Trickle or Stream?
Global Determinants of Remittance Flows

Julian Tait – 483670

Abstract

Worker remittances represent an increasing proportion of international capital flows and an ever growing source of income for the developing world. A lot of attention has been devoted to the micro economic implications remittances have within a country. Yet the macroeconomic determinants have only recently been placed in the spotlight. This paper applies generalised method of moments to a comprehensive dataset of countries to find motivations for remittance flows to be of a hybrid nature, balancing both altruistic as well as selfish characteristics. These findings have far reaching implications for policy makers around the world.

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I. Introduction

We now live in a world that is interconnected in business as well as social aspects. What started with travelling and grasping business opportunities or increasing a supply chain network has led to more than 3% of the population living in a country they were not born in (World Bank, 2011). In response to these large movements of people the money these migrants send home (remittances) now outweighs foreign direct investment flows as the largest source of external income to emerging economies (World Bank, 2019). Globalisation offers vast possibilities for those migrating to increase the livelihood of individuals and households at the receiving end. Often these make up the shortfalls and enable access to healthcare, education, food and other basic needs that would otherwise be unattainable (Sikder et al., 2017; Connell & Conway, 2000). The probability of a child completing school is impacted ten times as much by an increase in remittance flows as compared to the same increase in a general income (Edwards & Ureta, 2003). Beyond financial benefits, Levitt (1998) coins the term and explores the idea of *social remittances*. These are ideas and behaviours that migrants learn and get accustomed to and eventually bring back to their origin country to stimulate new norms upon their return. This knowledge spill over leads to large benefits to communities and countries alike that cannot simply be quantified. There is however a darker side to this increased development. This becomes especially apparent if not all of the population has equal access to remittance flows. If this is the case, a one sided rise in income can lead to an increase in income inequality in the country (Taylor and Wyatt, 1996). Nonetheless, COVID-19 puts these streams of income at great risk. Remittance flows are predicted to decrease by up to 20% in 2020 as the economic consequences of the pandemic run their course (World Bank, 2020)[1].

Remittances are resources sent by a migrant to their origin country to be received by family members or friends or be invested in financial and non-financial assets. These can be in the form of official bank transfers, in-kind gifts or informal cash transfers. As measured in this research it encompasses only those passing through official channels. The consequences of these are well established, yet learning more about the causes of remittances has great potential for societal gain. It allows government to create stimulating policy with a more

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[1] *Migrants tend to face higher risks than natives at job or wage losses.*

complete picture. When a labour-emitting country aims to attract income back for further development, it can ultimately achieve favourable conditions more effectively once it understands the macroeconomic determinants. With this gain in mind, the research question guiding this paper is the following.

Which macroeconomic characteristics determine the size of remittance flows?

This paper builds on existing literature by expanding the scope as well as decreasing potential bias by using dynamic panel data estimates. The endogeneity concern in previous ordinary least square regressions (OLS) has been a considerable limitation. This originates in the presence of reverse causality, whereby on top of the independent variables influencing remittances, remittances may actually influence the independent variables as well. The implementation of this econometric model allows for estimates to be made with less bias.

The remainder of this paper consists of 5 sections. Section II builds the theoretical framework. Section III describes the data and its sources. Section IV develops the model used to inspect the data. Section V presents the results. Section VI discusses these, elaborates on any limitations faced and finishes by concluding the paper.

II. Theoretical Framework

This section discusses the past literature to build a footing from which I can build the research methodology of this paper. This is broken down into the two important parts. The microeconomic foundations of remittances and the macroeconomic findings based thereon.

2.1 Microeconomics

Applying basic decision theory to migration compares the costs of moving to the benefit gained through increases of relative wages and living standards (De Jong, 2000). One of these can be the benefit future remittances can have on the living standards of those left behind. Empirical research has been conducted on the microeconomic motivations of households' and individuals' decision to and quantity to remit using case studies throughout the developing world. One such in India finds the decision to remit increases when the wife of a migrant stays behind (Banerjee, 1984). Lucas and Stark (1985) find in Botswana three motivations for individuals to remit. Pure altruistic goals to increase the welfare of family

members at home with additional income is the first. The second is pure self-interest. This can encourage flows to the home country for investments in real or financial assets. Lastly there can be an arrangement whereby both benefit from the migration of individuals. The remittances can be a return as settling a previous investment in education by the household or returns to a diversification strategy by aiding a child in moving abroad to protect against crop failure or cyclical fluctuations of the labour sending country. In this paper I will refer to the first two aspects of Lucas and Stark (1985) respectively as the selfish migrant and the altruistic migrant. De la Brière et al. (2002) find support for the first two motivations in Dominican household data. In both of these cases, the individual may expected to keep consumption in the host country to a minimum (Glytsos, 1988).

2.2 Macroeconomics

Although the microeconomic rationale has long been researched, the difficulty of measuring and attaining large data on country wide or global figures on remittances and macroeconomic variables have made the impact of and motivations of these harder to examine. To limit the scope of research, papers have focussed efforts on individual labour sending countries.

Glytsos (1988) focusses on the Greek-German migration flow while El-Sakka and McNabb (1999) focuses on Egypt and the Arab world. The case studies do not all agree on significant determinants. Some find support of altruistic motives in positive relationships between the dependency ratio and remittances (Lueth, 2008; Buch) or in negative relationships for development (GDP per capita) and remittances (El-Sakka & McNabb, 1999; Barua, 2007). In contrast to demonstrations of altruistic behaviour, real interest rates are found to have a significant impact on remittances (El-Sakka & McNabb, 1999; Lueth, 2008; Adams, 2007; Straubhaar, 1986). This suggests individuals decision to remit can be influenced by financial return to both financial assets as well as non-financial investments in durable goods or property. A negative relationship with political stability (Straubhaar, 1986) suggests the future potential of any remittances sent back is also taken into consideration.

