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Remittance Concentration and Volatility:
Evidence from 72 Developing Countries

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I N T E R N A T I O N A L M O N E T A R Y F U N D

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Strategy, Policy and Review Department

Remittance Concentration and Volatility: Evidence from 72 Developing Countries

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Abstract

This paper contributes to the literature by introducing the role of geographic concentration of the source of remittances. Specifically, using data over 2010-2015 for 72 developing countries, we study the impact of (i) large remittances and (ii) the geographic concentration of the source of remittances on economic volatilities. Results suggest that while (i) large remittances can be stabilizing on average, (ii) high remittance concentration from source countries can aggravate economic volatilities in recipient countries. Results are robust to global shocks affecting both source and recipient countries, and volatility in the remittance-sending country.

JEL Classification Numbers: E32, F24, O19.

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I. INTRODUCTION AND CONTRIBUTION TO THE LITERATURE

Remittances are an increasingly important source of foreign exchange inflows in many developing countries. As of end 2016, worldwide remittances surpassed \$500 billion, and this number will only continue as migration persists. Remittance flows to low-income countries (LICs) are high, reaching around \$40 billion in Sub-Saharan Africa or around 3 percent of their combined GDP. Such inflows can act as buffers against adverse economic shocks at the country level, as well as smooth consumption at the household level.

The existing theoretical and empirical literature has examined the determinants of remittance inflows as well as their developmental impact. Remittances are generally linked to migration patterns, economic activity in sending versus receiving country, investment opportunities in sending versus receiving country, as well as the quality of institutions, economic policies and risks in the receiving country (Ncube and Brixiova 2013; Frankel 2011; IMF 2005). Several studies also examined the positive development impact of remittances. At the household level, remittances can be associated with higher consumption and less poverty by loosening budget constraints and increasing human and capital accumulation (IMF 2005). Tansel, and Yaşar (2010) provides such evidence in Turkey for example. These impacts at the household level suggest that remittances can play a role at the aggregate macro level.

In this paper, we expand the existing empirical literature in two important ways. First, we empirically test the relationship between large remittances and the volatility of a wide range of external (exchange rate and imports growth) and real sector (government revenues and real GDP growth) variables. Existing studies have focused on growth or consumption volatility only. Second, we study the potentially negative role that the geographic concentration of the sources of remittances can have on volatilities, notwithstanding the positive impact of large remittances themselves.

To the best of our knowledge, this is the first study in the literature to study the relationship between geographic concentration of source of remittances and economic volatility in recipient countries. Combining both objectives of this study, we examine the hypotheses of the positive role of remittances and the negative role of high remittance concentration on economic volatility in a sample of 72 developing countries over the 2010-2015 period. We find that while (i) large remittances can be stabilizing on average, (ii) high remittance concentration from source countries can aggravate economic volatility in recipient countries, notwithstanding the positive role of large remittances by themselves.

The rest of this paper is structured as follows. Section II presents a theoretical and empirical background. Section III provides stylized facts on remittance and remittance concentration in our country sample. Section IV presents the empirical methodology and regression results. Finally, Section V concludes.

II. THEORETICAL AND EMPIRICAL BACKGROUND

Remittances can affect the economy through various channels. As argued by Abdih et al (2009) and Chami et al (2006), these channels include (i) higher taxes whereby remittances – by encouraging higher consumption of domestic and imported goods – can increase government revenue from consumption- and trade-based taxation; (ii) higher private savings and bank deposits which can be used by banks to purchase government debt securities; (iii) higher seigniorage revenue if remittances increase the domestic demand for banking sector liabilities, thus increasing the demand for money; and (iv) smoothing consumption in the absence of complete credit markets (Hyder et al 2015; Jack and Suri 2014). Chami et al (2008) formalize these channels in a theoretical framework, using household budget constraints, linking remittances to fiscal sustainability. As such, since remittances can increase the revenue base, several studies have added remittances to GDP or exports as a more appropriate measure of capacity to pay for debt sustainability purposes (Abdih et al 2009 and IMF 2013).

Remittances can potentially have negative economic effects. Chami, Fullenkamp, and Jahjah (2003) provide evidence that remittances can negatively impact growth through lowering incentives to work and by increasing the reservation wage (the lowest wage at which a worker would be willing to accept a particular type of job). Chami et al (2018) argue that high levels of remittances can spark a vicious cycle of economic stagnation and dependence; what they call a “remittance trap”. Remittances can lead to exchange rate appreciation, thus lowering export competitiveness and leading to a contraction of tradable sectors (i.e. the “Dutch disease”), especially in small open economies with large remittances (World Bank 2006a; IMF 2005; and Amuedo-Dorantes and Pozo 2004). Remittances can also encourage higher (consumption goods) imports and lower government effectiveness (Chami et al 2018). Some empirical studies have found that remittances can be pro-cyclical if migrants’ decision to remit is mostly driven by investment motives (Bettin et al 2014; Cooray and Mallik 2013).

Theoretically, remittances can have an ambiguous impact on macroeconomic volatility.² Remittances can affect macro aggregates through the activities of remittance-receiving households, primarily through their consumption decisions and saving/investment patterns (Rapoport and Docquier 2006; Abdih et al 2009), and depending on the input-output sectoral linkages in the economy (Dridi et al 2019). The trade theoretic literature relates remittances to macro aggregates via their effects on relative prices and welfare. The basic Mundel-Flemming model can explain the impact of an aggregate demand shock (i.e. impact of remittances on

² The determinants of remittances are a separate strand of the literature. See Rapoport and Docquier (2006) for a comprehensive survey.

