	2.0766	0.0000	12.0900	N	408
		between		2.1075	0.4752	6.6062	n	17
		within		0.8594	-0.7978	7.6222	T-bar	24
Africa	remittance_ratio	overall	2.0742	5.8223	0.0000	69.4900	N	1284
		between		4.4614	0.0100	26.9408	n	44
		within		3.3779	-19.0766	44.6234	T-bar	29

Table A3: Hausman Test on General and Regional Samples

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic

General Sample	$\text{chi2}(7) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B) = 48.17$ **Prob>chi2 = 0.0000**
Africa	$\text{chi2}(7) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B) = 16.72$ **Prob>chi2 = 0.0193**
Caribbeans, Central, and South America	$\text{chi2}(7) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B) = 10.17$ **Prob>chi2 = 0.1794**
Central, Eastern, and South-Eastern Europe	$\text{chi2}(7) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B) = 135.84$ **Prob>chi2 = 0.0000**
South/South-East Asia	$\text{chi2}(7) = (b-B)'[(V\_b-V\_B)^{\wedge}(-1)](b-B) = 55.41$ **Prob>chi2 = 0.0000**

14

Table A4: Estimated Coefficients From Linear Regressions on General and Regional Samples

	Dependent variable: gdp_growth_{it}				
	General Sample	Africa	Caribbeans, Central, and South America	Central, Eastern, and South-Eastern Europe	South/South-East Asia
Explanatory Variable	Fixed-effects	Fixed-effects	Random-effects	Fixed-effects	Fixed-effects
rem_ratio_percent	0.005 (0.17)	0.068 (2.58) **	-0.234 (-2.37) **	-0.520 (-0.85)	0.330 (1.44)
trade_gdp_ratio_percent	0.021 (2.59) **	0.018 (1.3)	0.020 (2.78) ***	0.050 (2.84) **	0.035 (1.32)
investment_rate_percent	0.105 (3.24) ***	0.012 (0.29)	0.168 (3.3) ***	0.414 (4.54) ***	0.242 (2.53) **
savings_rate_percent	0.091 (4.09) ***	0.073 (2.75) ***	0.061 (1.33)	0.177 (2.63) **	-0.108 (-1.89) *
fdi_ratio_percent	0.050 (1.29)	0.002 (0.12)	0.100 (0.44)	0.447 (3.03) **	-0.945 (-2.81) **
financial_development	-12.241 (-6.16) ***	-16.347 (-2.82) ***	-5.608 (-2.71) ***	-20.919 (-5.92) ***	-13.391 (-3.31) ***
administration	-0.490 (-0.19)	7.496 (1.52)	0.589 (0.27)	-5.004 (-1.03)	-7.039 (-0.79)
_cons	4.377 (3.1) ***	3.536 (1.72) *	1.715 (1.16)	-1.205 (-0.44)	10.157 (1.85) *
Observations	3080	1109	721	342	383
Countries	109	41	21	14	12
R^2	0.0413	0.0162	0.1172	0.1666	0.0707

Note: The table presents the panel data regressions' results, reporting their t-statistics in parentheses and respective significance levels (if any) of $\alpha = 0.01$ (denoted as '***'), $\alpha = 0.05$ (denoted as '**'), or $\alpha = 0.1$ (denoted as '*')

15

Endnotes

[1] Barajas, A., Chami, R., Cosimano, T., Fullenkamp, C., Gapen, M., & Montiel, P. (2008). Macroeconomic Consequences of Remittances. *IMF Occasional Papers*, International Monetary Fund, https://www.researchgate.net/publication/285351490_Macroeconomic_Consequences_of_Remittances

[2] Barajas, A., Chami, R., Cosimano, T., Fullenkamp, C., Gapen, M., & Montiel, P. (2008).

[3] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009). Do Workers' Remittances Promote Economic Growth. *IMF Working Paper*, 09/153, https://www.imf.org/external/pubs/ft/wp/2009/wp09153.pdf

[4] Clemens, M., & McKenzie, D. (2018). Why Don't Remittances Appear to Affect Growth? *The Economic Journal*, Volume 128, Issue 612, F179–F209, https://doi.org/10.1111/ecoj.12463

[5] Cocco, F., Wheatley, J., Pong, J., Blood, D., & Rininsland, Æ. (2019, August 28). *Remittances: the hidden engine of globalisation*. Financial Times. Retrieved from https://ig.ft.com/remittances-capital-flow-emerging-markets/?fbclid=IwAR2vC8blb7h1ctX2OMz2WX5ZAnnRkd_kBEKU7ExMf2u7mCc5Q-t2PBAh4bI.

[6] The World Bank. (2021, May 12). Defying Predictions, Remittance Flows Remain Strong During COVID-19 Crisis. Retrieved from https://www.worldbank.org/en/news/press-release/2021/05/12/defying-predictions-remittance-flows-remain-strong-during-covid-19-crisis.

[7] The World Bank. (2021, May 12).

[8] Eggoh, J., Bangake, C., & Semedo, G. (2019). Do remittances spur economic growth? Evidence from developing countries. *The Journal of International Trade & Economic Development*, 28:4, 391-418, DOI: 10.1080/09638199.2019.1568522

[9] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009).

[10] Chami, R., Hakura, D., & Montiel, P.J. (2009). Remittances: An Automatic Output Stabilizer? *IMF Working Papers*, No. 09/91, https://ssrn.com/abstract=1394811

[11] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009).

[12] Sutradhar, S. R. (2020). The impact of remittances on economic growth in Bangladesh, India, Pakistan and Sri Lanka. *International Journal of Economic Policy Studies*, 14, 275–295 https://doi.org/10.1007/s42495-020-00034-1

[13] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009).

