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Defying the Odds: Remittances During the COVID-19 Pandemic

Kangni Kpodar, Montfort Mlachila, Saad Quayyum and Vigninou Gammadigbe

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Abstract

This paper provides an early assessment of the dynamics and drivers of remittances during the COVID-19 pandemic, using a newly compiled monthly remittance dataset for a sample of 52 countries, of which 16 countries with bilateral remittance data. The paper documents a strong resilience in remittance flows, notwithstanding an unprecedent global recession triggered by the pandemic. Using the local projection approach to estimate the impulse response functions of remittance flows during Jan 2020-Dec 2020, the paper provides evidence that: (i) remittances responded positively to COVID-19 infection rates in migrant home countries, underscoring its role as an important automatic stabilizer; (ii) stricter containment measures have the unintended consequence of dampening remittances; and (iii) a shift from informal to formal remittance channels due to travel restrictions appears to have also played a role in the surge in formal remittances. Lastly, the size of the fiscal stimulus in host countries is positively associated with remittances as the fiscal response cushions the economic impact of the pandemic.

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I. INTRODUCTION

The COVID-19 pandemic has caused a large loss of human lives and led to the sharpest and most coordinated global output contraction in recent history. Countries were forced to put restrictions on people's mobility to fight the pandemic and shut down non-essential businesses for extended periods. Unlike during the Global Financial Crisis where the advanced countries were hit hard, while many low-income developing countries were relatively unscathed, the COVID-19 pandemic has had a large adverse impact on economic activity in both advanced and developing countries. While the advanced economies were able to provide significant fiscal and monetary support to their population, developing countries, particularly low-income countries (LIC), could only afford much less due to limited policy space. As a result, the impact of the pandemic on output has been much larger in the latter group (IMF 2021a).

Financial flows to developing economies have been important sources for financing development, even more so as the COVID-19 pandemic reversed hard-won development gains achieved over the last decades. For instance, remittance flows were greater than 5 percent of GDP in 57 countries in 2019 and are important lifeline for the poor. The World Bank estimates that about US$550 billion was sent back by migrant workers to low- and middle-income countries in 2020. In 2018, remittances to LICs were nearly four times higher than official development assistance (ODA) and in 2019 they exceeded foreign direct investment (FDI).

While FDI quickly dried up during the pandemic, and ODA growth was constrained by fiscal pressures in advanced economies, much of the debate was focused on remittances with conflicting predictions on the implications of the pandemic. Indeed, at the onset of the pandemic, some studies drew attention on the potential large adverse impact of the pandemic on remittances considering the ensued global recession (e.g. World Bank, 2020a; Chami and Sayeh, 2020). Such predictions were in line with Barajas *et al.* (2012) which found that remittance flows increase business-cycle synchronization between remittance recipient countries and rest of the world and are particularly effective in channeling downturns from remittance sending countries to remittance receiving countries.

However, subsequent analyses pointed out that the picture was not unconditionally bleak as remittances were showing sign of resilience during the pandemic (Quayyum and Kpodar, 2020). This conjecture is consistent with evidence of remittances being great automatic stabilizers, smoothing output and consumption, especially among the poor (Chami, Hakura and Montiel, 2009; Combes and Ebeke, 2011). But, sharp output contraction, together with travel restrictions in major migrant hosting economies, jeopardized migrants' employment and income opportunities and brought into question remittances' ability to smooth consumption in home countries at the start of the pandemic.

Against this backdrop, this paper provides an early assessment of how remittances flows to developing countries evolved during the pandemic and sheds light on the key driving factors. In doing so, it compiles a new and unique dataset of monthly remittance flows for a sample of 52 countries during January 2018 through December 2020, as well as monthly bilateral remittance flows (corridor data) for 16 recipient countries (with 410 corridors in total). The paper

documents that many countries saw sustained increases in remittances during the pandemic especially after May 2020. In investigating the driving forces behind this resilience in remittances, the paper tested three main hypotheses: (i) the resilience in remittances was driven by a surge in COVID-19 cases in home countries as migrants rush to provide financial support to cushion the impact of the pandemic on their families; (ii) the resilience reflects a shift from informal remittance channels to formal channels triggered by widespread border closures and travel restrictions; (iii) the resilience was due to increase in remittances supported by the unprecedented fiscal stimulus implemented by richer countries, which are major migrant host countries.

Using the new dataset and local projection models *à la* Jordà (2005), the paper finds that remittances responded positively to COVID-19 infection rates in home countries, after controlling for various factors including economic activity, underscoring its role as an important automatic stabilizer. Analysis of corridor-level data shows that higher COVID-19 infection rates in host countries, on the other hand, slowed down remittance flows. In addition, more stringent virus containment measures in home countries seem to have dampened remittance flows, after controlling for level of economic activity and infection rates, suggesting that containment measures may have made it more difficult to receive remittances, *ceteris paribus*. Travel restrictions (as measured by reductions in flight arrivals) boosted formal remittances, although the impact is short-lived. Finally, the size of the fiscal stimulus has positive spillover effects on remittances to migrant's home countries, through the favorable impact on economic activities in the host country.

The paper fills an important void in the literature by analyzing some of the key drivers of remittance flows in the COVID-19 pandemic, using a novel dataset of high frequency data including a proxy for economic activity. The analysis helps to shed light on the various competing hypotheses on the drivers of remittance in this pandemic. The finding that remittances responded positively to COVID-19 infection rates in home country is novel and helps to cement remittances' role as an automatic stabilizer.

This paper adds to the literature in several ways. While other papers have explored the impact of various shocks such as natural disasters, changes in rainfall, and changes in terms of trade on remittances, this paper is one of the first to explore the impact of a pandemic and policy responses to it on remittance flows. Also, unlike previous studies that have analyzed the response of remittances to major shocks in the receiving country, this paper takes a look at remittances in a context where both the sending and receiving countries are simultaneously experiencing supply and demand shocks induced by the COVID-19 pandemic. Moreover, to the best of our knowledge this paper is the first to exploit a high frequency dataset on remittances and test the impact of travel restrictions on formal remittance flows.

The paper is organized as follows. Section II presents a brief overview of the literature on the drivers of remittances, followed by Section III which discusses the newly compiled monthly remittance dataset and the stylized facts. Section IV lays out the empirical model and Section V presents the results. We conclude in Section VI with some policy implications.

II. LITERATURE REVIEW

There is a vast literature on remittances covering its many facets such as its effects on economic development, its drivers, and the nature of decision-making at the household level. There are two major strands of the literature, one focusing on macroeconomics drivers of remittances while the other focuses on microeconomic considerations. Yang (2011) provides an excellent overview of the various strands and their key findings. Other comprehensive surveys include IMF (2005), World Bank (2006) and Chami *et al.* (2008).

Although studies converge on the drivers of remittances at both the macro- and microeconomic levels, there is disagreement on the relative importance of the drivers. Docquier and Rapoport (2006) provide a useful survey of the microeconomic literature. The seminal paper in the field is by Lucas and Stark (1985) who distinguish between the role of altruism and self-interest in sending remittances. Migrants may remit for altruistic reasons to boost consumption of family members at home. Households may also rely on remittances as an insurance mechanism, whereby the migrant workers abroad are expected to provide support to family members at home when they face an income shock.

Using data from Botswana especially during a drought, Lucas and Stark (1985) found a strong support for the insurance motive for remittance. Agarwal and Horowitz (2002) found evidence that remittances are sent for altruistic reasons. Shimar (2011) found that migrants who are more altruistic are likely to send more remittances home. Cox, Eser and Jimenez (1998) found that private transfers were typically directed towards those who are ill and those that are unemployed. These altruistic and insurance role for remittances are likely to be at play during COVID-19 pandemic as migrants face urgent need to support family members at home who are experiencing adverse health and economic challenges due to the pandemic.

Another reason migrants send money home is for loan repayment. Migrants often borrow hefty amounts at high interest rates to finance their trips abroad. These are often from family and friends at home or from money lenders in the informal market. Using migrant data from Qatar, Antoniades *et al.* (2018) find evidence that loan repayment obligations had a stronger role to play in remittance decision than altruism. Pressures to repay loans may mount (especially from friends and family members) when the home economy is in distress.

Migrant workers may also remit home for investment purposes. Pre-COVID-19 empirical evidence points to remittances being more targeted towards consumption (see Barajas *et al.* 2009, Combes and Ebeke, 2011). If migrants have investments in businesses at home, the COVID-19 lockdown likely induced a liquidity crunch at these businesses, which may induce them to remit more money home.

At the individual level, the level and frequency of sending remittances is also determined by factors such as income, education, environment in the country of residence, the existence of country-to-country remittance corridors, etc. Determinants at the receiving end include level of income, relationship with sender, potential senders' assets in area of origin, etc., (Carling 2008).

The main macroeconomic determinants of remittances (without being exhaustive) include the stock of migrants, income of the home and host country, cyclicality of growth between country

of employment and home country, disasters, exchange restrictions and transaction costs (see for example Freund and Spatafora 2007). Countries with greater migrant stocks abroad receive more remittances in general. Adams (2009) finds that skill levels of the migrants abroad also matter and that countries that export greater proportion of low-skilled workers receive more in remittances per capita than countries that export high-skilled workers.

The literature finds that growth in the country of employment is positively associated with remittance flows, while growth in home country is negatively associated with remittance flows (Abdih *et al.* 2012, Barajas *et al.* 2010, De *et al*. 2019b, Frankel 2011, World Bank 2020a). For instance, during the global financial crisis, when advanced economies suffered collapses in growth, remittance flows to low- and middle-income countries fell by 5 percent. At the same time, previous studies also found remittances to be less volatile than other foreign currency flows and relatively stable even during episodes of sharp business cycle volatility, such as during sudden stops and financial crises (De *et al*. 2019a). Moreover, remittances helped to cushion adverse shocks to home country economic activity from natural disasters (Yang, 2007) and drop in rainfall in countries with low-level of financial development (Arezki and Bruckner, 2012). Combes and Ebeke (2011) also found that remittances help to smooth consumption and provide insurance against various shocks including natural disasters. What would happen to remittances during the pandemic when both the host and the home countries were faced with sharp growth contractions was hence an open question at the onset.