(continued...)

output) as a function of capital openness and the exchange rate regime.³ Chami et al (2008) argue the effects of remittance flows on macroeconomic variables depends on whether they are exogenous or endogenous and how they interact with the characteristics of the recipient country. To the extent that remittances are exogenous and volatile, they could transmit this volatility into the recipient economy in the same way as shocks to terms of trade or capital flows (Chami et al 2012). Chami et al (2006) argue that remittances can theoretically magnify effects of domestic business cycles if labor supply is endogenous. Jidoud (2015) using a small open economy DSGE model argues that the stabilizing effect of remittances hinges on two theoretical channels: the size of the negative wealth effect on labor supply induced by remittances and the ability of remittances to induce financial sector development.⁴ Frankel (2011), Abdih et al (2012), and Bettin et al (2014) argue that remittances can be counter-cyclical with respect to income in the recipient country, but pro-cyclical to income in the source country. World Bank (2006a) and Ahmed and Martínez-Zarzoso (2016) discuss the “smoothing hypothesis” whereby remittances can be more counter-cyclical than other FX flows such as FDI or portfolio flows, stabilizing output along the business cycle.

Empirically, most studies show that remittances can reduce volatility, focusing on output or growth volatility. IMF (2005) estimates that a 2.5 percentage point increase in the remittances/GDP ratio is, on average, associated with a one sixth decrease in output volatility. World Bank (2015) finds similar results. Chami et al (2008 and 2012) estimate that an increase in worker’s remittances-to-GDP ratio of one percentage point is associated with a reduction of 0.164 and 0.3 percent in GDP growth volatility, respectively in different sample periods and countries, and after controlling for other factors as identified in the literature. Bouoiyour et al (2016) find that remittances in Morocco can smooth growth volatility, while FDI flows can aggravate it, providing empirical support to the theoretical notion of the counter-cyclicity of remittances as opposed to other FX flows.

III. AN INITIAL LOOK AT THE DATA

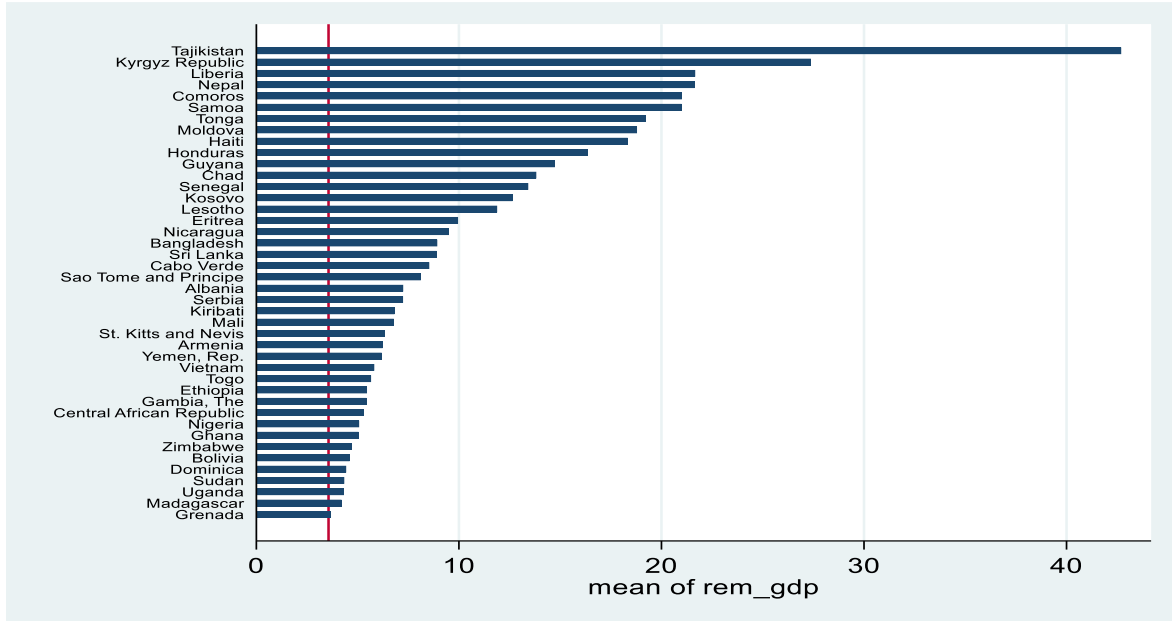
Remittances represent an important source of foreign currency for several developing countries. As a share of GDP, Tajikistan has the highest share; slightly above 40 percent of its GDP on average over 2010-2015, followed by Kyrgyz Republic, Liberia, Nepal and Comoros. Figure 1 shows countries with an average remittances-to-GDP above the median of the sample (vertical red line at 3.6 percent of GDP in Figure 1). In absolute values, Nigeria reported the highest remittances; slightly above \$20 billion a year on average over 2010-2015, followed by

³ For example, if remittances increase under a flexible exchange rate regime, the resulting currency appreciation would offset the increase in aggregate demand from increased expenditure.

⁴ Adeniyi et al (2019) and Ahamada and Coulibaly (2011) present empirical support to the importance of financial development in how remittances can affect macroeconomic volatility.

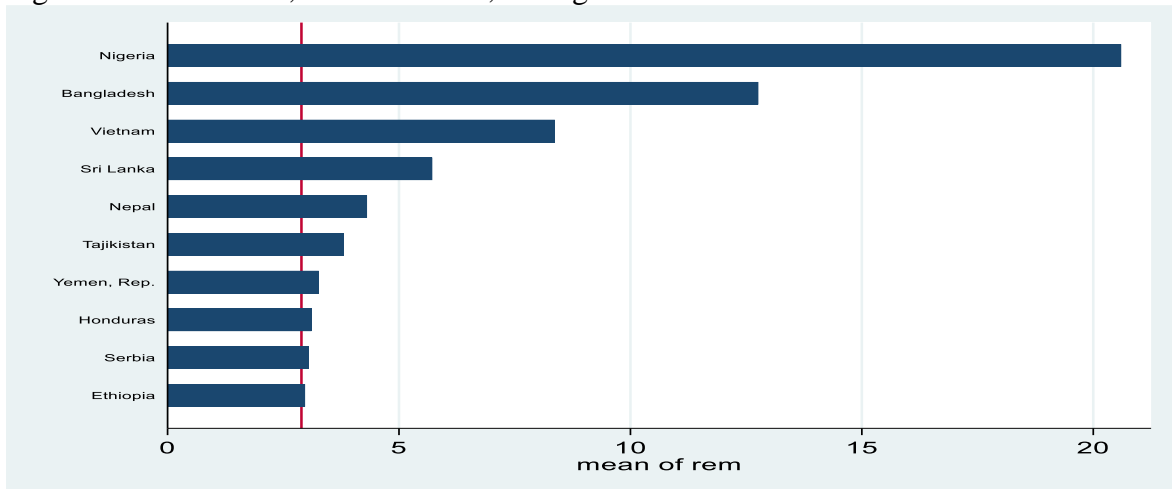
Bangladesh, Vietnam and Sri Lanka. Figure 2 shows countries in the 90th percentile of the distribution of our sample (vertical red line at \$2.9 billion in Figure 2).