Easier access to larger amounts of data have allowed for larger dataset to be compiled and assessed. Using a set of 11 remittance receiving countries, Lueth and Ruiz-Arranz (2008) apply a gravity model (as often used in trade) to bilateral remittance flows, allowing

characteristics of both the receiving and sending country to be assessed for an unbalanced sample of a 24 year period.[2] These find that flows are responsive to the cyclical movement of the migrant's origin country. As in previous literature, the authors find support for altruistic motivations in the positive relationship with the dependency ratio. They also find the inflation rate and home country currency appreciation to have a positive impact on remittance flows. Following the altruism motivation proposed by Lucas and Stark (1985), remittance flows should increase in the wake of a natural disaster. However, In contrast to other literature (Mohapatra, Joseph & Ratha, 2009), they do not find natural disasters to significantly influence the flow of remittances.

A limitation faced by prior literature is that of endogeneity in regression equations. By construction, an ordinary least squares regression (OLS) cannot control for this. Haderi et al. (1999) highlight this, by finding that Albania's inflation and exchange rate is influenced by incoming remittance flows. Due to this endogenous nature of research on remittances, Adams (2008) applies the use of instrumental variables (IV) to estimate the effect skill composition of emigrating citizens has on their future returns. He finds that the low skilled labourer emitting countries receive higher per capita remittances than do the high skilled migrants. I will apply a similar instrumentation of foreign migration stock and poverty.

To guide the paper through answering the research question, the following hypotheses have been derived from previous literature. These are drawn from the altruistic motivations proposed by Lucas and Stark (1985).

H1: Remittance flows are motivated through altruistic motives.

H2: Remittance flows are negatively related to economic development.

H3: Remittance flows are unrelated to measures or financial return.

Following from the literature discussed, the variables of interest are the dependency ratio, the real interest rate, the exchange rate, GDP per capita growth and inflation. Also included in the models will be proxies for economic development.

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[2] They gathered their unique dataset from country specific government institutions. This ranged from 2 years in Croatia and Kazakhstan to 24 years in Bangladesh depending on the country.

III. Data

This section covers the sources and measurements of the data. Data on migration has been compiled by authors of a paper in *The Economic Journal* (Adsera & Pytikova, 2015) from a comprehensive investigation into the connection between migration and linguistics. These were sourced by asking government offices of 30 OECD countries for detailed yearly records of migration in-flows and the size of their respective yearly total foreign migration stocks. Although these have been collected on a bilateral level, reporting the number of migrants from each country i in a second country j, this paper only assesses the determinants of the labour emitting country. To aggregate these values to a country level, the stock of i in each country j is summed up to the total emigrated population of country i. An issue in comparability arises in the different definitions of migrant by governments. Immigrant can be defined by country of birth or citizenship. As this differs between countries, the data may present problems of comparability. This paper prefers the concept definition as country of birth, which is most widely used.[3]

The data on macroeconomic measurements has been extracted from the World Bank and compiled into yearly observations for each of the 218 territories inspected. The values are based on data from the IMF, UNESCO, national accounts and the World Bank's own staff estimates. In its original format, the data on macroeconomic measurements includes subtotal observations for areas (e.g. 'Eurozone' or 'low income countries'). To ensure data is not counted twice in the analysis, all observations described as areas by the World Bank were removed**.** The number of groups (territories) drop from 263 to 218.

Data is not readily available or collected for each territory, nor is it consistent over time. Inconsistencies in the data become apparent when examining *Table 1*. The average number of observations per territory varies from 5.59 for the literacy rate to 58.69 for the percentage of urban population.[4] The number of groups (n) varies from 95 for exchange rate observations to 218 groups with observations of total population. The sources and

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[3] Australia, Austria, Canada, Denmark, Finland, France, Iceland, Ireland, Mexico, New Zealand, Norway, Poland, Slovakia, Spain, Sweden, Turkey, the UK and the US do so, while a few countries use the definition of citizenship. These include Belgium, Czech Republic, Germany, Greece, Hungary, Italy, Japan, Korea, Luxembourg, the Netherlands, Portugal and Switzerland. (Adsera & Pytikova, 2015).

[4] ÷This is not including *Country* or *Year* as these are not measured but merely define each observation.

measurements are summarised in *Appendix Table A1* and the summary statistics are presented in Table 2**.**

Remittances can be measured in different ways. The measure selected in this paper is the ratio of yearly remittance flows to GDP of a country. Two alternative measures are the absolute value of remittance flows or remittances per capita. Including GDP increases comparability between countries by scaling flows to the size of countries. A downside of this, however, is the dependency on a macroeconomic variable. The mechanics of the calculation mean this measure may pick up on changes in GDP unrelated to remittance flows. Absolute values work best in the absence of large differences in remittance flows. As can be seen in *Table 1, Remittances Received* has a high standard deviation of 4.42 billion dollars, reporting large differences in remittance flows. Scaling allows for better interpretation of the coefficients of interest. Comparability of values is important for the interpretation of coefficients, and it is for this reason the remittances relative to GDP was selected. This ratio is calculated by dividing remittances received by the GDP at current prices. The dataset does not include this as an absolute value but is instead calculated by multiplying GDP per capita at current prices by the midyear total population.

While assessing the data for outliers and anomalies Lesotho stands out. Figure A1 plots remittance flows relative to GDP over time. Comparing panel A and B displays graphically the magnitude of remittance flows in Lesotho. The maximum value outside of Lesotho is around 48.2, whereas Lesotho is consistently above this threshold. Excluding these points generates a more comparable distribution of observations. Other variables do not generate need for any further data cleaning. Table 1 therefore excludes Lesotho form the dataset, while Table A2 summarises the variable composition prior to removing Lesotho.