Transaction costs constitute a major friction in the transfer of remittances and, as a result, affect their volume. When costs are high, migrants either refrain from sending money home, reducing the volumes, or use informal channels (Freund and Spatafora 2007). Estimates for amount of remittances sent through informal channels can vary significantly from 50 to 250 percent of remittance flows (Freund and Spatafora 2007, Amjad *et al.* 2013, Ratha 2011)). While the overall cost of remittances has been going down over the past decade, mostly due to competition from more technologically adept companies to the dominant market players such as Western Union and MoneyGram, their costs remain high. As a result, informal channels are still active, but flows through informal channels may have been adversely affected by travel restrictions in the COVID-19 pandemic.

More recently, Shimizutani and Yamada (2021) use monthly household panel data covering the period before and during the epidemic to examine the impacts of COVID-19 on a set of household welfare indicators in Tajikistan. The main results show adverse but temporary effects of the pandemic in April and May 2020. The results also suggest that remittances quickly returned to the levels of previous years after this decline in April and May 2020. Remittances have helped mitigate the negative effects of the pandemic-induced recession by playing an insurance role. Similar results are found for Mexico. Dinarte *et al*. (2021) observe a significant increase in formal remittances during the pandemic despite record unemployment in remittance sending economies. The authors argue that such an increase likely reflects a shift from informal (unrecorded) to formal remittance channels rather than an increase in total remittances.

In sum, the literature highlights several factors that may influence in opposite directions the response of remittances in times of adverse shocks. While the decline in activity in the sending country could create downward pressure on remittances, the negative shock in the receiving

country could increase remittances on the basis of altruism and insurance. The specific context of the pandemic would suggest that the net effect is a priori uncertain and will also depend on the substitution between formal and informal remittances. Finally, the effect of the pandemic on remittances may depend on the response of countries to contain the health crisis (containment and border closures) and sustain economic activity (fiscal stimulus).

III. DATA AND STYLIZED FACTS

A. Data Definitions and Sources

The analysis of remittance flows is subject to challenges related to their definition, accuracy and data availability. It is therefore important to use an internationally accepted definition to ensure comparability in a cross-country setting. In this context, we follow the definition of remittances by the World Bank, which is widely used in the literature and consistent with the reporting standards adopted by many countries. Remittances (inward or outward) are defined as the sum of personal transfers and compensation of employees as compiled in national balance of payments data collected by the International Monetary Fund (IMF), supplemented by additional data from official country sources, including central banks and national statistical institutes. Personal transfers include all current transfers in cash or in kind between resident and nonresident individuals, regardless of the source of income of the sender and the relationship between households (WDI, 2020). Thus, personal transfers may go beyond workers' remittances. Compensation of employees refers to the income of cross-border, seasonal, and other short-term workers who are employed in an economy where they are nonresident, or residents employed by nonresident entities.[2]

While the World Bank's remittance dataset covers a worldwide sample of countries over a relatively long period, the annual frequency limits analyses in a fast-changing environment, such as during the COVID-19 pandemic, where high-frequency data are needed to capture the dynamics of remittances in a more granular way, investigate counterintuitive trends and inform policy making in a timely manner. In addition, the World Bank dataset does not include high frequency bilateral remittance data. Given that remittance behaviors are heavily influenced by receiver and sender-country characteristics, total remittance flows at the receiving country level can reflect divergent or heterogonous driving forces from source countries.

To overcome these challenges, we compiled a new and unique dataset of monthly remittance flows for a sample of 52 countries, of which 6 are high-income countries, 35 are middle-income countries and 11 are low-income countries (see Annex 1 for the sample composition and data sources). The time dimension of the data collected spans from January 2018 to December 2020. In addition, we gather monthly bilateral remittance flows (corridor data) for 16 countries in the sample, totaling 410 corridors.

[2] The definition of remittances used in this study covers formal transfers and therefore does not consider informal transfers and in-kind remittances, which are difficult to estimate. Remittances made through informal banking arrangements that allow the transfer of funds outside formal financial institutions (*hawala*-type transactions) are also excluded.

The data are extracted from detailed balance of payments and statistical notes published by national central banks and statistical institutes. Where necessary, the data are converted into US dollars using the monthly average USD/local currency exchange rate from the IMF's International Financial Statistics (IFS) database or the relevant central banks. The compilation of the remittances data required some flexibility in the definition of the variables while preserving comparability across countries. Indeed, some countries in the sample have reported workers' remittances instead of personal transfers in their balance of payments, and for those, workers' remittances are used as a proxy for personal transfers. Others do not report compensation of employees, but given that these flows are significantly smaller in magnitude relative to personal transfers, the overall trend in remittances is little affected (see Annex 2 on data availability by country). Overall, the 52 countries in the sample accounted for 45 percent of worldwide remittances in 2019.

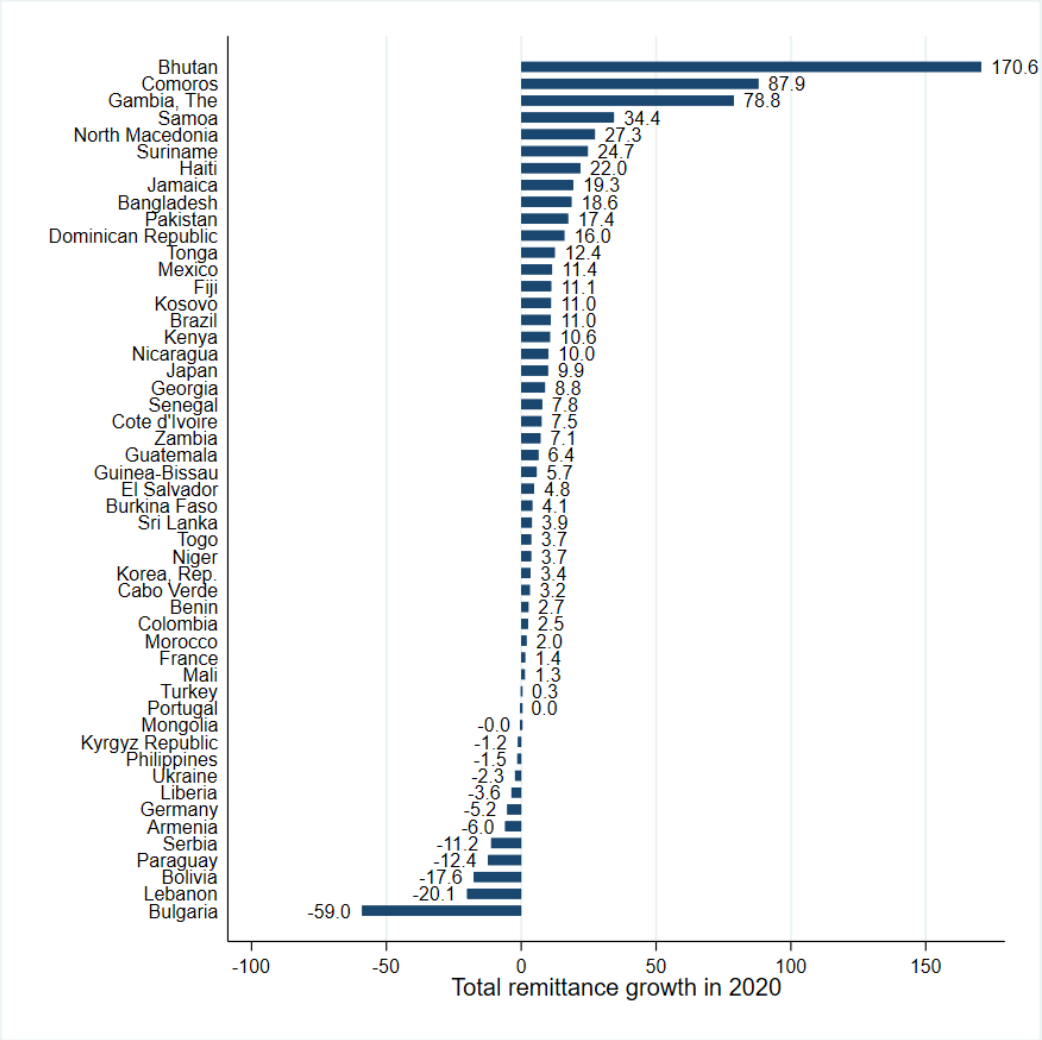
B. Stylized Facts

Figure 1 shows the year-on year change in remittance inflows for the countries in the sample in 2020. Defying the odds at the time when the COVID-19 pandemic unfolded, formal remittances surprisingly rose in most of the countries in the sample, including developing economies. Out of the 52 countries, 39 experienced an increase in inward remittances, and in some cases a double-digit growth, despite the global recession triggered by the COVID-19 pandemic.

Nonetheless, there are significant variations across countries. Bhutan, Comoros and Gambia experienced the largest increase in remittances. The almost threefold surge in remittances in Bhutan is thought to be partially driven by Bhutanese migrants returning home with their savings (Royal Monetary Authority of Bhutan, 2020). In Gambia, remittances from official channels have remained exceptionally high, in part, due to a reduction in private transfers through informal channels (which have since migrated to formal channels), remittances from the Gambian diaspora in response to COVID-19 and an improved remittance data recording system (IMF, 2021a; Bloomberg, 2021). In Comoros, the positive surprise in remittance growth could be essentially linked to migrants' altruism amid the pandemic (Central Bank of Comoros, 2021).

At the other end of the spectrum, Bulgaria recorded a 59 percent decline in inward remittances in 2020, mainly reflecting the deterioration of economic activity in the euro area (Bulgarian National Bank, 2020). In Lebanon, a high-remittance dependent economy, the drop in remittances may have been compounded by a fragile financial system and a widening black-market premium.

Figure 1. Change in Inward Remittances in 2020 relative to 2019 (percent)



Source: Authors' calculations.