Figure 1: Remittances-to-GDP, average 2010-2015



Source: Calculations based on IMF WEO and WB Migration and Remittances databases.

Figure 2: Remittances, in US Billions, average 2010-2015



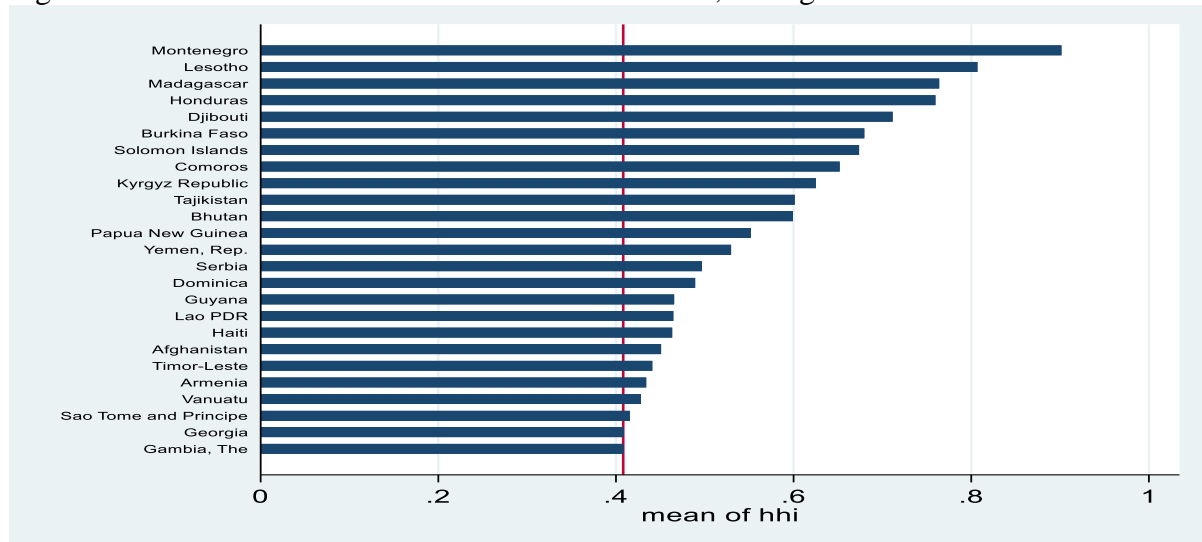
Source: Calculations based on WB Migration and Remittances database.

The geographic concentration of the origin of remittances is an important angle that is missing in the empirical literature. Using the Herfindahl–Hirschman Index (HHI) to measure geographic concentration of the origin/source of remittance, we compare the size of remittances received from each country in relation to overall remittances over 2010-2015. The HHI index is defined as the sum of the squares of the shares of remittance sending countries to

all countries, producing a range between 0 and 10,000 points, which we then normalize to become an index between 0 and 1. A higher HHI indicates higher concentration.

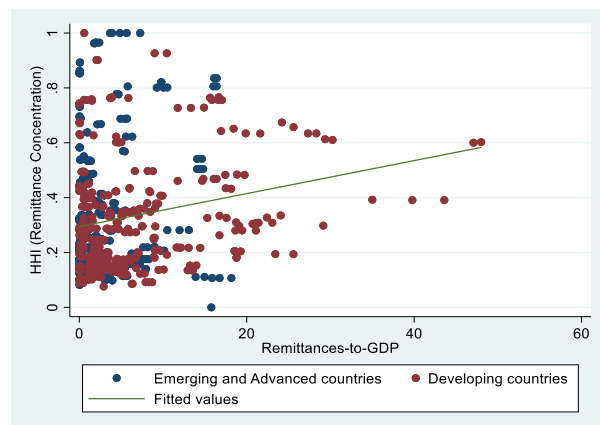
Concentration appears to be high in several developing countries, mostly in the African region with remittances originating mostly from South Africa and France. Data suggests that Montenegro has the highest concentration during the period under consideration, with remittances mostly from its neighbor Serbia. This is followed by several African countries, such as Lesotho and Madagascar with remittances almost entirely originating from South Africa and France, respectively. Although this could be due to a number of factors, geographic proximity, formal colonial ties and shared languages appear to be the most relevant (Arizala et al 2018; Gonzalez-Garcia et al 2016; Barajas et al 2010; and Lueth and Ruiz-Arranz 2006). Figure 3 shows developing countries with an average HHI above the sample's top HHI quartile (vertical red line at around 0.4 HHI index in Figure 3).