Table 1

Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	N	n	T
Country	131.1935	79.15354	1	264	13020	217	60
Year	1989.5	17.31877	1960	2019	13020	217	60
Dependency Ratio	71.89952	20.23593	15.74309	121.0511	11376	194	58.6392
GDP Growth	2.075102	6.046669	-64.9924	140.3708	9295	212	43.8443
GDP per Capita	8319.998	16375.16	34.79058	189170.9	9689	212	45.7028
Inflation	23.16012	336.3121	-60.4964	23773.13	7809	187	41.7594
Literacy Rate	80.68522	21.08689	5.40465	99.99819	936	167	5.60479
Exchange Rate	116.1398	115.3358	18.73379	3522.72	3551	94	37.7766
Real Interest Rate	5.936983	18.19929	-97.6154	789.799	4166	146	28.5342
Remittances Received	1.51E+09	4.43E+09	6038.03	8.31E+10	6278	195	32.1949
Remittances Received - % of GDP	3.591351	5.678511	2.89E-05	48.19517	5953	192	31.0052
Urban Population - % of Population	51.11279	25.64078	2.077	100	12618	215	58.6884
Total Stock of i	226184.9	666518.8	0	12100000	6496	203	32
Population Total	24200000	1.01E+08	3893	1.39E+09	12695	217	58.5023
Poverty Ratio	10.37156	17.70118	0	94.1	1681	164	10.25

Note. This table presents a summary of all variables used in the research after Lesotho has been removed. Groups (n) represents the number of territories for which data is available for at least one year.

Table 2

Remittances divided by GDP - per Decade

Decade	Mean	Std. Dev.	Min	Max	N	n	T
'60s	.	.	.	.	0	0	.
'70s	2.084502	3.580939	0.001357	24.04492	431	87	4.95402
'80s	2.722803	4.710484	0.00012	36.41663	968	109	8.88073
'90s	2.615649	4.681507	0.001208	48.19517	1293	157	8.23567
'00s	4.141011	6.266031	2.89E-05	44.12622	1638	181	9.04972
'10s	4.732107	6.418326	0.000183	43.76805	1623	185	8.77297

Note. Each Decade runs from '0 to '9. N measures the total number of observations. n measures the total number of groups for which at least one remittances received is measured in each decade. T measures the average number of observations per group per decade.

IV. Methodology

4.1. Generalised Methods of Moments

This section develops the methodology applied. As implemented in past literature, we specify an equation with remittances as the dependent variable and a *collection* of independent variables determined to influence yearly remittance flows. Included in this collection will be three types of variables, similar to the groups used by Buch & Kuckulenz (2010). The first will be GDP per capita and GDP per capita growth to control for general macroeconomic environment. The second are the domestic interest rate, inflation and the exchange rate. This sheds light on the return in the domestic market. The third will be all demographic variables that have the potential to influence remittance inflows. The basic form of this is presented in the following equation:

$$remit = \beta_1 * X1 + \varepsilon \qquad \text{Equation (1)}$$

where *remit* represents the aggregate remittance flows into a given country, X1 refers to a collection of independent variables, β_1 the coefficient of interest and ε the error term.

The first concern addressed for regression results is unobserved country specific heterogeneity. Adapting *Equation (1)* to incorporate these as fixed effects (FE) removes the time-invariant heterogeneity, yet estimates will suffer from the Nickell bias (Nickell, 1981). This bias arises when the time frame in panel data is short and the number of cross sectional observations approaches infinity, which may be severe given the small number of observations for certain countries and variables. A further concern for this analysis is one of endogeneity. Remittances (the dependent variable) are dynamically determined. This, as opposed to a static estimation on independent variables, means its value is dependent on its own past observations as well as being determined by the dependent variables. On top of this, a number of the regressors are at risk of not being exogenously determined, but endogenously. Endogeneity raises the concern of miscalculating coefficient estimates. Given the dynamic characteristic of the panel data set, the methodology must take this into account.

The system Generalised Method of Moments (GMM) approach makes use of panel data with 'internal instruments'. This initially transforms it and secondly eliminates groupwise heterogeneity. As our data has many gaps, first difference transformation would lead to the loss of many observations. This occurs because a past value must be subtracted from each

present value to generate a difference. Once a gap is present, the next chronological observation cannot be included in the data set. Arellano and Bover (1995) recommend the use of the forward orthogonal deviations (FOD or two-step GMM) transformation to prevent unnecessary loss of data. Unlike the difference GMM approach, this eliminates only the last chronological observation for each individual, meaning in presence of gaps it does not remove 2 observations required for differencing after each gap.[5] Endogeneity arises if the dependent or independent variables are correlated with the error term, which can lead to bias in estimated coefficients. To counter this, the system GMM uses lagged values of the dependent as an instrument to control for the endogenous nature of the data. For the dependent variable (remittances), this is done using moment conditions, which hold true only for the true value of the coefficient (the real estimate without bias). The endogenous *independent* variables however, are to be instrumented by their lag using a two-stage 'iv-style' approach. Adapting Equation 1 with these specifications leads to the following:

$$remit_{it} = \varphi_i + \beta_1 * remit_{i,t-1} + \beta_2 * X_{it} + \varepsilon_{it} \qquad \text{Equation (2)}$$

where $remit_{it}$ represents the aggregate remittance flows into a given country in year t, $remit_{i,t-1}$ represents the value of remittance flows in year t-1, X refers to a collection of independent variables, φ refers to the country specific heterogeneity and ε the error term.

Although the GMM approach reduces bias, it relies on assumptions over the instruments included that must be tested. This concerns the validity of the instruments and over-identifying restrictions. The Hansen and Sargan J Test (Hansen, 1982; Sargan, 1958) of over-identification test the null hypothesis that one or more instruments are invalid. If autocorrelation is present then these lags may not be effective instruments. The Arellano-Bond test for second order autocorrelation finds the null hypothesis that the second lag is a valid instrument cannot be rejected. These two statistics are included in the relevant columns for all GMM models. Not rejecting the null hypotheses leads me to continue with the use of these instruments.

This paper will build up to the GMM model by running an OLS and FE regression as comparisons. More tests have been run on differing samples sizes and variables to test for robustness of results.

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[5] In Stata 13.1 the *xtabond2* command is implemented.