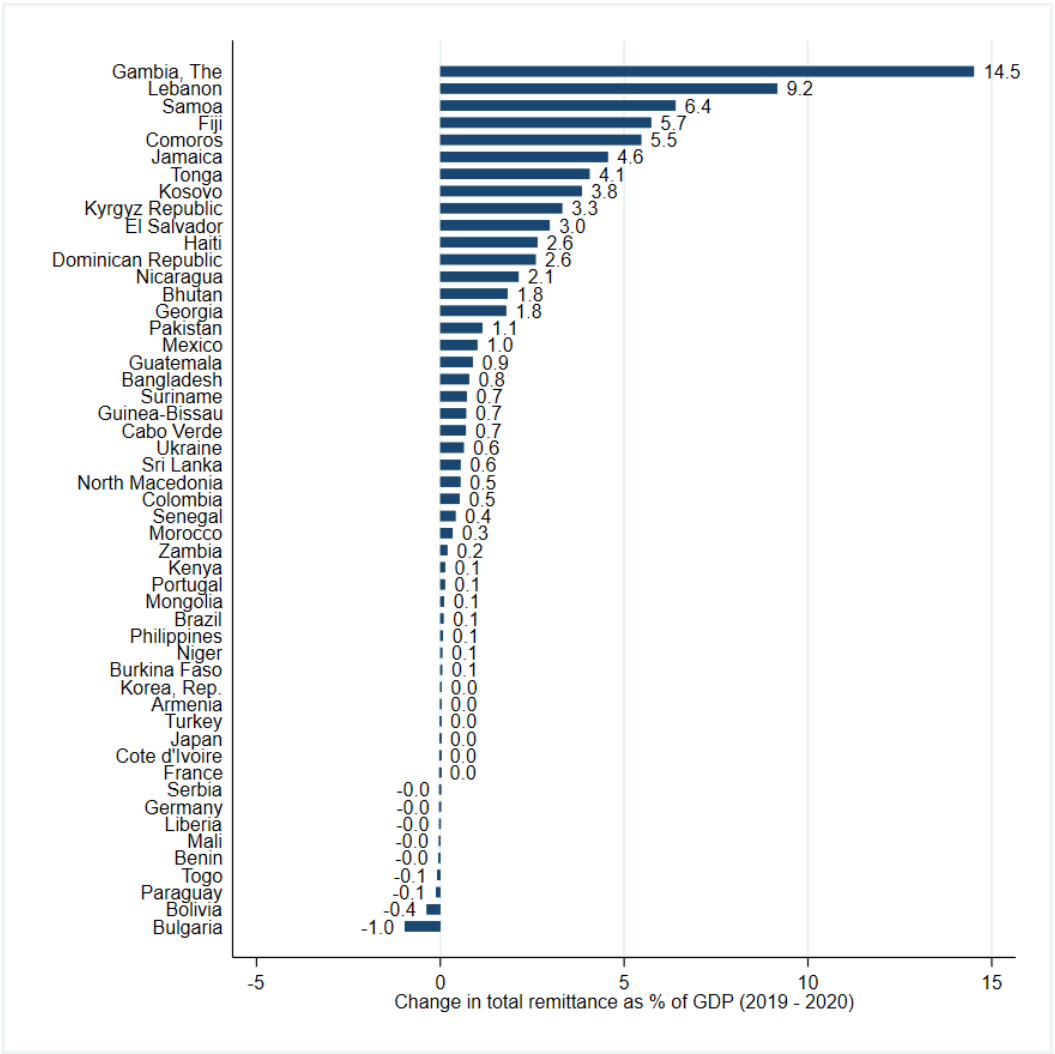
Notes: For some countries, the figures reported reflect the year-on-year growth in remittances for the last month available in 2020

Interesting insights emerge from Figure 2 which shows the change in the ratio of remittances to GDP between 2019 and 2020. As countries experienced a severe recession following the COVID-19 pandemic, the remittance-to-GDP ratio mechanically increased. That said, how the change in remittances offset or amplified the base effect from lower GDP gives a sense of the economic impulse from remittances. For Lebanon, although remittances in nominal terms shrank by 20.1 percent in 2020, the remittances to GDP ratio increased by 9.2 percent of GDP as the economy is estimated to have contracted by more than the decline in remittances.[3] The change in the remittance-to-GDP ratio also mirrors the economic significance of remittances. A large

[3] Nevertheless, the figures for Lebanon should be interpreted with caution. GDP estimates for the year 2020 are surrounded with unusually high uncertainty related to multiple exchange rate practices.

decline in remittances may not necessarily imply a sizeable economic shock. For instance, despite the 59 percent drop in remittances in Bulgaria, the drop in the remittances to GDP ratio was mild, about 1 percentage point of GDP. Similarly, the large increase in remittances in Bhutan translates into only a 2-percentage point increase in the ratio of remittance to GDP.

Figure 2. Trends in Inward Remittances as a Percent of GDP, 2020



Source: Authors' calculations.

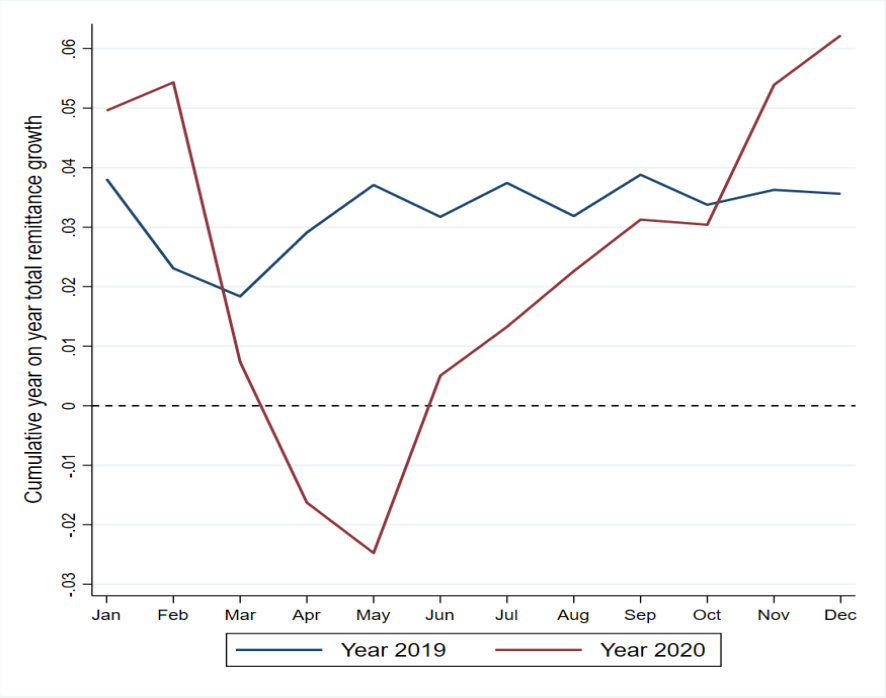
Overall, the large increase in remittance-to-GDP ratio seen in many countries, although likely to be temporary, highlights the critical importance of these flows in cushioning shocks in developing countries.[4] This is particularly the case in countries where remittances are several times the size of government fiscal support, which has been constrained by the pre-pandemic fiscal space. It appears that the recession and containment measures in migrant host economies—

[4] The likelihood that remittances decline in the future is not negligible, particularly if the impact of the pandemic becomes protracted. Also, migrants might be frontloading remittances, possibly drawing on their savings, which would affect their ability to sustain this trend over a long period.

that would impose a downward pressure on remittances— have been dwarfed by the urgent need for migrants to provide assistance to their families (driven by altruism or insurance), a possible shift from informal to formal remittance channels and in a very few cases a temporary return of migrants who have repatriated their savings. In contrast, for countries where these compensating forces are not strong enough, remittances declined.

A novel feature of our dataset is the ability to observe the intra-year dynamic of remittances. Figure 3 shows the year-on-year growth rate of cumulative remittances in 2020 (the sample median) and compares it to the trend in 2019. The V-shaped recovery in remittances is clear. Remittance growth started off the year well above the level in early 2019, before falling sharply as the COVID-19 pandemic spread out to the World and drastic containment measures to stop the pandemic were put in place by countries. After bottoming out in May 2020, remittance growth quickly recovered to finish the year in a positive territory, well above the December 2019 level.

Figure 3. Evolution of the Growth Rate of Cumulative Remittance Flows in 2019 and 2020
(median year-on-year growth rate)



Source: Authors' calculations.
Notes: Cumulative remittances are defined as the sum of total remittances received from the beginning of the year.

IV. EMPIRICAL STRATEGY

This paper focuses on the pandemic period (Jan-2020 through Dec-2020), and adopts the following model to explain developments in remittances:

$$\Delta \ln(Rem)_{c,t+h} = \sum_{i=1}^{n} \alpha_i \Delta \ln (Rem)_{c,t-i} + \sum_{i=1}^{n} \beta_i \ln (Covid)_{c,t-i} + \sum_{j=0}^{h} \delta_j \ln (Covid)_{c,t+j} + \sum_{i=1}^{n} \theta_h X_{c,t-i} + v_t + u_c + \varepsilon_{c,t+h}$$
for h=0, …, H Eq(1)

where:

- Δ*ln(Rem)* is the year-on-year cumulative change in remittances for a given month since Jan 2020. For instance, taking the month of June 2020, Δln(Rem) is the change in the remittances in the first six months of the year relative the same period in 2019 (in percent).
- *Covid* stands for the number of total COVID-19 cases per million population in the remittance-receiving country
- *X* is a set of control variables which include the number of total COVID-19 cases per million population in the remittance-sending country; economic activity in the remittance sending and receiving countries proxied by Nitrogen Dioxide (NO2) emissions per head; and the US dollar/local currency exchange rate.
- *v* is the time dummy, *u* is the country specific effect, and ε is the error term clustered at the country level and robust to heteroscedasticity.
- the number of lags, *n*, is limited at 3 to reduce the loss of observations at the beginning of the sample period, and the forecast horizon, *h*, is constrained to 4- 5 months by the time dimension of the data.
- All variables are in logarithmic form, unless otherwise indicated.[5]

The model is estimated by the local projection approach (LP) developed by Jordà (2005), which allows to gauge the impact of a shock at time *t* on the dependent variable at different forecast horizons. The LP is robust to misspecification as the impulse responses can be defined without any reference to the unknown data-generating process (Jordà, 2005), whereas conventional vector autoregressive models (VARs) require imposing sufficient identifying restrictions to derive the impulse responses functions (IRFs). Should the VAR specification be non-representative of the data generating process, this can lead a bias in the estimation of and inference from the IRFs. Reflecting its flexibility and appealing features, the LP has been increasingly used in the literature, including by Auerbach and Gorodnichenko (2013); Jordà *et al*. (2013); Caselli and Roitman (2016); Kpodar and Abdallah (2017); Ramey and Zubairy (2018); Furceri, Loungani, and Zdzienicka (2018); and Alesina *et al*. (2019).