Figure 3: Herfindahl index: Remittances Concentration, average 2010-2015



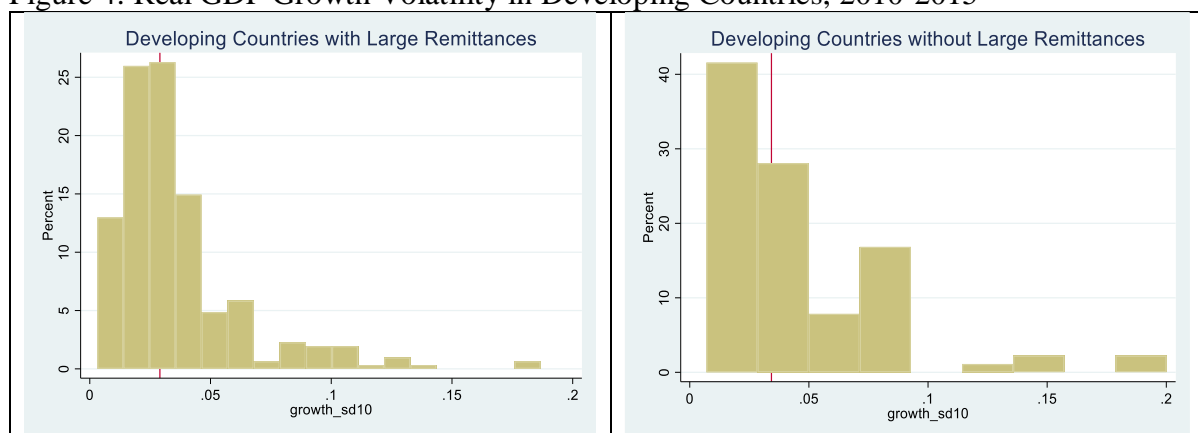
Source: Calculations based on WB Migration and Remittances database.

Countries with high remittances seem to have high remittance concentration as well. Plotting our measure of remittance concentration (HHI) against remittances-to-GDP, over 2010-2015, shows that countries that receive high remittances tend to receive them from concentrated source-countries, on average. This is especially the case for developing countries.



Large remittances seem to be associated with lower economic volatilities. Following De et al (2016), World Bank (2015) and IMF (2005), we define countries with large remittances as those where remittances-to-GDP exceed 1 percent.⁵ We then use a rolling 10-year window of the standard deviation of external and real sector variables of interest to calculate their volatility (higher values indicate higher volatility). For example, Figure 4 shows that the median volatility of real GDP growth was 0.29 in developing countries with large remittances (Figure 4 panel A) compared to 0.34 in those without large remittances (Figure 4, panel B).⁶ Similarly, developing countries with large remittances have lower volatility of exchange rate movements (Figure 5 panel A median of 0.07 compared to panel B median of 0.12 in countries without large remittances), lower imports growth (median of 16.07 compared to median of 21.5 in countries without large remittances), and lower volatility of changes in revenues (median of 0.12 compared to median of 0.15 in countries without large remittances).

Figure 4: Real GDP Growth Volatility in Developing Countries, 2010-2015

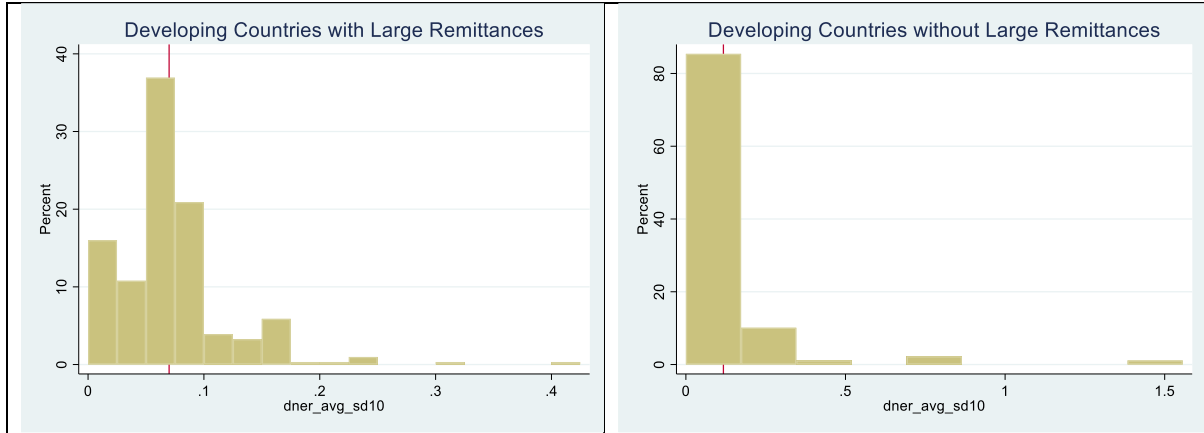


Source: Calculations based on IMF WEO, WB WDI, and WB Migration and Remittances databases.

Figure 5: Nominal Exchange Rate Volatility in Developing Countries, 2010-2015

⁵ Chami et al (2008) define remittance-dependent countries as those with remittances-to-GDP ratios of 5 percent or more.

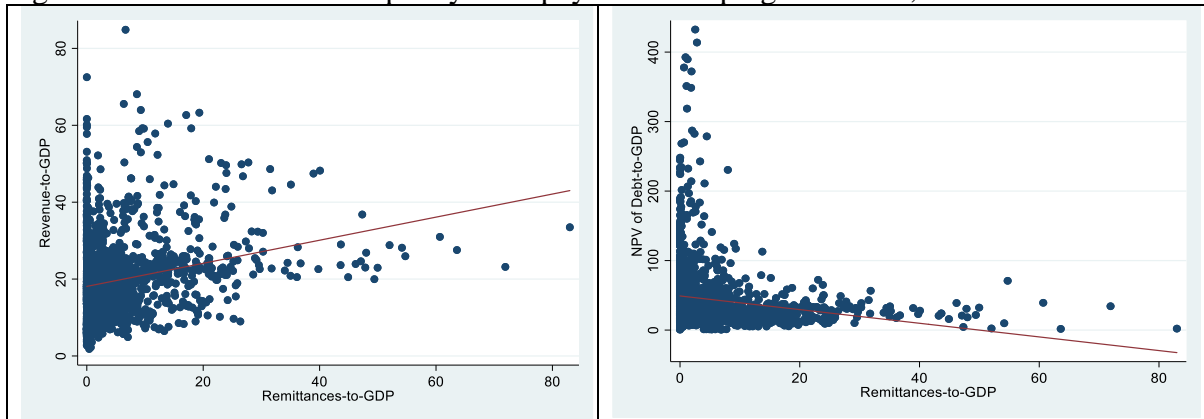
⁶ Both samples have similar standard deviations, although that with large remittances has a more positively skewed distribution compared to that without large remittances (skewness of 2.19 compared to 1.88). The sample with large remittances also has a fatter tail than that without large remittances, with more observations around the median (kurtosis of 9.35 compared to 7.53).