4.1 Choice of Instrument

In addition to instrumenting endogenous variables with their own lags, in certain instances other instruments exist. The problem of endogeneity arises in migration stock because it might not just influence remittance flows, but the stock may be in part determined by the current or past remittance flows. This is known as reverse causality and, when present, this introduces the risk of another bias. However, implementing an exogenous instrument instead, reduces this potential bias. In the case of Migration stock, a potential instrument is total population. This does not directly influence remittance receipts, but does so only through changes in migration levels. A possible instrument for poverty (measured as the poverty ratio) is the percentage of a population living in an urban environment. This is again not expected to be directly influenced by remittance flows. The theoretical relationship of these instruments is given in the following equation:

$$X = \alpha + \delta * Z + \varepsilon \qquad \text{Equation (3)}$$

where X is the variable being instrumented and Z is the instrument used. This relationship is graphically presented in figure 1.

Instrument Validity

In order to have an unbiased and consistent estimate of X on Y in an IV approach, two assumptions must hold. Firstly, one of the instrument exogeneity. There must be no direct influence of the instrument (Z) on the outcome (Y). This cannot be tested but can

Figure 1: Instrument Relationship

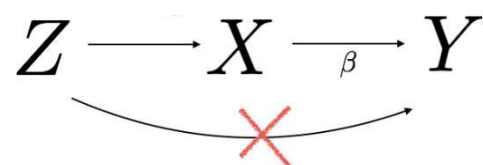be logically deduced. Secondly, the instrument must have a strong first stage. This refers to the effect Z has on X and must be tested. In doing so, the F-statistic for (joint) significance on Z on X is evaluated. First stage test results for each instrument are higher than the rule of thumb of ten and are summarised in table A3 and A4. I therefore conclude both instruments to be valid and relevant.

V. Results & Discussion

5.1 Full Model Results

This section interprets and compares the results presented in Table 3. **Table 3** specifies a column for each model. Column 1 presents the base line FE regression, before controlling for endogeneity in the regressors. Column 2 depicts the GMM regression controlling for endogeneity in the dependent variable. Column 3 finally includes the full specifications of the GMM model, instrumenting all macroeconomic variables at risk of endogeneity with their 2nd lag. The exogenous yet instrumented variables for poverty and migration stock remain instrumented by percentage of urban population and migration stock throughout all specifications.[6] The third model is the most complete, in which endogeneity of both the dependent and independent variables are controlled for. Therefore, I will be interpreting *Model 3* while comparing these results with the two prior models.

Turning first to the lag of the remittances received, this has a highly significant coefficient in all models. In model three this coefficient is around 0.495. The strongly significant and positive correlation with its past values suggests how a stimulated growth in remittances in one year can have far reaching impacts on an economy.

The first macroeconomic variable of GDP Growth captures the economic potential of a country and the attractiveness for investment. From theory, one would expect a positive impact on remittances if the routes are selfish in nature, remitting for personal gain. Alternatively, if the flows are driven by altruism, GDP growth should have a negligible or insignificant effect. GDP growth is determined to have a significant and positive impact on remittance flows, though only in the complete model. An increase in the growth rate by 1 percentage point is predicted to increase remittances relative to GDP by around 0.1 percentage points. This finding supports the theory of a self-interested migrant.

Turning to the market return variables, these serve a similar function to GDP growth. These assess the possible returns on flows brought back to the origin country for investment purposes. Inflation rate is used as a proxy for financial stability, the real interest rate for the return in a country and the exchange rate is included to control for international

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[6] This will be assessed in a robustness check specifying a regression by replacing the instruments with the variables themselves.

attractiveness and competitiveness of the local currency. In this model none of the three variables are determined to have a significant impact on remittance flows.

Moving on to the demographic control variables, the dependency ratio has a negative and significant impact. The dependency ratio sheds light on the demographic situation at home. A higher dependency ratio requires a smaller work force to provide. A possible source of additional income is to send a worker abroad to earn better than possible in the labour sending country. Conforming with the altruistic nature of migration, this would suggest a positive relationship. In the case of a selfish migrant, no relationship is expected. The data contradicts the idea of the selfish migrant. Both model 2 and 3 determine a positive coefficient, yet the size is sensitive to the sample chosen. The full specification in *model 3* determines a coefficient 20% larger than that in *model 2*. As the dependency ratio increases by one percent, the remittance flows are predicted to decrease by around 0.3 percentage points. An altruistic individual would be inclined to increase remittances when the origin country is struggling. If we assume migrants to be selfish, we would expect this not to have a significant impact on remittances. This finding thus provides evidence in contradiction of the altruistic migrant while not supporting or refuting the idea of the selfish migrant.

The percentage of the population living in an urban environment also has a significant impact on remittances. The instrument for poverty is significant to a 10% significance level. This suggest a higher proportion living in urban cities is associated with a lower flow of remittances relative to GDP. This variable however, is only the instrument implemented for poverty. Therefore, to interpret this coefficient correctly we must combine the results with the first-stage regression results from *Table A4.* Combining both, an increase in the poverty ratio by 1 percentage point is predicted to increase remittance flows by around 1.5 percentage points relative to GDP.[7] The positive relationship supports the altruistic hypothesis. Alternatively it can be interpreted the other way around, suggesting that as the poverty in a country decreases the remittance flows start to shrink. The causal link may be more relevant in this order. Total population, the instrument for migration stock does not

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[7] Interpreting the instrumented variables must be done by combining them with the results of the relevant first stage regressions. As depicted in **FIGURE 1**   the value must be divided by the first stage estimate to calculate the effect of X on Y. Appendix table A3 and A4 lay out these first stage relationships.*

have a significant effect. Lastly, time does not have a significant influence on yearly remittance flows.