The LP, however, recognizes that subsequent shocks are possible. Therefore, the derived impulse response function captures the treatment effect given the usual path of subsequent shocks and the usual behavior of other variables. Teulings and Zubanov (2014) note that this might bias the results, and as a result the LP specification can be expanded to control for shocks occurring between *t+1* and *t+h* (captured by the third term of equation 1). This, in effect, sterilizes the effect of potential subsequent shocks, thereby isolating the treatment effect of the shock at time *t* on the dependent variable.

[5] To deal with zero values, we use ln(1+*x*), with *x* being the variable.

Several factors, including data availability constraints, guided the choice and measurements of the variables. Using the year-on-year change in remittances allows to capture the dynamics of remittances relative to a situation without the pandemic, while the cumulative remittances up to a given month helps smooth out potential noises in the series.

As discussed in the literature review, while studies have identified a variety of drivers of remittances, they concur that they key determining factors are the income per capita of the remittance-sending and receiving countries. However, monthly GDP data or high frequency data on economic activity (such as industrial production) are not available for developing countries. An exception is the data on NO2 emissions, primarily from burning fossil fuels for transportation and electricity generation, which although an imperfect proxy of economic activity, has the advantage of being readily available for a worldwide sample of countries at a monthly frequency.[6] Deb *et al.* (2020) show that NO2 emissions are strongly correlated to economic variables which are used in macro-economic analysis such as industrial production.

The variable of interest in this model is the COVID-19 infection rate (aggregated from daily data) of the remittance-receiving country. But, given that the pandemic has also affected the remittance-sending countries, this needs to be controlled for. The challenge is how to define the remittance-sending countries in the absence of corridor (or bilateral) remittance data for most countries in the sample. To overcome this, we rely on the 2017 migrant stock matrix compiled by the World Bank to calculate for each migrant-hosting country its share in the total migrants originating from a given country. The COVID-19 infection rate in the remittance-sending country is proxied by the weighted average of the corresponding variables in the host countries, with the weight being the migrant share (this assumption will be relaxed later when considering the remittance corridor data). The same approach has been used to calculate the level of NO2 emissions per head in the remittance-sending country.

Due to limited data availability on the nominal effective exchange rate, the average US dollar/local currency exchange rate of the remittance-receiving country has been used. The rationale for controlling for the exchange rate is that many developing countries have experienced exchange rate pressures amid the pandemic, and the resulting depreciation may have affected remittances. The direction of the effect is, however, subject to debate in the literature. In the case of Mexico, Mandelman and Vilán (2020) argue that intertemporal substitution might have played a role since a stronger dollar provide immigrants with additional incentives to send more resources back home. On the other hand, if migrants target a given level of income for their families, a depreciation of the local currency means that they can send less in foreign currencies for the same outcome. To properly isolate the impact of the COVID-19 pandemic on remittances, the exchange rate effect needs to be controlled for.

A positive association between remittance inflows and COVID-19 infection rate in the home country would lend support to the hypothesis that migrants' altruism or the insurance motive has played a role in the strong resilience in remittance inflows observed so far. This would be consistent with the counter-cyclical nature of remittances, as it has been evidenced during

[6] Another possible proxy is the night light measure, but data are available with a delay.

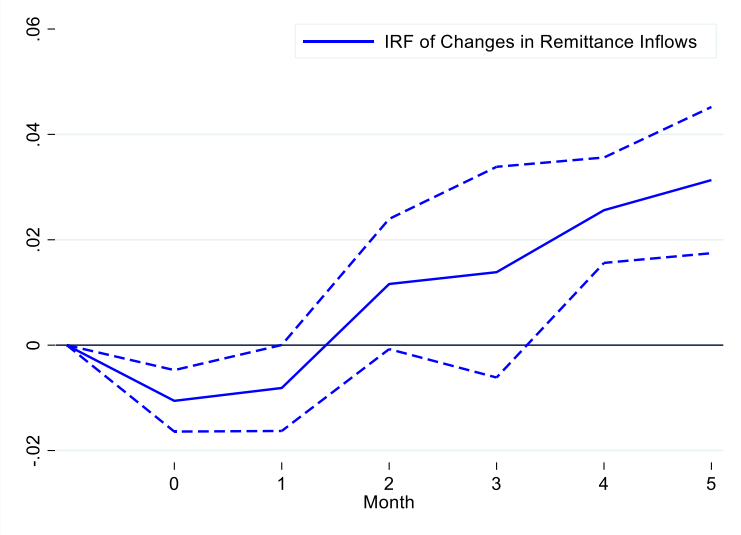
periods of recessions, financial crises, food price shocks and natural disasters (Frankel 2011; De *et al.* 2019a, Combes *et al*, 2014; Bettin, Presbitero, and Spatafora, 2015; and Yang, 2007).

V. THE RESULTS

A. The Response of Remittances to the COVID-19 Pandemic

We estimate the IRF of the changes in remittances with respect to the number of total COVID-19 cases per million population in the home country (Figure 4). The results show that within two to five months after the shock, remittances are positively associated with COVID-19 cases. For instance, a 10 percent rise in COVID-19 cases per million population would lead to 0.3 percentage point increase in remittances on a cumulative basis after 5 months. This result sheds light on the shock absorption role of remittances for vulnerable households in poor countries.

Figure 4. Impulse Response Function of Remittance Growth with Respect to COVID-19 Infection rate in the Home Economy



Source: Authors' calculations.

Since the regression controls for economic activities in the host country, and to the extent that NO_2 emissions can reliably capture the state of the economy, the identified impact of COVID-19 on remittances represents the efforts of migrants to assist their families beyond the economic hardship they were facing.[7] On the other hand, by controlling for economic activities in the home country, the significance of the result shows that migrant sought to support their families more than what the economic impact would entail. This can be related to the health impact of the

[7] Microeconomic studies would be needed to investigate how the pandemic has affected migrants' employment status and the consequences for remittances at the individual level. It could be that migrants who were employed during the pandemic were able to continue supporting their families back home; those who became partially employed may have been forced to devote a higher share of their income to remittances, while those who lost their jobs may have dissaved.

crisis, as poor families who rely on remittances, cannot afford social distancing measures, and hence are more exposed than others. Running the IRF without controlling for NO_2 emissions for the home and host economies shows a smaller reaction of remittances to COVID-19 infection rates. Predictably, the downward pressure on remittances from reduced economic activity in the host economy partially offsets the effect observed in Figure 4.

The fiscal response to the COVID-19 pandemic, in particular the direct support to households, has been unquestionably much smaller in developing countries than in advanced economies.[8] While cash transfer programs remain the most widely used safety net intervention by governments in developing economies (Gentilini, Almenfi, and Dale, 2020), the reach and appropriate targeting of these transfers in countries with weak social protection systems are uncertain. Additionally, these emergency cash transfer programs fell short of the disproportionate loss of income sustained by vulnerable households. In this context, our finding suggests that remittances have played a critical role of a complementary social safety net.

The initial drop in remittances observed in the IRF is surprising. This could be attributed to a delay in the response of remittances[9] and possibly the containment measures implemented in many countries. Lockdown measures were triggered by a rise in COVID-19 infections, and while these are justified on public health safety grounds, there were unintended consequences. Anecdotal evidence suggests that lockdown measures led to a closure of money transfer outlets, many of which were operating as small businesses. Since remittance transactions are mostly cash-based and require a physical access to the service providers, it is likely that a rise in COVID-19 infections may coincide with a decline in remittances.

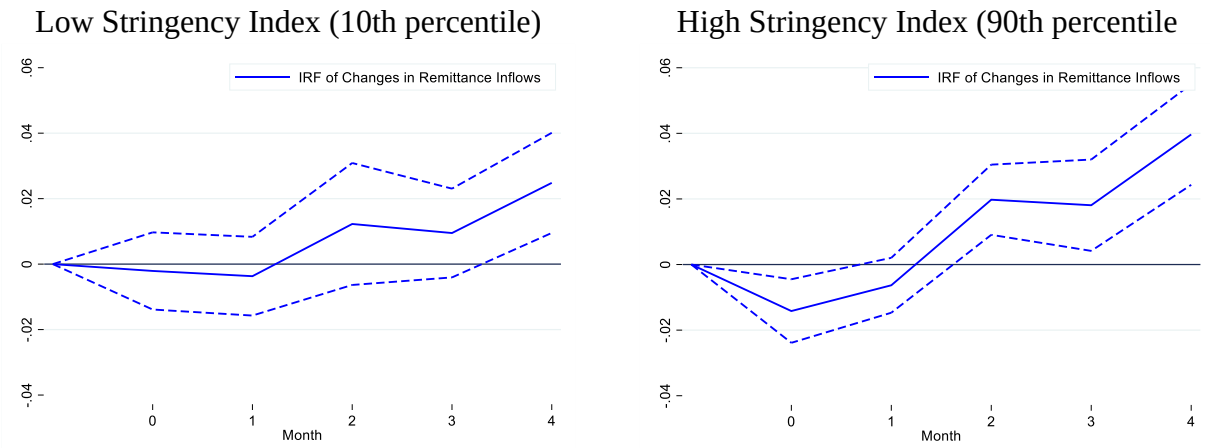
We then introduce an interaction between the total number of COVID-19 cases per million population and an index of stringency of government restrictions in the model.[10] This composite index compiled by the University of Oxford takes values between 0 and 100, with larger values indicating stricter containment measures. Figure 5 shows the IRF of remittances with respect to a COVID-19 shock for a country with a stringency index equal to the 10^{th} percentile of the sample (a stringency index of 28) and that of a country with a stringency index equal to the 90^{th} percentile of the sample (a stringency index of 87). The results indicate a more pronounced drop in remittances a month after the shock in the country with stricter containment measures, but the difference is not statistically significant (Figure 5). Nevertheless, as shown in Figure 6, the unconditional response of remittances to stricter containment measures in the home country is clearly negative and statistically significant, after controlling for the COVID-19 infection rate.

[8] The IMF estimates that total COVID-19-related fiscal measures in advanced economies in 2020 amounted to 9.14 percent of GDP compared to 5 percent of GDP for developing economies (IMF, 2021b).

[9] The time between when the shock materializes and when the remittances are sent to the beneficiaries.