Source: Calculations based on IMF WEO, WB WDI, and WB Migration and Remittances databases.

Remittances can be associated with higher capacity to repay debt. Higher remittances-to-GDP seem to be positively associated with higher revenue-to-GDP and lower NPV of public debt-to-GDP⁷ in our sample of developing countries over the 1990-2015 period (Figure 6).

Figure 6: Remittances and Capacity to Repay in Developing Countries, 1990-2015



Source: Calculations based on IMF WEO, WB WDI, and WB Migration and Remittances databases.

IV. THE MODEL, METHOD AND RESULTS

The methodology used is a static panel data approach on a sample of 72 developing countries over 2010-2015 to study the relationship between remittances, remittance concentrations and the volatilities variables in the external sector (exchange rate changes and import growth) and real sector (government revenue changes and real GDP growth). The choice of dependent variables follows from the theoretical section above, where remittance FX inflows can affect exchange rate dynamics, which when combined with changing savings/consumption patterns can affect imports of G&S. Remittances can also affect

⁷ We use NPV instead of nominal debt as most of our sample is Low Income-Countries, where their debt stock is predominantly external concessional loans.

revenues/consumption/investment through various channels, which ultimately affects GDP growth. Data for the dependent variable, $volatility_{it}$ one for each of the four types of volatility, are calculated from the IMF World Economic Outlook database, while that of the independent variables comes from both the IMF World Economic Outlook and the WB World Development Indicators databases. The panel is balanced. We use Fixed Effect (FE) and Random Effect (RE) models, which are appropriate for such a panel with large N and small T.⁸ Regressors are lagged and expressed in logs where appropriate to account for potential endogeneity and reverse causality.⁹

$$volatility_{it} = \beta_0 + \beta_1 rem_dummy_{it} + \beta_2 hhi_{it} + \beta_3 rem_dummy * hhi_{it} + \beta_4 X_{it} + \varepsilon_t$$

Coefficients of interest are those attached to remittances and remittance concentration. These correspond to coefficients β_1 - β_3 . The following describes how the large remittance and remittance concentration variables are constructed:

- **We create a dummy variable to identify developing countries with large remittances.** The dummy variable takes the value of one if, for a given county in a given year, the remittances-to-GDP ratio was equal to or higher than 1 percent of GDP, following the definition of large remittances in IMF (2005), World Bank (2015) and De et al (2016).¹⁰ The dummy would take the value of zero otherwise. The expected sign of the coefficient would be negative if higher remittances are associated with lower volatilities.
- **We use the Herfindahl–Hirschman Index (HHI) to measure remittances concentration.** As mentioned earlier, the HHI, hhi_{it} , measures the size of remittances received from each country in relation to overall remittances, with a higher index indicating higher geographic concentration of remittances. We use annual bilateral remittance data, by country, from the World Bank Migration and Remittances database over 2010-2015.¹¹ The expected sign of the estimated coefficient in the remittance-receiving country could be positive (increasing volatility) or negative (decreasing volatility), depending on the

⁸ Given the very short time dimension, which is constrained by data availability on remittance concentration, dynamic panel methods such as GMM or pooled mean group estimators are not applicable.

⁹ While having instrumental variables would have been ideal, it is difficult to find an instrument in a cross-sectional dimension that is correlated with remittances but not economic volatility. Bugamelli and Paterno (2009b) uses distance and GDP growth in the source country as instruments. Alternatively, internal instruments if one uses a dynamic panel method are also not feasible in our context given the very small T dimension.

¹⁰ About 23 percent of our sample, of 385 country-year observations, lies below the large remittance-to-GDP definition of 1 percent.

¹¹ Data, which starts in 2010, is available online on the World Bank website:
<https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data>

degree of spillover of positive or negative shocks from the remittance-sending countries. We also create an interaction dummy variable to capture the effect of both having large remittances and a high concentration of remittances. This variable, $rem_dummy * hhi_{it}$, intends to study the effect of high remittance inflows coming from a concentrated source. For example, the potential negative effect of the fact that Tajikistan's remittances come mostly from Russia, despite the potential positive effect of the high absolute value of the remittance inflows themselves.

Other independent variables include those identified in the literature, and importantly the role of institutions, global shocks and source country volatility. Other regressors, X_{it} are a list of factors that may influence economic volatility as identified in the literature. This includes quality of institutions, initial GDP levels, trade openness, real effective exchange rate, global shocks, and source country volatility (World Bank 2015; Bettin et al 2014; Chami et al 2012; Craigwell et al 2010; Bugamelli and Paterno 2009b; Acemoglu et al. 2003; Rodrik 1998). Specifically, important explanatory factors include:

- **The Country Policy and Institutional Assessment (CPIA) is used as a measure of quality of institutions.** The CPIA, an annual index published by the World Bank¹², is widely accepted in the literature as a broad indicator of development and institutional effectiveness. It rates countries against 16 different criteria grouped into four broad clusters: economic management, structural policies, policies for social inclusion and equity, and public-sector management and institutions. The CPIA index ranges from 1 (low/weak institutions) to 6 (high/strong institutions).
- **The role of global shocks is captured by changes in oil prices and world growth.** These can be perceived as exogenous shocks that affect both remittance sending and receiving countries. In what follows, we examine whether the impact of remittance concentration on volatility changes with and without these global shocks.
- **We also examine the role of volatility in the source country in the respective regressions.** In a sample of North and Sub-Saharan African countries, Barajas et al (2010) projects that countries with stronger migration ties to Europe would experience larger declines in their GDP owing to the fall in remittance inflows in the wake of the global financial crisis, compared to those receiving remittances mostly from larger neighboring countries within Africa. Barajas et al (2012) present evidence that the remittances can be asymmetric in that they are more effective in channeling economic downturns than

¹² The CPIA data is available starting 2005, here: <http://data.worldbank.org/data-catalog/CPIA>. The CPIA, since 1980, has been used to allocate World Bank International Development Association (IDA) resources to eligible client countries. It is produced annually for more than 70 IDA eligible countries.

upswings from sending to recipient countries in a sample of 11 emerging economies. To construct the source volatility variable, we identify the top remittance-sending country (the one with the highest contribution to the HHI index) and use its rolling 10-year standard deviation. We use exchange rate changes, imports of G&S growth, government revenues changes and real GDP growth source-country volatilities in the respective exchange rate changes, imports of G&S growth, government revenues changes and real GDP growth volatility equations.

Results are shown for external and real sector volatilities. We start with volatilities of external sector (exchange rate and imports growth) variables, followed by volatilities of real sector (government revenues and real GDP growth) variables.

Volatility of External Variables

Regarding volatility of changes in the nominal exchange rate:¹³

- **Results suggest that large remittances can be stabilizing.** The coefficients of interest are negative and significant as expected, suggesting remittances are associated with lower volatility (Table 1, eqs.1-3). This is in line with the hypothesis that remittances can act as automatic stabilizers in recipient countries, as the domestic currency value of remittances increases in the event of a depreciation. Furthermore, central banks can potentially use the relatively more stable flow of FX from remittances, compared to exports or debt portfolio inflows, to intervene in the FX market as deemed appropriate; thereby contributing to less exchange rate volatility. Diagnostic tests indicate panel RE model is the preferred one (Table 1, eqs.1-3).¹⁴
- **But when combined with high concentration, large remittances can aggravate exchange rate volatility.** The interaction dummy is positive and statistically significant,

¹³ The nominal exchange rate is defined in LCU/USD such that higher values indicate a depreciation against the U.S. dollar.

¹⁴ Pooled OLS is also estimated, in all regressions, assuming that the intercept and the slopes do not change across units or over time. Results of the F-test, comparing the unconstrained FE model with the constrained OLS model, are highly significant, indicating that pooled OLS would be biased and inconsistent (Baltagi 2008). We also apply the Breusch and Pagan (1980) Lagrangian multiplier test, and we reject the null hypothesis of no individual effects, rendering the OLS inconsistent. Regarding the static panel estimation methodologies, a FE model considers the individual effect to be fixed (hence the name fixed), as opposed to the RE model which assumes the specific individual effect is randomly distributed (hence the name random). The RE model, which is a feasible Generalized Least Squares (GLS) developed by Swamy and Arora (1972), is generally assumed to be a more efficient estimator than the FE model. The Hausman test basically checks a more efficient model against a less efficient but consistent model to make sure that the more efficient model also gives consistent results. See Hosny (2011) for a similar application in the context of a trade gravity model. In what follows, we report either the FE or the RE panel model, depending on the result of diagnostic tests.

indicating that high source remittance concentration can be harmful notwithstanding the positive impact of large remittances by themselves (Table 1, eqs.1-3).

- **Stronger institutions are associated with lower volatility.** The coefficient on the CPIA variable is negative and statistically significant (Table 1, eqs.1-3).
- **Results are robust after controlling for global shocks and source country volatility.** Adding global shocks that can affect both the source and recipient countries (oil prices and world growth) do not change the sign and statistical significance of the coefficients attached to other variables of interest; namely the large remittance dummy, the concentration index, the large remittance concentration interaction variable and the CPIA measure of quality of institutions (Table 1, eqs.2-3). Results are robust after controlling for exchange rate volatility in the source country (Table 1, eq.3), and a dummy variable to differentiate between fixed and flexible exchange rate regimes (Table 1, eqs.1-3).¹⁵

For the nominal imports of G&S growth volatility equation:

- **Large remittances by themselves are stabilizing, but can aggravate volatility when combined with high remittance concentration.** This result is similar to that of the exchange rate volatility regressions above. FX inflows from remittance could potentially influence imports of goods and services through their impact on the exchange rate, either via labor supply decisions or industry demand for goods (Craigwell et al 2010) and/or whether the FX is used for savings or consumption. This is evident from the negative coefficient attached to the large remittance dummy variable and the positive coefficient on the interaction dummy (Table 1, eqs.4-6). The finding that large remittances can smooth imports volatility is in line with the Bugamelli and Paterno (2009a) finding that large remittances can reduce current account reversals, especially above a threshold remittance-to-GDP ratio of 3 percent.
- **Higher trade openness is associated with higher import growth volatility** (Table 1, eqs.5-6), given that more open economies would be subject to stronger transmission of such shocks onto the domestic real economy. This is in line with Barajas et al (2012).

¹⁵ Results are the same, with or without the exchange rate dummy, where flexible de facto regimes take the value of 1 for (flexible) countries with yearly nominal changes of ± 2 percent, and 0 (fixed) otherwise, following the definition used in Ben Naceur et al (2019), Hosny et al (2015) and Schambaugh (2004). Other robustness checks include using different exchange rate definitions (nominal versus end of period) and using different large remittance dummy definitions (remittances of 10 percent of GDP and 20 percent of exports cutoffs as defined in IMF (2013), versus the 1 percent of GDP cutoff).