The size of the significant coefficients is sensitive to changes in the model used. This concerns the 1st *lag of remittances received* and the *dependency ratio*. A possible explanation for these variances is the sample used to calculate the models. In the FE regression all 15739 observations are included for which all variables in the regression are available. When controlling for endogeneity in the dependent variable, *model 2* includes instruments for the lagged remittances. This reduces the number of observations included to calculate the regression results to 1470. In *model 3* instruments are implemented for the independent variables using the second lag of the variables. The nature of implementing a second lag further reducing the observations included to 1381. Excluding or including observations can have a large impact on the size of coefficients. The mechanics of using second lags as instruments requires those observations to be dropped for which there is no second lag available. This concerns the chronologically first observations (decades), which as can be seen in **Table 2** has lower means than the later decades. Excluding these values from the sample could lead to these sensitive changes. Nonetheless, for both *GDP growth* and *total population* in model *1* and *3* the coefficients are positive and significant confirming the positive relationship with remittance flows.

Table 3
Remittances Received - Macroeconomic Determinants

	(1) FE	(2) GMM - No Instruments	(3) GMM - Full
1st Lag of Remittances Received	0.797***	0.534***	0.495***
	(18.03)	(3.87)	(3.76)
GDP per Capita Growth	-0.0113	0.0864	0.0978*
	(-1.35)	(1.56)	(1.97)
Inflation	-0.000399	-0.0243	-0.000403
	(-0.77)	(-0.61)	(-0.11)
Real Interest Rate	0.00540	0.0209	0.0537
	(1.00)	(0.60)	(0.99)
Exchange Rate	-0.00270***	-0.0105	-0.0229
	(-3.21)	(-0.79)	(-1.47)
Dependency Ratio	0.00899	-0.255**	-0.304*
	(1.51)	(-2.13)	(-1.88)
% Urban Population	0.00291	-0.346	-0.869*
	(0.36)	(-1.36)	(-1.95)
Total Population	1.00e-09	7.41e-08	0.000000312
	(0.53)	(0.58)	(1.45)
Year	0.00859	-0.153	-0.161
	(1.44)	(-1.47)	(-1.12)
Constant	-17.10		
	(-1.45)		
Observations	1539	1470	1381
F	158.0	18.60	13.41
df_m	8	9	9
df_r	63	64	64
Hansen J	.	61.15	57.95
Hansen p-value	.	1.000	1.000
Arellano-Bond AR(2)	.	0.124	0.239

Note. Column 1, Column 2, Column 3. Observations by decades in model 3. 80s: 82; 90s: 253; 00s: 522; 10s: 524.

t-statistics in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01

5.2 Robustness Checks

In this section I explore the robustness of the implemented model to modifications in samples and independent variables. I find limiting to certain decades influences the size of coefficients and the inclusion of the instruments to also alter the significance and magnitude of effects. However, I conclude that these differences are on the one hand due to the smaller samples selected and on the other, the consequence of endogeneity in the regressors. The differences in results therefore do not negate the findings made.

Decades

TABLE 2 suggests remittances are not stable over time, so results may be sensitive to the inclusion of certain time periods. To this end, *Table 4* breaks the model down by decade as well as including the full sample as a comparison. The significance of GDP growth is lost in each of the decades individually and only present at a 5% significance level in the full sample. Total population (instrument for migration stock) is also insignificant in the individual decades and only to a 10% significance level in the full sample. The exchange rate switches sign and is significant in the 80s, however the sample size is limited to 89 observations and 19 groups. The sign before inflation, dependency ratio and the real interest rate are sensitive to the samples selected, suggesting the findings identified for these may not be robust. Owing to the large variance in the number of groups and observations throughout the decades I take the full model to give the most complete picture.

Table 4

Remittances Received – Decades

	(1) 80s	(2) 90s	(3) 00s	(4) 10s	(5) Full
1st Lag of Remittances Received	0.649*	0.143	-0.000883	0.0925	0.495***
	(1.93)	(0.74)	(-0.00)	(0.54)	(3.76)
GDP per Capita Growth	-0.00516	-0.0263	0.332*	0.00906	0.0978*
	(-0.22)	(-0.48)	(1.97)	(0.36)	(1.97)
Inflation	-0.00309	-0.00139	-0.156	-0.0255	-0.000403
	(-0.11)	(-0.33)	(-0.86)	(-0.85)	(-0.11)
Real Interest Rate	0.0377	-0.0407	0.0933	-0.0119	0.0537
	(0.71)	(-0.94)	(0.90)	(-0.39)	(0.99)
Exchange Rate	-0.00127	0.0238	-0.104	0.0282	-0.0229
	(-0.21)	(1.09)	(-1.19)	(0.57)	(-1.47)
Dependency Ratio	0.184	0.0839	1.557	-0.0970	-0.304*
	(0.99)	(0.86)	(1.14)	(-0.27)	(-1.88)
% Urban Population	-0.0281	-0.181	-2.909*	0.100	-0.869*
	(-0.06)	(-0.13)	(-1.69)	(0.17)	(-1.95)
Total Population	3.21e-07	7.28e-09	-8.62e-07	1.18e-07	3.12e-07
	(0.74)	(0.02)	(-0.73)	(0.36)	(1.45)
Year	-0.186	0.217	2.750	-0.290	-0.161
	(-0.71)	(0.56)	(1.58)	(-0.85)	(-1.12)
Observations	82	253	522	524	1381
F	13.84	2.322	1.041	1.222	13.41
df_m	9	9	9	9	9
df_r	18	40	61	63	64
Hansen J	6.57	26.01	28.77	22.5	57.95
Hansen p-value	0.996	0.407	0.274	0.430	1.000
Arellano-Bond AR(2)	0.408	0.195	0.282	0.266	0.239

Note. df_m refers to the number of groups in the respective model. t statistic in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Reintroduction of Instrumented Variables

To control for endogeneity I used instruments for both migration stock and the poverty measures. To assess the impact this has on the results I have reintroduced these as instrumented independent variables in *table 5.* The poverty ratio remains significant, however, it also switches sign. Meanwhile the migrant stock remains insignificant.