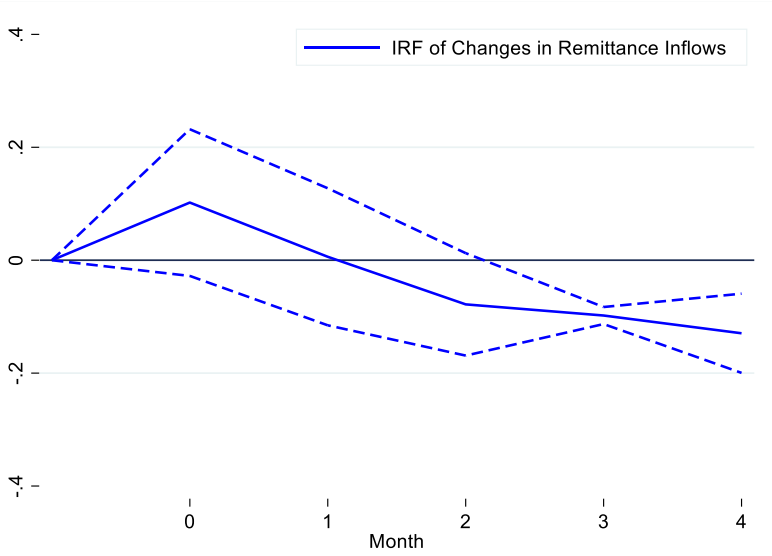
[10] For identification purpose, the model also includes the index of stringency in additive term, and the appropriate lag values.

Figure 5. Containment Measures and the Response of Remittance Growth to the COVID-19 Infection Rate in the Home Economy



Source: Authors' calculations.

Figure 6. Unconditional Effects of Containment Measures on Remittance Growth in the Home Economy



Source: Authors' calculations.

Robustness analysis

A range of robustness tests are conducted. First, we rerun the IRF for the change in remittance-to-GDP ratio (Annex Figure 1). The results are similar, confirming the altruism/insurance hypothesis as a plausible explanation of the resilience in remittance flows during the pandemic. We also use the number of new COVID-19 cases per million population, without qualitatively

altering the main findings (Annex Figure 2). Since countries experienced multiple waves of COVID-19 infections, we tested if there is a symmetry in the response of remittances to a negative or a positive change in COVID-19 infections.[11] The result indicates that a positive change in the COVID-19 infection rate leads to an increase in remittance flows, while a decline in the COVID-19 infection rate also reduces remittances (Annex Figure 3). Nevertheless, the difference between the two coefficients at different time horizons is not statistically significant. The lack of conclusive evidence on a potential asymmetry suggests that the response of remittance to the spread of COVID-19 is of a short-term nature, and consequently does not translate into a structural increase in remittances.

B. Testing for the Informal Channel Hypothesis

Remittances through informal channels are by definition hard to measure, but are believed to be sizeable. They often take the form of cash carried by airplane passengers, goods sent by migrants to their relatives, or *hawala*-type transactions whereby the money is remitted without cash movements across borders. The approach typically used in the literature is to rely on errors and omissions in the balance of payments (BOP) to gauge a shift of informal remittances to formal channels (e.g., Freund and Spatafora, 2008), but this suffers from drawbacks. El-Qorchi, Maimbo, and John (2003) offer a comprehensive critique, noting that BOP accounts probably contain little numerical—and certainly no identifiable—traces of *hawala* (informal remittances), and, thus, no empirical handle can be grasped to quantify or explore the dimensions and forms of these kinds of transactions. The rationale is that if the underlying transaction is outside the formal financial sector from both ends, it is unlikely to contribute to errors and omissions. Further, errors and omissions capture unrecorded trade flows, capital flights, and reflect to a great extent the quality of BOP statistics. Informal remittances are likely to be relatively small compared to these large flows and statistical errors, and hence may have a limited impact on errors and omissions.

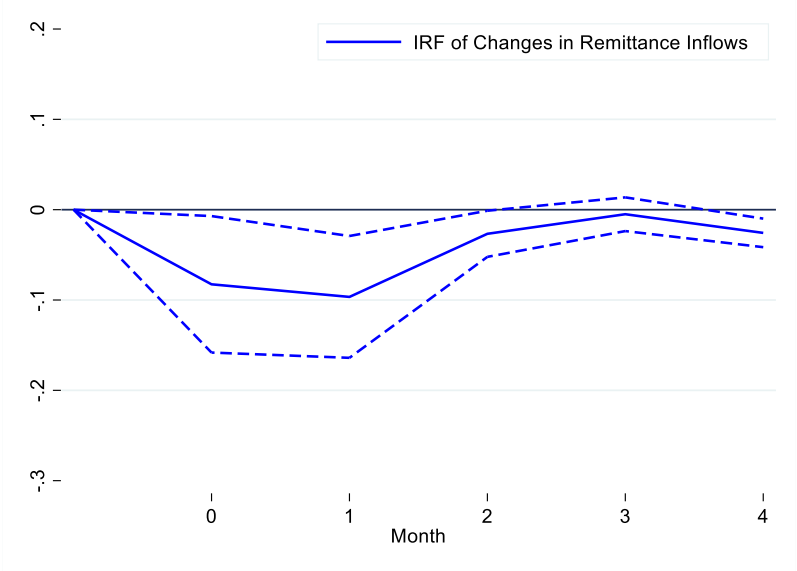
The border closures and ensued suspension of international flights amid the COVID-19 pandemic has led to the belief that a major channel of informal remittances has been severely disrupted. Consequently, some analysts partly attributed the resilience of remittances during the pandemic to a shift from informal remittances to the formal sector. We tested this hypothesis by introducing in the model the year-on-year monthly change in arrival flights, with the appropriate lags and lead values.[12] Figure 7 shows the IRF which lends support to the hypothesis the air travel restrictions have a positive and significant impact on formal remittance flows. To illustrate, a complete shutdown of passenger air traffic (a 100 percent drop) would lead to an increase in formal remittances inflows by about 10 percentage points within the first two months,

[11] The total COVID-19 infection rate is interacted with a dummy variable taking 1 when new COVID-19 cases surge and 0 when they decline.

[12] Daily data on international flight arrivals are provided by Flightradar24 and then aggregated at a monthly frequency for each country.

after which the impact phases out gradually.[13] Nevertheless, it should be noted that from the perspective of the receivers, remittance flows do not necessarily increase; rather the flows are better captured in official statistics.

Figure 7. Impulse Response Function of Remittance Growth with Respect to International Air Traffic Flows to the Home Economy



Source: Authors' calculations.

C. Evidence from Remittance Corridor Data

As indicated above, remittance corridor data have been successfully compiled for 16 receiving countries in the sample. For each of these countries, the data provide the breakdown of remittance inflows according to the country of origin of the transfers, making up a total of 410 corridors with data at a monthly frequency. Estimating the model with corridor data enables us to carry out an additional robustness tests and a more granular analysis by looking at how the incidence of the COVID-19 pandemic in the remittance-sending countries affect remittance inflows to the receiving countries.[14]

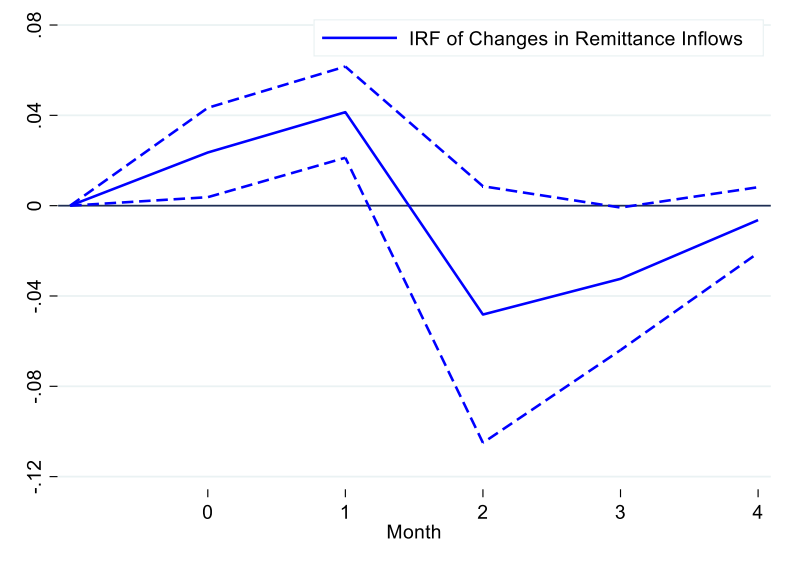
Figure 8 depicts the IRF derived from estimating by the LP the response of remittance growth to new COVID-19 cases per million population in the home economy. We confirm the previous results whereby remittances react positively to COVID-19 shocks in the home country. However, the dynamic and the magnitude of the response are somewhat different, most likely reflecting

[13] Given that air travel restrictions are taken to slow down the spread of COVID-19, the model controls for COVID-19 infection rate (as in the baseline specification) to properly isolate the impact of air traffic restrictions on remittances.

[14] The only differences with the main model include the size of the sample and the use of corridor specific effects instead of country-specific effects. The error term is clustered at the corridor level.

country heterogeneity. Remittances rise within the first month to reach a peak of about 0.4 percentage point increase following a 10 percent surge in total COVID-19 cases per million, then decline somewhat before rebounding, although the changes following the initial reaction are not statistically significant.[15]

Figure 8. Impulse Response Function of Remittance Growth with Respect to the COVID-19 Infection Rate in the Home Economy: Evidence from Corridor Data

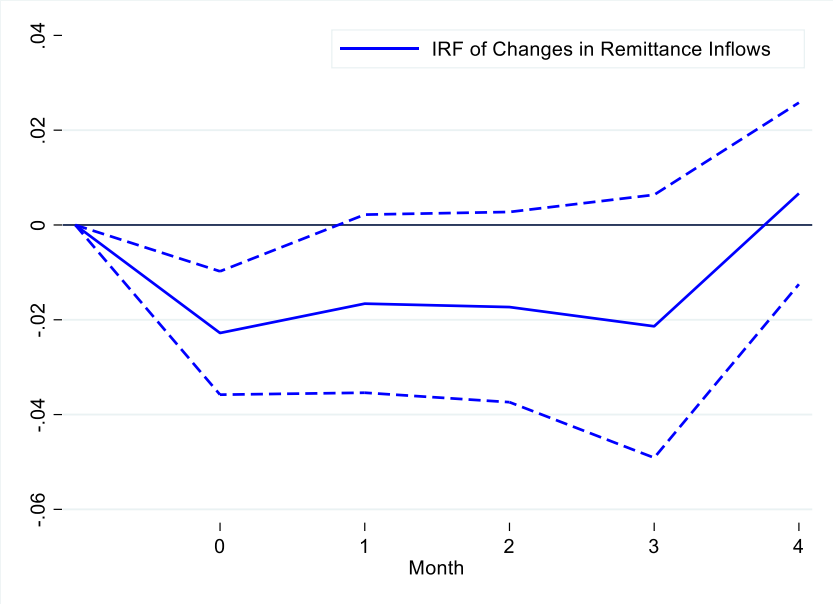


Source: Authors' calculations.