- **Results are robust after controlling for global shocks and volatility in the source country.** Adding global growth and oil price shocks does not change the sign and significance of the large remittance dummy and the large remittance concentration interaction variable (Table 1, eqs.5-6). Similarly, the inclusion of import growth volatility in the remittance-source country does not change the results (Table 1, eq.6).

Table 1: Volatility of Changes in Nominal Exchange Rate and Imports Growth

	Volatility Exchange Rate			Volatility Imports Growth		
	(1)	(2)	(3)	(4)	(5)	(6)
rem_dummy1	-0.09*** (0.032)	-0.09*** (0.032)	-0.10*** (0.034)	-2.729*** (0.992)	-2.516** (0.994)	-2.641** (1.103)
Hhi	-0.156** (0.070)	-0.162** (0.069)	-0.155** (0.072)	-4.771** (1.955)	-4.392** (1.963)	-3.731* (2.039)
rem_dummy1hhi	0.167** (0.080)	0.178** (0.080)	0.182** (0.086)	5.543** (2.277)	4.798** (2.294)	5.133** (2.586)
L.openness	-0.006 (0.025)	-0.014 (0.025)	-0.015 (0.026)	1.860 (1.168)	3.177*** (1.188)	2.800** (1.276)
L.lcpia	-0.158** (0.063)	-0.150** (0.063)	-0.155** (0.065)	0.486 (4.434)	-3.081 (4.259)	-0.578 (4.654)
L.lreer				18.524*** (0.945)	18.806*** (0.955)	18.943*** (0.971)
L.doil_price		0.001 (0.060)	-0.003 (0.063)		2.182 (1.337)	2.090 (1.398)
L.world_growth		-0.703 (0.799)	-0.685 (0.849)		-16.786 (17.874)	-15.216 (18.720)
L.source_vol			-0.000 (0.001)			-0.001 (0.002)
exr_regime	0.042*** (0.012)	0.042*** (0.012)	0.045*** (0.013)			
Constant	0.334*** (0.077)	0.358*** (0.080)	0.362*** (0.084)	-66.16*** (6.654)	-63.90*** (6.738)	-67.38*** (6.872)
Observations	355	355	335	355	355	331
R-squared	0.126	0.139	0.143	0.597	0.603	0.617
dummy	rem>1	rem>1	rem>1	rem>1	rem>1	rem>1
method	Panel RE	Panel RE	Panel RE	Panel FE	Panel RE	Panel FE
F-test (pool OLS)	3.51***	3.55***	3.49***	291.73***	294.55***	294.34***
Breusch-Pagan LM	101.3***	70.47***	62.14***	664.95***	667.84***	624.22***
Hausman test	9.72	10.54	13.03	19.10***	2.72	16.98*
Number of groups	72	72	68	72	72	68

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

“rem_dummy1” is the large remittance dummy variable using the 1 percent of GDP definition; “hhi” is the HHI index based on 2010-2015 data; “rem_dummy1hhi” is the interaction dummy between the large remittance

dummy based on the 1 percent definition and the HHI index; “L.openness” is lagged trade openness; “L.cpia” is lagged CPIA used as a proxy for quality of institutions; “L.reer” is lagged real effective exchange rate; “L.doil_price” is the lagged change in oil prices; “L.world_growth” is lagged world GDP growth; “L.source_vol” is lagged volatility of the dependent variable in the source country; and “exr_regime” is a dummy variable with value 1 if flexible exchange rate regime and 0 if fixed.

Volatility of Real Variables

Regarding the volatility of changes in government revenue:

- **Large remittances can lower revenue volatility, but can aggravate volatility if combined with high source-country remittance concentration.** The relevant coefficients on the large remittances and the remittance-concentration dummies are negative and positive, respectively (Table 2, eqs.7-9).
- **Stronger institutions and higher global growth are associated with lower revenue volatility, and results are robust to global shocks and source country volatility.** The relevant coefficients on the CPIA and world growth variables are negative and statistically significant (Table 2, eqs.7-9). The inclusion of global variables (oil prices and world growth, Table 2 eqs.8-9) and source country volatility (Table 2, eq.9) do not change the results on the main variables of interest on remittances and remittance concentration.

Regarding the volatility of real GDP growth:

- **Large remittances are stabilizing, while remittance concentration seems to have no impact on growth volatility.** The stabilizing role of remittances is evident from the negative and statistically significant coefficient attached to the large remittances dummy (Table 2, eqs.10-12). This result is in line with several empirical studies (for example Chami et al 2008; Chami et al 2012; Bugamelli and Paterno 2009b). Remittance concentration is found to be statistically insignificant as well the interaction dummy between large remittances and remittance concentration, although coefficient signs are as expected (Table 2, eqs.10-12).
- **Stronger institutions are associated with lower real GDP growth volatility.** Holding all else constant, the CPIA coefficient is negative and significant suggesting that better institutions can be stabilizing (see Table 2, eqs.10-12). Ajide et al (2015) take this further and interact several measures of institutions with remittances to establish the growth

volatility reduction potential of remittances in a sample of 71 remittances-recipient countries.¹⁶

- **Results are robust to global exogenous shocks and source country volatility.** The coefficient on world growth is negative and statistically significant, while coefficients attached to the large remittances dummy and CPIA maintain their significance (Table 2, eqs.11-12). This result is close in spirit to the work of Bettin et al (2014), who in explaining remittance flows in a sample of developing countries, estimate a regression with the cyclical and trend components of GDP in both the source and recipient countries as explanatory variables. They find that remittances remain negatively correlated with the business cycle in the recipient country, even in the presence of similar negative shocks to both source and recipient countries. Similarly, results are robust to controlling for real GDP growth volatility in the source country (Table 2, eq.12).