This shift in coefficients is also paired with other changes. Comparison between the two columns in *Table 5* shows a relatively stable relationship with the past lag of remittances, as well as GDP growth. However, the previously insignificant market return measures become significant, the exchange rate even to a 1% significance level. Meanwhile, the impact of the dependency ratio is almost tripled when excluding the instruments. Given the initial risk endogeneity and the following control measures of using instruments, the fully instrumented model gives a more complete picture.

Table 5

Remittances Received Relative to GDP – Uninstrumented

	(1) Not Instrumented	(2) Fully Instrumented
1st Lag of Remittances Received	0.525***	0.495***
	(3.98)	(3.76)
GDP per Capita Growth	0.0651	0.0978*
	(1.48)	(1.97)
Inflation	0.121*	-0.000403
	(2.01)	(-0.11)
Real Interest Rate	0.0537**	0.0537
	(2.36)	(0.99)
Exchange Rate	-0.117***	-0.0229
	(-3.98)	(-1.47)
Dependency Ratio	-0.832**	-0.304*
	(-2.25)	(-1.88)

Poverty Ratio	-0.173**	
	(-2.54)	
Migrant Stock	-0.00000113	
	(-0.41)	
Year	-0.481*	-0.161
	(-1.74)	(-1.12)
% Urban Population		-0.869*
		(-1.95)
Total Population		0.000000312
		(1.45)
Observations	175	1381
F	117.5	13.41
df_m	9	9
df_r	27	64
Hansen J	18.36	57.95
Hansen p-value	0.999	1.000
Arellano-Bond AR(2)	0.381	0.239

Note. t statistic in parentheses. $^{*} p < 0.1$, $^{**} p < 0.05$, $^{***} p < 0.01$.

VI. Discussion & Limitations

Discussion

To answer the original research question, I set up hypotheses to guide the paper. These followed from existing literature, in particular Lucas and Stark's three theories on the motivations to remit (1985). Assessing each of these hypotheses in turn will help answer 'w*hich macroeconomic characteristics determine the size of remittance flows'.* I will begin with the second and third hypotheses as these break down the first.

H1: Remittance flows are motivated through altruistic motives.

H2: Remittance flows are negatively related to economic development.

H3: Remittance flows are unrelated to measures or financial return.

The data suggests financial return measures to have an insignificant impact on remittances relative to GDP, which is in line with *hypothesis 3*. This does not stand out in contradiction of past literature and is inline with certain case studies (Straubhaar, 1986; Glytsos, 1988). This opposes the theory of a selfish migrant. In the case of a selfish migrant, one would expect higher potential financial returns to increase the money invested in assets in the origin country. This phenomenon does not appear to be a cause for remittance flows. It is, however, consistent with expectations derived from the altruistic migrant. For this type, other people's wellbeing is the motivation for transfers and is assumed to be steady -ceteris paribus- if the financial returns change. As discussed later, for policy purposes, this distinction may be critical.

The finding that economic growth has a positive relationship with remittances relative to GDP leads to the second hypothesis being rejected. However, the poverty ratio plays a significant role in the determination of remittance flows. The positive relationship with remittances relative to GDP supports the theory of the altruistic migrant, for whom an increase in poverty is paired with an increase in support for family member or friends at home. This is in line with many microeconomic papers relying on survey data.

Turning towards the overall motives of migrants, the first hypothesis can neither be rejected nor accepted. I find support for both sides, suggesting a hybrid nature of remittances in which both altruism and selfishness play a role. This finding could be caused by this research being unable to differentiate between two different groups of migrants who act on different beliefs and motivations. Alternatively, both motivations may guide the behaviour of one group of nearly homogenous migrants for whom investing and aiding other is important. This hybrid nature is consistent with previous research and highlights the difficulty policy makers face in international flows of migrants and their returns.

These findings have a lot to say about policy. As mentioned before, policy in most countries is designed to help a population. With this aim in mind, implementing effective policy -those that perform what they are intended to- is crucial. I will summarise the relevant take-aways for this. Owing to the hybrid nature of flows, determining the proportions of people in either category of the selfish or altruistic migrant will lead policies to be implemented which encourage the desired behaviour. Alternatively, if both aspects are present in each individual, it is important to determine the extent to which each may

outweigh the other, the relative elasticity of remittance flows would be important to be aware of. This area of research would greatly improve the quality and targets of policy.

Finally, the consistent and long lasting impact of stimulated change is important for policy. The positive coefficient for the first lag of remittance flows suggests the policy has further reaching implications than merely the following year. Building flows in one year therefore directly increases what the next year will bring in for both the central government and the support the people of the country receive. Knowing this, the costs of policy implementation could be discounted over many years, instead of just the benefit felt in the following year.

Limitations

There are however limitations faced by this research. These concern the available data, as well as problems related to measurement. Firstly, collected data on the migration stocks is limited to those in 30 OECD countries. Although these are linked to their origin countries all around the world, the OECD consists of only a subgroup of all countries, as a club of mostly rich countries. Under the well-grounded economic conditions for migration to richer, better paying countries, this does not render the research useless. Instead, it is a starting point incorporating a large proportion of migration destination countries.

Next, the variables assessed in this paper are not all that would be of interest. Further variables have been excluded from this research for reasons of data availability. Data on education, including potential proxies of illiteracy or enrolment in primary, secondary or tertiary education are only available for limited time frames and only for a select few countries. Including these greatly impacts the econometric analysis and reliability of results. Although this paper was unable to include these variables it is an interesting future addition to the field.

In the presence of measurement difficulties, data can be incomplete or include errors. As a consequence, the measured remittances likely do not encompass the entire picture of remittance flows. There are large swathes that pass through informal channels such as in-kind gifts, unaccounted money sent in cash or in the form of capital goods. Highlighting the risk this poses to results, Korovilas (1999) estimates that total remittances in Albania may be up to 75% higher than measured through official means. Only in small scale studies can estimates

of the true figures be attained. Microeconomic analysis can work around this by using survey data, which, if accurately reported, encompasses all income channels. Of course, this measurement comes with its own challenges.