With the corridor data, it is also interesting to investigate the impact of the COVID-19 pandemic and the stringency of containment measures in the host country. We discussed the disproportionate adverse impact of the pandemic on migrants, who often are employed in the sectors hardest hit by the pandemic. As anticipated, the IRF indicates that remittances in the home country declines with the COVID-19 shock in the host country (Figure 9), the opposite of what occurs with a COVID-19 shock in the home country. The stringency of the containment measures in the host economy also appears to be negatively associated with remittances to the home economy (Figure 10).

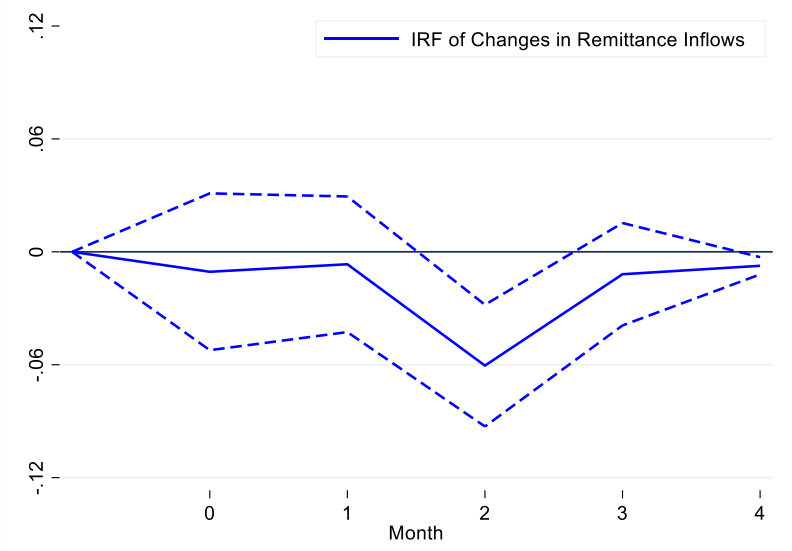
[15] The IRF obtained using the number of new COVID-19 cases per million population yield broadly similar conclusions

Figure 9. Impulse Response Function of Remittance Growth in the Home Economy with Respect to the COVID-19 Infection Rate in the Host Economy: Evidence from Corridor Data



Source: Authors' calculations.

Figure 10. Impulse Response Function of Remittance Growth in the Home Economy with Respect to the Stringency Index in the Host Economy: Evidence from Corridor Data



Source: Authors' calculations.

D. Fiscal Stimulus in Migrant Host Countries and Remittances Patterns

The pandemic prompted many countries to undertake massive fiscal stimulus measures at a scale never seen before in the recent history. These includes additional social spending and tax cuts, as well as loans or equity injections and public guarantees. Measures benefiting households directly consisted of cash handouts, wage subsidies, enhanced unemployment benefits and other social transfers. Since some analysts argue that the fiscal stimulus in advanced economies could be a contributing factor to the resilience of remittances, it is useful to test if this is supported by the corridor remittance data.

We used a dummy variable taking 1 if the size of the COVID-19-related fiscal measures is above the median of the sample of remittance-sending countries, and 0 otherwise.[16] This dummy is interacted with the COVID-19 infection rate of the home economy to assess whether the reaction of remittances inflows to COVID-19 incidence in the home economy is conditional to the size of the fiscal stimulus in the host economy. As countries that have been hard hit by the pandemic would tend to provide more fiscal stimulus, the regression excludes the incidence of COVID-19 and the NO_2 emissions of the host economy in a first step.

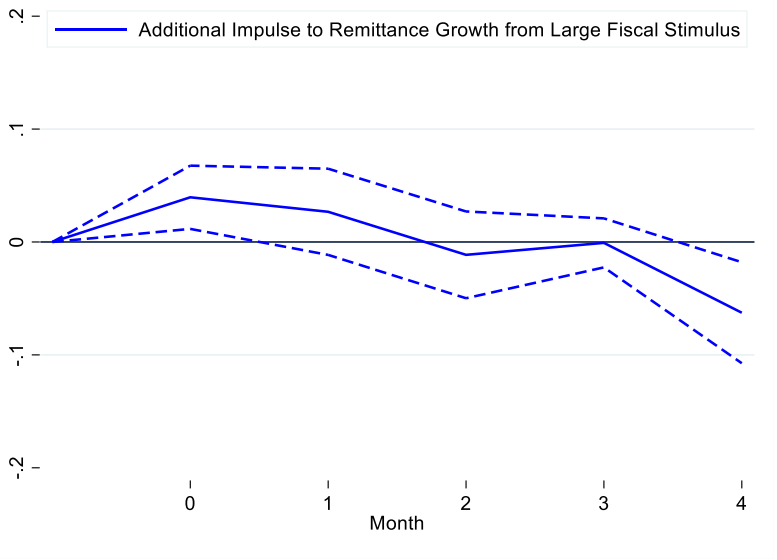
Figure 11 depicts the difference between the response of remittances to COVID-19 in the corridors where the remittance sending countries had a large fiscal response compared to those where the fiscal response in the remittance sending countries is weaker (below the sample median). The finding suggests that fiscal stimulus measures, indeed, have a positive effect on remittance flows, although this tends to decline over time. This difference becomes statistically non-significant after controlling for the incidence of COVID-19 and No2 emissions of the host economy, which suggests that the main channel through which fiscal stimulus affected remittances was by cushioning the adverse economic and health impact of the pandemic in the host economy.[17]

One could argue that an issue of measurement may arise with the size of the announced measures if they were not fully implemented in 2020. To address this issue, we use the change in the government spending ratio to GDP in 2020 relative to pre-COVID level. The results, again, lends support to the hypothesis that in countries with larger fiscal responses to avert the health and economic fallout of the pandemic, migrants were able to send more money to their families back home.

[16] Data are provided by the IMF (see IMF, 2021b)

[17] This result could also suggest that direct support to households (which was part of the fiscal stimulus) did not benefit the migrants, otherwise there should be a residual effect of the fiscal stimulus on remittances. It is possible that many migrant workers, in particular the undocumented migrants, lacked access to basic social safety nets and hence did not qualify for these government support measures, but only benefited indirectly from broad economic support measures that helped save jobs.

Figure 11. Size of the Fiscal Stimulus in the Host Economy and the Response of Remittance Growth to the COVID-19 Infection Rate in the Home Economy



Source: Authors' calculations.

VI. Conclusion

This paper set out to investigate whether the deep global recession brought about by the COVID-19 pandemic has led to a sharp decline in remittances as previously feared. A number of analysts feared that the patterns in remittance flows observed during the global financial crisis would prevail, perhaps with greater intensity now given the depth of the economic dislocation worldwide. The paper therefore explored competing hypotheses in the literature on drivers of remittances to identify plausible explanations in the context of the pandemic.

We investigated the conjecture that the pattern of remittance flows is likely to be affected by such factors as the relative economic and pandemic developments between recipient and sending countries. The paper also dug into the various channels of remittances as well as more granular data based on remittance corridors. A novel feature of our investigation was to build a unique intra-year dataset on monthly basis to observe the dynamics of remittances.

The analysis shows that, after an initial fall, remittances appear to have played the role of an automatic stabilizer during the pandemic. Remittances seem to have defied the odds by surprisingly rising in most countries in the sample, many of which are developing economies. It appears that the recession and pandemic containment measures in migrant host economies—that would impose a downward pressure on remittances—have been dwarfed by the urgent need for migrants to provide assistance to their families (driven by altruism or insurance motive). A shift from informal remittance channels to formal channels appears to have also played a role. Finally, there is evidence that fiscal stimulus in advanced economies have supported remittances, mainly through the impact on growth in these economies.

Understanding how remittance flows were affected in the pandemic has important policy implications. It can help assess options to address the large external financing needs stemming from the global crisis, and provide insights to policy makers on appropriate fiscal, monetary and financial sector policies in response to these flows. In countries where a large segment of low-income households relies on remittances, understanding remittance flows can help assess the impact on poverty, and inform policies to support the poor. The magnitude of remittance flows and their convenient countercyclical nature also call for bold steps to address the issue of high cost of remittances, which continues to hinder remittance flows to many countries.

While the evidence so far shows that there was an increase in remittances in most countries, it remains to be seen whether this is a durable trend. Indeed, the paper finds that some of the increase is largely due to temporary factors. Going forward, how the pandemic is brought under control in various countries and the subsequent positive impetus to economic activity will have important ramifications on the ensuing dynamics of remittance flows.

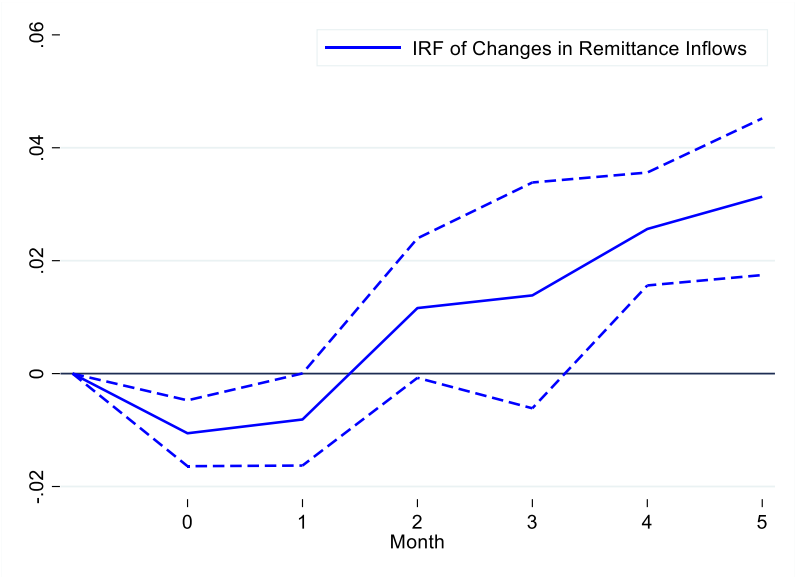
ANNEX 1. SAMPLE COMPOSITION AND DATA SOURCES