Table 2: Volatility of Changes in Government Revenues and Real GDP Growth

	Volatility Gov. Revenue			Volatility Real GDP Growth		
	(7)	(8)	(9)	(10)	(11)	(12)
rem_dummy1	-0.022** (0.011)	-0.024** (0.011)	-0.019* (0.011)	-0.012** (0.006)	-0.013** (0.006)	-0.012** (0.006)
hhi	-0.027 (0.021)	-0.031 (0.021)	-0.035* (0.020)	-0.018 (0.011)	-0.017 (0.011)	-0.018 (0.012)
rem_dummy1hhi	0.050** (0.025)	0.053** (0.025)	0.037* (0.020)	0.012 (0.013)	0.012 (0.013)	0.010 (0.014)
Initialgdp				-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
L.openness	-0.022* (0.013)	-0.030** (0.013)	-0.020 (0.014)	-0.004 (0.006)	-0.007 (0.006)	-0.007 (0.006)
L.lcpia	-0.18*** (0.046)	-0.14*** (0.048)	-0.109** (0.049)	-0.050*** (0.017)	-0.05*** (0.017)	-0.045** (0.018)
L.lreer	0.055*** (0.010)	0.049*** (0.010)	0.054*** (0.010)	0.005 (0.006)	0.004 (0.006)	0.004 (0.006)
L.doil_price		0.023 (0.014)	0.017 (0.015)		0.011 (0.008)	0.010 (0.008)
L.world_growth		-0.53*** (0.191)	-0.424** (0.195)		-0.227** (0.106)	-0.216** (0.110)
L.source_vol			-0.001 (0.002)			-0.190 (0.137)
Constant	0.175**	0.176**	0.114	0.091***	0.102***	0.106***

¹⁶ Focusing exclusively on the remittances-institutions relationship, in a sample of 111 countries, Abdih et al (2012) present evidence that higher ratio of remittances to GDP may lead to lower indices of control of corruption, government effectiveness, and rule of law, even after controlling for potential reverse causality.

	Volatility Gov. Revenue			Volatility Real GDP Growth		
	(7)	(8)	(9)	(10)	(11)	(12)
	(0.073)	(0.072)	(0.071)	(0.033)	(0.033)	(0.034)
Observations	355	355	305	355	355	340
R-squared		0.179	0.191	0.070	0.061	0.061
dummy	rem>1	rem>1	rem>1	rem>1	rem>1	rem>1
method	Panel RE	Panel FE	Panel FE	Panel RE	Panel RE	Panel RE
F-test (pool OLS)	250.4***	263.5***	344.5***	23.54***	24.23***	23.90***
Breusch-Pagan LM	656.9***	658.4***	565.5***	465.23***	468.89***	442.29***
Hausman test	0.99	16.12*	16.67*	7.27	0.22	10.51
Number of groups	72	72	62	72	72	69

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

“rem_dummy1” is the large remittance dummy variable using the 1 percent of GDP definition; “hhi” is the HHI index based on 2010-2015 data; “rem_dummy1hhi” is the interaction dummy between the large remittance dummy based on the 1 percent definition and the HHI index; “Initialgdp” is GDP level in first sample year; “L.openness” is lagged trade openness; “L.cpia” is lagged CPIA used as a proxy for quality of institutions; “L.reer” is lagged real effective exchange rate; “L.doil_price” is the lagged change in oil prices; “L.world_growth” is lagged world GDP growth; and “L.source_vol” is lagged volatility of the dependent variable in the source country.

V. CONCLUSION AND POLICY IMPLICATIONS

This paper studies the impact of the geographic concentration of remittances on economic volatility. Specifically, we empirically estimate the impact of large remittances and high remittance concentration on volatilities of external sector (exchange rate and imports) and real sector (revenues and real GDP growth) variables, while controlling for other variables that may affect these volatilities as identified in the literature. To conduct the empirical analysis, we use a balanced panel of 72 developing countries over the 2010-2015 period and bilateral remittance data to construct an HHI as a measure of remittance concentration, our main variable of interest.

We find that large remittances can be stabilizing on average, but high remittance concentration from source countries can aggravate economic volatilities in recipient countries. Results suggest that large remittance inflows are associated with lower volatilities in a statistically significant manner in almost all estimated regressions. Importantly, however, large remittances when combined with high remittance concentration are shown to aggravate, not reduce, volatility, notwithstanding the positive role of large remittances by themselves.

Stronger institutions are important for both lowering volatilities and avoiding the remittances trap. Empirical results suggest that stronger institutions (measured by higher CPIA) are generally associated with lower external and real sector volatilities. This finding is robust to controlling for global shocks and volatility in source-countries. In addition, stronger

institutions, in the presence of large remittance inflows, would help mitigate the Dutch disease problem and break the vicious circle of the remittance trap by providing better incentives to work and lowering the cost of doing business.

The results suggest that countries could benefit by diversifying the source of remittances.

In a study of Middle East and North Africa (MENA) countries, Mitra et al (2016) discuss how policy initiatives in advanced countries can be replicated to facilitate communication networks with emigrants in MENA countries, and help diversify sources of remittances while also promoting trade and investment opportunities.¹⁷ Relatedly, the financial cost of sending remittances, including via mobile money, can play an important role (see Arizala et al (2018) and Jack and Suri (2014) for evidence from SSA countries and Kenya, respectively). On average, remittance sending costs in 2017 were about 25 percent higher in SSA countries than in the rest of the world (Arizala et al 2018). For instance, according to the World Bank's Remittances Prices Worldwide database¹⁸, the average cost of sending remittances in 2017 to Nigeria was around 8 percent, double that of Tajikistan's 4 percent.¹⁹

¹⁷ Although concentration may sometimes be beneficial, as shown by Vaaler (2013) who finds that geographically-concentrated diasporas can increase their home-country venture funding access.

¹⁸ See <https://datacatalog.worldbank.org/dataset/remittance-prices-worldwide>

¹⁹ This issue is also observed in higher-income emerging economies, where for example it is more expensive to send remittances from Indonesia's first remittance source country (Malaysia, at around 6 percent, despite the geographic proximity) than from its second source country (Saudi Arabia, at around 4 percent).

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