A limitation of the approach taken in this and other papers is the separation of the microeconomic and macroeconomic foundations. Just as microeconomic case studies do not take potentially significant macroeconomic variables into consideration, I have assumed the opposite for this analysis. Studies using household surveys and micro data suggest the characteristics of the migration community also plays a role in remittances. These refer to more discreet personality trains and demographic statistics such as age, gender, initial income and the number of those in the origin country reliant on the migrant. Combining both sides would generate a more complete understanding of the determinants of remittance flows.

Finally, the comparison of aggregate world-wide flows has its costs and benefits. I have generalised the results, suggesting the same impact is present regardless of the country in question. Just as previous literature on microeconomic foundations has found, there are differences. An interesting starting point for future research is the differential between for example, low, medium and high income countries. Does this have an impact on the flows of remittances? This exceeds the scope of this paper but will be interesting to continue investigating.

Future Research

The relevance of the field suggests findings can have significant impacts on the livelihood of a population and the potential attainable by a whole country. For this reason, research including a wider range of variables that have so far been beyond the scope of literature would greatly enhance the knowledge in the field. The specifics of education would be an interesting starting point in this. The breakdown by a country's wealth and development would also be interesting to see if asymmetric differences are present.

Conclusion

In this paper, I have assessed the underlying macroeconomic characteristics, determining a migrant's remittance flows to their country of origin. Through careful application of the generalised method of moments analysis paired with the use of instrumental variables, I find that there is significant evidence supporting both sides of the

altruism/selfish discussion. In support of altruism, I find poverty to have a positive relationship with remittance flows relative to GDP. On the alternative side, I find the economic potential of a country (proxied by GDP growth) to have a positive impact supporting selfish behaviour. These findings do not contradict each other and instead support both sides are motivators for migrants, suggesting as past literature has, a hybrid nature of remittance flows. In an ever increasingly globalising world, effective management of remittance flows, both through official and unofficial means can have far reaching impacts on the population and the country as a whole. Implementing policy suggestions based on research in the field has the potential to improve the wellbeing of many. Having identified key limitations of this paper, the potential problems are laid out, generating just caution to the results, while maintaining their applicability. The findings from a more comprehensive review with larger data are nonetheless paired with their applicability to the real world in policy make them an important addition to the existing macroeconomic literature.

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Appendix

Table A1

Data Sources and Measures

Variable	Source	Measure
Remittances Received	World Bank estimates from on IMF balance of payments	Sum of personal transfers and compensation of employees (USD)
a) General Macro		
GDP Growth	OECD and World Bank National Accounts	(Current USD)
GDP per Capita – Current Prices	OECD and World Bank National Accounts	GDP divided by midyear population (Current USD)
GDP per Capita - PPP	OECD and World Bank National Accounts	GDP divided by midyear population (PPP adjusted USD)
b) Market Return		
Inflation	IMF	Consumer Price Index; measured as a percentage
Real Effective Exchange Rate	IMF	Value of a currency against a weighted average of several foreign currencies divided by an index of costs.
Real Interest Rate	IMF	Lending interest rate adjusted for inflation.
c) Demographic		
Dependency Ratio	World Bank; Government statistical agencies and World Bank country departments	<15 or >64 as % of working age population
Literacy Rate	UNESCO Institute for Statistics	% of population aged 15 and above
Urban Population - %	United Nations Population Division	World Urbanization Prospects: 2018 Revision
Political Rights	Freedom in the World Scores	Freedom House Index – Political Rights

| Civil Liberties	Freedom in the World Scores	Freedom House Index – Civil Liberties
Total Stock of i	OECD International Migration Database	.
Total Population	World Bank; Government statistical agencies and World Bank country departments	.
Poverty Ratio	World Bank; Government statistical agencies and World Bank country departments	% of population on less than $1.90 a day (2011 PPP)

Note. IMF refers to the International Monetary Fund. UNESCO is the United Nations Educational, Scientific and Cultural Organisation. OECD is the Organisation for Economic Co-operation and Development.

Figure A1

Scatterplot lot of Remittances as % of GDP over time

A. Including Lesotho   B. Excluding Lesotho
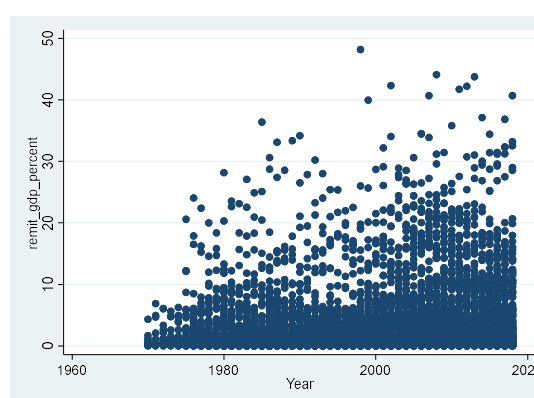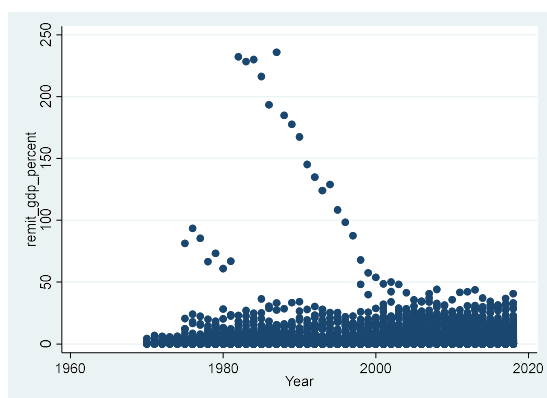
Note. Panel A. plots remittances compared to GDP of all countries and territories. Panel B. excludes Lesotho form the same scatter plot.