Country	Data Source	Corridor Data	Country	Data Source	Corridor Data
Armenia	Central Bank of Armenia	*	Korea, Rep.	Bank of Korea	
Bangladesh	Bangladesh Bank	*	Kosovo	Central Bank of The Republic of Kosovo	
Benin	Central Bank of West African States (BCEAO)		Kyrgyz Republic	Kyrgyz Bank	*
Bhutan	Royal Monetary Authority of Bhutan		Lebanon	Bank of Lebanon	
Bolivia	Central Bank of Bolivia		Liberia	Central Bank of Liberia	
Brazil	Central Bank of Brazil	*	Mali	Central Bank of West African States (BCEAO)	
Bulgaria	Bulgarian National Bank		Mexico	Central Bank of Mexico	
Burkina Faso	Central Bank of West African States (BCEAO)		Mongolia	Central Bank of Mongolia	
Cabo Verde	Bank of Cabo Verde	*	Morocco	Office des Changes of Morocco	*
Colombia	Central Bank of Colombia		Nicaragua	Central Bank of Nicaragua	*
Comoros	Central Bank of Comoros		Niger	Central Bank of West African States (BCEAO)	
Cote d'Ivoire	Central Bank of West African States (BCEAO)		North Macedonia	National Bank of The Republic of North Macedonia	
Dominican Republic	Central Bank of Dominica	*	Pakistan	State Bank of Pakistan	*
El Salvador	Central Reserve Bank of El Salvador		Paraguay	Central Bank of Paraguay	*
Fiji	Reserve Bank of Fiji		Philippines	Central Bank of Philippines	*
France	Bank of France		Portugal	Bank of Portugal	
Gambia, The	Central Bank of The Gambia		Samoa	Central Bank of Samoa	*
Georgia	National Bank of Georgia	*	Suriname	Central Bank of Suriname	*
Germany	Deutsche Bundesbank		Senegal	Central Bank of West African States (BCEAO)	
Guatemala	Bank of Guatemala		Serbia	National Bank of Serbia	
Guinea-Bissau	Central Bank of West African States (BCEAO)		Sri Lanka	Central Bank of Sri Lanka	
Haiti	Bank of Haiti	*	Togo	Central Bank of West African States (BCEAO)	
Italy	Bank of Italy		Tonga	National Reserve Bank of Tonga	
Jamaica	Bank of Jamaica	*	Turkey	Central Bank of the Republic of Turkey	
Japan	Bank of Japan		Ukraine	National Bank of Ukraine	
Kenya	Central Bank of Kenya		Zambia	Bank of Zambia	

ANNEX 2. DATA AVAILABILITY BY COUNTRY

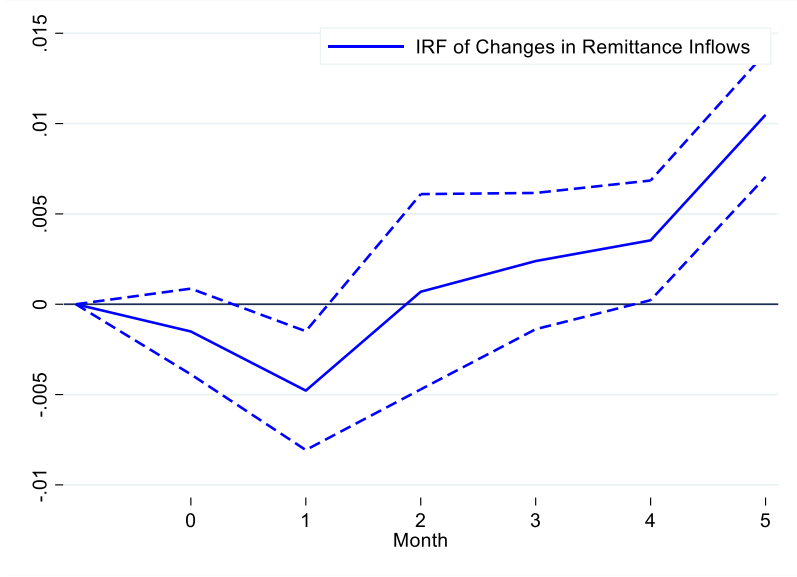
Country	Personal transfers	Workers' remittances	Compensation of employees	Country	Personal transfers	Workers' remittances	Compensation of employees
Armenia	*			Korea, Rep.	*		*
Bangladesh		*		Kosovo		*	*
Benin	*			Kyrgyz Republic	*		
Bhutan	*			Lebanon		*	*
Bolivia		*		Liberia	*		
Brazil	*		*	Mali	*		
Bulgaria		*	*	Mexico		*	
Burkina Faso	*			Mongolia	*	*	*
Cabo Verde	*			Morocco		*	
Colombia		*		Nicaragua	*		
Comoros	*			Niger	*		
Cote d'Ivoire	*			North Macedonia	*	*	*
Dominican Republic	*			Pakistan		*	
El Salvador	*			Paraguay	*		
Fiji	*			Philippines	*	*	*
France		*		Portugal		*	*
Gambia, The	*			Samoa	*		
Georgia	*			Suriname	*		
Germany			*	Senegal	*		
Guatemala	*			Serbia	*	*	*
Guinea-Bissau	*			Sri Lanka		*	
Haiti	*			Togo	*		
Italy			*	Tonga	*		*
Jamaica	*			Turkey	*	*	*
Japan	*		*	Ukraine	*	*	*
Kenya	*			Zambia	*		

Annex Figure 1. IRF of Change in Remittance to GDP ratio with Respect to the COVID-19 Infection Rate in the Home Economy



Source: Authors' calculations.

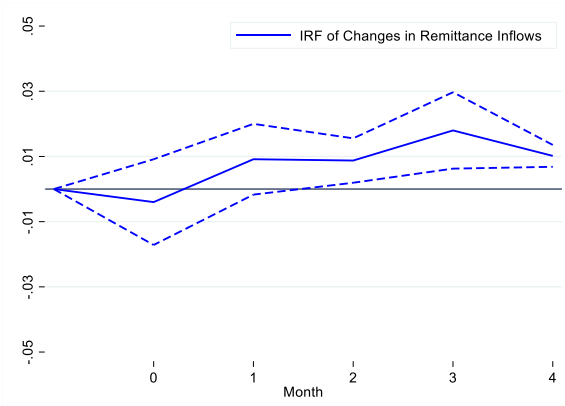
Annex Figure 2. IRF of Change in Remittance with Respect to COVID-19 Infection Rate (new cases) in the Home Economy



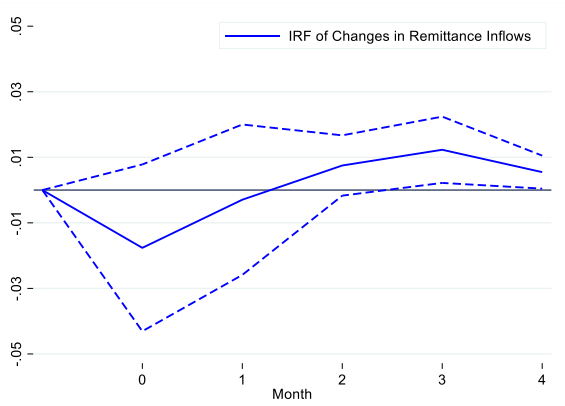
Source: Authors' calculations.

Annex Figure 3. IRF of Remittance Growth with Respect to Positive and Negative Changes in the COVID-19 Infection rate in the Home Economy

Negative change in COVID-19 infections



Positive change in COVID-19 infections



Source: Authors' calculations.

APPENDIX 1. VARIABLE DEFINITIONS AND SOURCES

Variable	Definition	Sources
Remittances (inward or outward)	Sum of personal transfers and compensation of employees in millions USD/Local Currency.	Central Banks and National institutes of Statistics (see annex 1 for details)
Gross Domestic Product (GDP)	Gross domestic product, current prices in Billion USD	World Economic Outlook (WEO, 2021).
New COVID-19 cases per million population	Number of new Covid-19 cases divided by total population (in million)	Center for Systems Science and Engineering (CSSE) at Johns Hopkins University
Total COVID-19 cases per million population	Total confirmed cases of Covid-19 divided by total population (in million)	
NO2 emissions per head	Total Nitrogen Dioxide (NO2) emission divided by total population	Sentinel-5p Data
Exchange rate (LCU per USD)	Value in USD of one unit of local currency	International Financial Statistics (IFS)
Stringency index	Composite measure based on 9 response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response)	The Oxford Covid-19 Government Response Tracker (OxCGRT)
International flight arrivals	Total number of International arrival flights	FlightRadar24
Stock of migrants	Bilateral stock of migrants	World Bank

APPENDIX 2. SUMMARY STATISTICS

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Change in the cumulative remittances	524	-0.002	0.821	-4.161	1.135
Change in the cumulative remittances to GDP	524	0.005	0.802	-4.182	1.135
New COVID-19 cases per million population	488	1,246	3,011	0	25,557
Total COVID-19 cases per million population	480	3,943	7,868	0	57,009
Change in the NO2 emissions per head	554	0.005	0.197	-2.399	1.416
Change in the USD/LCU exchange rate	521	0.001	0.024	-0.083	0.158
Stringency index	456	59.493	22.162	0	100.000
International flight arrivals	576	3,358	8,022	0	59,392

APPENDIX 3. CORRELATION MATRIX

		1	2	3	4	5	6	7	8
Change in the cumulative remittances	1	1							
Change in the cumulative remittances to GDP	2	0.9981* (0.000)	1						
New COVID-19 cases per million population	3	-0.0344 (0.4734)	-0.0371 (0.4391)	1					
Total COVID-19 cases per million population	4	-0.0658 (0.174)	-0.0672 (0.1646)	0.8830* (0.000)	1				
Change in the NO2 emissions per head	5	0.0018 (0.9686)	-0.0017 (0.9688)	0.0564 (0.2178)	0.1125* (0.0145)	1			
Change in the USD/LCU exchange rate	6	0.047 (0.302)	0.0479 (0.2927)	-0.0699 (0.1459)	-0.1226* (0.0113)	-0.1220* (0.0064)	1		
Stringency index	7	0.2302* (0.000)	0.2265* (0.000)	0.1607* (0.0006)	0.1546* (0.001)	-0.0583 (0.2182)	0.0573 (0.2515)	1	
International flight arrivals	8	-0.0687 (0.1176)	-0.0694 (0.1138)	0.0235 (0.6067)	0.0871* (0.0576)	0.2527* (0.000)	-0.3087* (0.000)	-0.2303* (0.000)	1

Notes. The P-values are in parenthesis. (*) means significant at 1, 5 or 10% level.