[14] Yang. D. (2008). International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks. *The Economic Journal*, Volume 118, Issue 528, 591–630, https://doi.org/10.1111/j.1468-0297.2008.02134.x

[15] Hanson, G., & Woodruff, C. (2003). Emigration and Educational Attainment in Mexico. University of California at San Diego. https://www.researchgate.net/publication/228802899_Emigration_and_Educational_Attainment_in_Mexico

[16] Cox, E.A., & Ureta, M. (2003). International Migration, Remittances, And Schooling: Evidence From El Salvador. *Journal of Development Economics*, 72, 429-461. http://www.nber.org/papers/w9766

[17] Clemens, M., & McKenzie, D. (2018).

[18] Eggoh, J., Bangake, C., & Semedo, G. (2019).

[19] Sutradhar, S. R. (2020).

[20] Clemens, M., & McKenzie, D. (2018).

[21] Dujava, D., Kalovec, M. (2020). Do Remittances Matter for Economic Growth?. *Ekonomický časopis / Journal of Economics*, 68 (9), 869-894. ISSN 0013-3035. DOI: https://doi.org/10.31577/ekoncas.2020.09.01

[22] Abdih, Y., Chami, R., Dagher J., & Montiel, P. (2010). Remittances and Institutions: Are Remittances a Curse? *Department of Economics Working Papers 2010-13*, Department of Economics, Williams College. https://web.williams.edu/Economics/wp/MontielRemittancesAndInstitutions.pdf

[23] Hanson, G., & Woodruff, C. (2003).

[24] Cox, E.A., & Ureta, M. (2003).

[25] Javid, M., Arif, U., & Qayyum, A. (2009). Impact Of Remittances on Economic Growth and Poverty. *Academic Research International*, Vol. 2, No. 1, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1075.6399&rep=rep1&type=pdf

[26] Dujava, D., Kalovec, M. (2020).

[27] Zghidi, N., Sghaier, I.M., & Abida, Z. (2018). Remittances, Institutions, and Economic Growth in North African Countries. *Journal of the Knowledge Economy*, vol. 9(3), pages 804-821. doi:10.1007/s13132-016-0377-5

[28] Williams K. (2018). Are remittances good for economic growth? The role of political institutions. *Applied Economics Letters*, 25:1, 56-60, https://doi:10.1080/13504851.2017.1293781

16

[29] Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth, *Journal of Development Economics*, Volume 90, Issue 1, 144-152, https://doi.org/10.1016/j.jdeveco.2008.10.005.

[30] Ekanayake, E. M., & Moslares, C. (2020). Do Remittances Promote Economic Growth and Reduce Poverty? Evidence from Latin American Countries. *Economies*, *8*(2), 35. https://doi:10.3390/economies8020035

[31] Olayungbo, D.O., Quadri, A. (2019). Remittances, financial development and economic growth in sub-Saharan African countries: evidence from a PMG-ARDL approach. *Financial Innovation 5, 9,* https://doi.org/10.1186/s40854-019-0122-8

[32] Bajra, U. Q. (2021). The effects of remittances on economic growth and inequality in Western Balkan countries. *Journal of Business Economics and Management*, *22*(3), 757-775. https://doi.org/10.3846/jbem.2021.14587

[33] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009). Do Workers' Remittances Promote Economic Growth. *IMF Working Paper*, 09/153, https://www.imf.org/external/pubs/ft/wp/2009/wp09153.pdf

[34] Giuliano, P., & Ruiz-Arranz, M. (2009).

[35] Olayungbo, D.O., Quadri, A. (2019).

[36] Aggarwal, R., Demirgüç-Kunt, A., & Pería, M. S. M. (2011). Do remittances promote financial development? *Journal of Development Economics, Volume 96, Issue 2, 255-264*, https://doi.org/10.1016/j.jdeveco.2010.10.005.

[37] Lueth, E., & Ruiz-Arranz, M. (2006). A Gravity Model of Workers' Remittances, *IMF Working Papers*, International Monetary Fund, https://www.imf.org/external/pubs/ft/wp/2006/wp06290.pdf

[38] Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel, P. J. (2009).

[39] Olayungbo, D.O., Quadri, A. (2019).

[40] Eggoh, J., Bangake, C., & Semedo, G. (2019).

[41] Javid, M., Arif, U., & Qayyum, A. (2009).

[42] Dujava, D., Kalovec, M. (2020).

[43] Gammeltoft, P. (2002). Remittances and Other Financial Flows to Developing Countries. *International Migration*. 40, 181 - 211. https://www.researchgate.net/publication/227521390_Remittances_and_Other_Financial_Flows_to_Developing_Countries

[44] Ratha, D. (2003). Workers' Remittances: An Important and Stable Source of External Development Finance. *Global Development Finance*, World Bank https://ssrn.com/abstract=3201568

[45] Abdih, Y., Chami, R., Dagher J., & Montiel, P. (2010).

[46] Tyburski, M. (2014). Curse or Cure? Migrant Remittances and Corruption. *The Journal of Politics*, 76(3), 814-824. https://doi:10.1017/s0022381614000279

[47] Zghidi, N., Sghaier, I.M., & Abida, Z. (2018).

[48] Ebeke, C. H. (2014). Do International Remittances Affect the Level and the Volatility of Government Tax Revenues? *Journal of International Development*, 26(7), 1039–1053. https://doi-org.kzoocoll.idm.oclc.org/10.1002/jid.2979

[49] Williams K. (2018).

17