Table A2

Summary Statistics – including Lesotho

Variable	Mean	SD	Min	Max	N (observations)	n (groups)	T (avg. years)
Country	.	.	.	.	13080	218	60
Year	1989.5	17.31876	1960	2019	13080	218	60
Dependency Ratio	71.98065	20.24257	15.74309	121.0511	11435	195	58.641
GDP Growth	2.081441	6.044425	-64.9924	140.3708	9353	213	43.9108
GDP per Capita - Current	8272.428	16336.93	34.79058	189170.9	9748	213	45.7653
GDP per Capita - PPP	14624.06	18311.32	285.586	153562.5	5439	198	27.4697

Inflation	23.08891	335.3916	-60.4964	23773.13	7852	188	41.766
Literacy Rate	80.68164	21.05495	5.40465	99.99819	939	168	5.58929
Exchange Rate	116.4092	114.8546	18.73379	3522.72	3591	95	37.8
Real Interest Rate	5.926267	18.12761	-97.6154	789.799	4205	147	28.6054
Remittances Received	1.5E+09	4.42E+09	6038.03	8.31E+10	6323	196	32.2602
Remittances Received - % of GDP	4.223043	10.99603	.0000289	235.9241	5997	193	31.0725
Urban Population - %	50.94644	25.70093	2.077	100	12677	216	58.6898
Political Rights	3.677623	2.228525	1	7	5537	187	29.6096
Civil Liberties	3.695503	1.929231	1	7	5537	187	29.6096
Total Stock of i	225077.6	665070.1	0	12100000	6528	204	32
Population Total	24100000	1.01E+08	3893	1.39E+09	12754	218	58.5046
Poverty Ratio	10.4584	17.78002	0	94.1	1685	165	10.2121
Poverty Ratio	10.37156	17.70118	0	94.1	1681	164	10.25

Note. Groups represents the number of territories for which data is available for at least one year.

Table A3

Migration Stock - First Stage Regression Results

	(1) Migration Stock
Total Population	0.00179***
	(16.72)
Constant	177787.5***
	(25.26)
N	6482
F	279.33
df_m	1
df_r	6480

Note. t statistic in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A4

Poverty – First Stage Regression Results

	(1) Poverty Ratio
% Urban Population	-0.579***
	(-24.13)
Constant	46.327***
	(26.54)
N	1662
F	33.85
df_m	1
df_r	1660

Note. t statistic in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A5
List of Territories Included in the Analysis

Afghanistan	Comoros	Hungary	Mongolia	Solomon Islands
Albania	Congo, Dem. Rep.	Iceland	Montenegro	Somalia
Algeria	Congo, Rep.	India	Morocco	South Africa
American Samoa	Costa Rica	Indonesia	Mozambique	South Sudan
Andorra	Cote d'Ivoire	Iran, Islamic Rep.	Myanmar	Spain
Angola	Croatia	Iraq	Namibia	Sri Lanka
Antigua and Barbuda	Cuba	Ireland	Nauru	St. Kitts and Nevis
Argentina	Curacao	Isle of Man	Nepal	St. Lucia
Armenia	Cyprus	Israel	Netherlands	St. Martin (French part)
Aruba	Czech Republic	Italy	New Caledonia	St. Vincent and the Grenadines
Australia	Denmark	Jamaica	New Zealand	Sudan
Austria	Djibouti	Japan	Nicaragua	Suriname
Azerbaijan	Dominica	Jordan	Niger	Sweden
Bahamas, The	Dominican Republic	Kazakhstan	Nigeria	Switzerland
Bahrain	Ecuador	Kenya	North Macedonia	Syrian Arab Republic
Bangladesh	Egypt, Arab Rep.	Kiribati	Northern Mariana Islands	Tajikistan
Barbados	El Salvador	Korea, Dem. People's Rep.	Norway	Tanzania

Belarus	Equatorial Guinea	Korea, Rep.	Oman	Thailand
Belgium	Eritrea	Kosovo	Pakistan	Timor-Leste
Belize	Estonia	Kuwait	Palau	Togo
Benin	Eswatini	Kyrgyz Republic	Panama	Tonga
Bermuda	Ethiopia	Lao PDR	Papua New Guinea	Trinidad and Tobago
Bhutan	Faroe Islands	Latvia	Paraguay	Tunisia
Bolivia	Fiji	Lebanon	Peru	Turkey
Bosnia and Herzegovina	Finland	Lesotho	Philippines	Turkmenistan
Botswana	France	Liberia	Poland	Turks and Caicos Islands
Brazil	French Polynesia	Libya	Portugal	Tuvalu
British Virgin Islands	Gabon	Liechtenstein	Puerto Rico	Uganda
Brunei Darussalam	Gambia, The	Lithuania	Qatar	Ukraine
Bulgaria	Georgia	Luxembourg	Romania	United Arab Emirates
Burkina Faso	Germany	Macao SAR, China	Russian Federation	United Kingdom
Burundi	Ghana	Madagascar	Rwanda	United States
Cabo Verde	Gibraltar	Malawi	Samoa	Uruguay
Cambodia	Greece	Malaysia	San Marino	Uzbekistan
Cameroon	Greenland	Maldives	Sao Tome and Principe	Vanuatu
Canada	Grenada	Mali	Saudi Arabia	Venezuela, RB
Caribbean small states	Guam	Malta	Senegal	Vietnam
Cayman Islands	Guatemala	Marshall Islands	Serbia	Virgin Islands (U.S.)
Central African Republic	Guinea	Mauritania	Seychelles	West Bank and Gaza
Chad	Guinea-Bissau	Mauritius	Sierra Leone	Yemen, Rep.
Channel Islands	Guyana	Mexico	Singapore	Zambia
Chile	Haiti	Micronesia, Fed. Sts.	Sint Maarten (Dutch part)	Zimbabwe
China	Honduras	Moldova	Slovak Republic	
Colombia	Hong Kong SAR, China	Monaco	Slovenia	

Note. Territories include recognised countries as well as recognised territories. All sub-totals have been removed from the dataset.