REFERENCES

Abdih, Y., A. Barajas, R. Chami, and C. Ebeke. 2012. "Remittance Channel and Fiscal Impact in the Middle East, North Africa and Central Asia," IMF Working Paper 12/104, Washington D.C.

Adams, R. H. 2009. "The Determinants of International Remittances in Developing Countries," *World Development,* 37(1): 93-103.

Agarwal, R. and A. W. Horowitz. 2002. "Are International Remittances Altruism or Insurance? Evidence from Guyana Using Multiple-Migrant Households." *World Development*, 30(11): 2033-44.

Alesina, A. F., D. Furceri, J. D. Ostry, C. Papageorgiou and D. P. Quinn. 2019. "Structural Reforms and Elections: Evidence from a World-Wide New Dataset" (No. w26720). National Bureau of Economic Research.

Amjad, R., M. G. Irfan and M. Arif. 2013. "How to Increase Formal Inflows of Remittances: An Analysis of the Remittance Market in Pakistan," International Growth Center, Working Paper

Antoniades, A., S. Ganesh, R. Weber, and R. Zubrickas. 2018. "Does altruism matter for remittances?" *Oxford Economics Papers,* 70(1): 225-242.

Ashraf, N., D. Aycinena, C. Martinez and D. Yang. 2015. "Savings in transnational households: a field experiment among migrants from El Salvador," *Review of Economics and Statistics*, 97: 332-351.

Arezki, R. and M. Bruckner. 2012. "Rainfall, Financial Development and Remittances: Evidence from Sub-Saharan Africa," *Journal of International Economics,* 87(2): 377-385.

Auerbach, A. and Y. Gorodnichenko. 2013. "Measuring the Output Responses to Fiscal Policy," *American Economic Journal: Economic Policy,* 4(2): 1-27.

Barajas, A., R. Chami, C. Ebeke, and S. J. A. Tapsoba. 2009. "Worker's Remittances: An Overlooked Channel of International Business Cycle Transmission?" IMF Working Paper 12/251, Washington D.C.

Barajas, A, R. Chami, C. Fullenkamp, M. Gapen, and P. Montiel. 2009. "Do Workers' Remittances Promote Economic Growth?" IMF Working Paper, WP/09/153, Washington D.

Barajas, A., R. Chami, C. Fullenkamp and A. Garg. 2010. "The Global Financial Crisis and Workers' Remittances to Africa: What's the Damage?" IMF Working Paper 10/24, Washington D.C.

Bettin, G, A. F. Presbitero and N. L. Spatafora. 2015. "Remittances and Vulnerability in Developing Countries" *The World Bank Economic Review,* 31(1); 1-23.

Bloomberg. 2021. "Gambia's Record Remittances Make Up for Tourism Losses, IMF Says" (https://www.bloomberg.com/news/articles/2021-02-04/gambia-s-record-remittances-make-up-for-tourism-losses-imf-says).

Bugamelli, M. and F. Paterno. 2009. "Do Workers Remittances Reduce the Probability of Current Account Reversals?" *World Development,* 37(12): 1821-1838.

Bulgarian National Bank. 2020. "January – June report 2020".

Carling, J. 2008. "The Determinants of Remittances," *Oxford Review of Economic Policy,* 20(3): 581-589.

Caselli, F. G. and A. Roitman. 2016. "Non-Linear Exchange Rate Pass-through in Emerging Markets," IMF Working Paper No. 16/1 (Washington: International Monetary Fund).

Chadi, A. and K. Kpodar. 2020. "How Large and Persistent is the Response of Inflation to Changes in Retail Energy Prices?," IMF Working Papers 2020/093, International Monetary Fund.

Chami, R., A. Barajas, T. Cosimano, C. Fullenkamp, M. Gapen and P. Montiel. 2008. "Macroeconomic Consequences of Remittances," IMF Occasional Paper 259. Washington D.C.

Chami, R., D. Hakura and P. Montiel. 2009. "Remittances: An Automatic Output Stabilizer?" IMF Working Paper, WP/09/91, Washington D.C.

Chami, R. and A. Sayeh. 2020. "Lifelines in Danger", *Finance and Development*, 57(2): 16-19, International Monetary Fund,.

Central Bank of Comoros. 2021. "Quarterly bulletin of the Central Bank of Comoros", No 29, fourth quarter 2020.

Combes, J. and C. H. Ebeke. 2011. "Remittances and Household Consumption Instability in Developing Countries," *World Development*, 39(7):1076-1089.

Combes, J., C. Ebeke, H. Etoundi, S. M. Ntsama and T. U. Yogo. 2014. "Are Remittances and Foreign Aid a Hedge Against Food Price Shocks in Developing Countries?, " *World Development,* 54(C): 81-98.

Cox, D. 1987. "Motives for Private Income Transfers," *Journal of Political Economy,* 95, 508–46.

Cox, D., Z. Eser, and E. Jimenez. 1998 "Motives for Private Transfers over the Life Cycle: an Analytical Framework and Evidence for Peru," *Journal of Development Economics*, 55: 57-80.

Cox, D. and M. Fafchamps. 2007. "Extended family and kinship networks: economic insights and evolutionary directions, in R. Rodrik and M. Rosenzweig (eds), *Handbook of Development Economics*, vol. 4, pp. 3711-3784, Amsterdam, Elsevier.

Cox, D., B. Hansen and E. Jimenez. (2004) How responsive are private transfers to income? Evidence from a laissez-faire economy, Journal of Public Economics, 88, 2193-219.

De, S., E. Islamaj, M. A. Kose, and S. R. Youseffi. 2019. "Remittances over the Business Cycle: Theory and Evidence," *Economic Notes,* 48(3).

De, S., S. Quayyum, K. Schuettler and S. R. Yousefi. 2019. "Oil Prices, growth and remittance outflow from the Gulf Cooperation Council." *Economic Notes,* 48(3)

Deb, P., D. Furceri, J. Ostry and Tawk Nour. 2020. "The Economic Effects of COVID-19 Containment Measures," IMF Working Paper No. 20/158.

Dinarte, L., D. Jaume, E. Medina-Cortina and H. Winker. 2021. "Not by Land nor by Sea: The Rise of Formal Remittances During Covid-19", Crawford School of public policy, Australian National University Seminar.

El-Sakka, M. I. T. and R. McNabb. 2009. "Macro Determinants of Emigrant Remittances," *World Development* 27(8):1493-1502.

El-Qorchi, M., M.S. Maimbo, and J. F. Wilson. 2003. "Informal funds transfer systems: an analysis of the Informal Hawala System" IMF Occasional Paper, vol. 222. International Monetary Fund, Washington, DC.

Frankel, J. 2011. "Are Bilateral Remittances Countercyclical? " *Open Economies Review*, 22(1), 1-16.

Freund, C. and N. L. Spatafora. 2008. "Remittances, transaction costs, and informality," *Journal of Development Economics*, 86(2), 356-366.

Furceri, D., L. Prakash and A. Zdzienicka. 2018. "The effects of monetary policy shocks on inequality," *Journal of International Money and Finance*, 85(C), 168-186.

Gentilini, U., M. Almenfi, I. Orton, and P. Pamela. 2020. "Social Protection and Jobs Responses to COVID-19: A Real-Time Review of Country Measures". World Bank, Washington, DC.

IMF. 2005. "Globalization and External Imbalances," *World Economic Outlook*, April.

IMF, 2021a. "Policy Tracker", https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

IMF. 2021b. "Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic" https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19.

Jordà, O., 2005, "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 95(1), 161-182.

Jordà, O., Moritz Schularick, and Alan M. Taylor, 2013, "When Credit Bites Back," *Journal of Money, Credit and Banking*, 45, No. s2, 3-28.

Kpodar, K. and C. Abdallah. 2017. "Dynamic Fuel Price Pass-through: Evidence from a New Global Retail Fuel Price Database," *Energy Economics*, 66, 303-312.

Lucas, R. E.B., and O. Stark. 1985. "Motivations to Remit: Evidence from Botswana," *Journal of Political Economy*, 93(5): 901-918.

Mandelman, F. S. and D. Vilán. 2020. "Remittances and COVID-19: A Tale of Two Countries", https://www.federalreserve.gov/econres/notes/feds-notes/remittances-and-covid-19-a-tale-of-two-countries-20201230.htm.

Quayyum, S. and K. Kpodar. 2020. "Supporting Migrants and Remittances as Covid-19 Ravages On," IMF Blog, September 11, 2020.

Ramey, V. and S. Zubairy. 2018. “Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data Valerie A.” *Journal of Political Economy*, 126(2), 850-901.

Rapoport, H. and F. Docquier. 2006. “The Economics of Migrants’ Remittances.” S.-C. Kolm and J. M. Ythier eds. *Handbook of the Economics of Giving, Altruism and Reciprocity: Applications*, 1135-1198.

Ratha, D. 2011. “Remittances: Funds for the Folks Back Home,” *Finance and Development*, International Monetary Fund, Washington D.C.

Royal Monetary Authority of Bhutan. 2020. “Annual Report 2020”.

Shimara, A. 2011. “Role of Altruism in Sending and Spending Remittances,” *Journal of East Asian Economic Integration*, 15(2): 61-82.

Shimizutani, S. and E. Yamada. 2021. “Resilience Against the Pandemic: The Impact of COVID-19 on Migration and Household Welfare in Tajikistan”, JICA Ogata Sadako Research Institute for Peace and Development working paper No. 218.

Teulings, C. N. and N. Zubanov. 2014. “Is economic recovery a myth? Robust estimation of impulse responses”. *Journal of Applied Econometrics*, 29, 497-514.

World Bank. 2006. “Economic Implications of Remittances and Migration,” *Global Economic Perspectives*.

World Bank. 2020a. “Migration and Development Brief 33: Covid-19 Crisis through a Migration Lens,” April 2020, KNOMAD-World Bank, Washington, DC.

World Bank. 2020b. “Migration and Development Brief 33: Phase II Covid-19 Crisis through a Migration Lens,” October 2020, KNOMAD-World Bank, Washington, DC.

Yang, D. 2011. “Migrant Remittances,” *Journal of Economic Perspectives*, 25(3): 129-152.