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Remittances in Times of Uncertainty: Understanding the Dynamics and Implications

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Remittances in Times of Uncertainty: Understanding the Dynamics and Implications

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ABSTRACT: This paper delves into the intricate relationship between uncertainty and remittance flows. The prevailing focus has been on tangible risk factors like exchange rate volatility and economic downturn, overshadowing the potential impact of uncertainty on remittance dynamics. Leveraging a new dataset of quarterly remittances combined with uncertainty indicators across 77 developing countries from 1999Q1 to 2019Q4, the analysis highlights that uncertainty in remittance-sending countries negatively affects remittance flows. In contrast, uncertainty in remittance receiving-countries has a more complex, dual effect. In countries with high private investment ratios, rising domestic uncertainty leads to a decline in remittances. Conversely, in countries with low public spending on education and health, remittances increase in response to uncertainy, serving as a social safety net. The paper underscores the heterogeneous and non-linear effects of domestic uncertainty on remittance flows.

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Contents

Introduction

The literature, both theoretical and empirical, indicates that remittance flows are influenced by various factors, ranging from altruistic motives to self-interest considerations (see Amuedo-Dorantes, 2014, and Ratha, 2017). Empirical studies explaining the drivers of remittances—which tend to corroborate the theoretical priors—can be broadly classified into two distinct groups. The first group focuses on microeconomic determinants of remittances, exploring the social and demographic characteristics of migrants and their families. The second group scrutinizes macroeconomic variables pertinent to both the host (sending) as well as home (receiving) countries (see meta-analysis of Cazachevicia, Havraneka, and Horvath, 2020, and Clemens and McKenzie, 2018 for recent discussions).

However, these studies have not explicitly incorporated one important factor, namely uncertainty, which from the emitter, and for the receiver of remittances, is likely to be a critical factor driving remittances. This gap may stem from the complex interplay of factors that influence remittance flows, including household characteristics, economic conditions and regulatory environments. Another explanation could be the limited availability of data and the challenges associated with measuring uncertainty, a subjective concept. Until now, the profession has focused more on measurable risk factors—as opposed to uncertainty--such as economic growth volatility and exchange rate volatility, rather than uncertainty itself (see Backer et al. (2013); Fernández-Villaverde et al. (2011); Leahy et al (1996)).

In recent years, economics has made significant strides in quantifying uncertainty and its macroeconomic implications (e.g. the seminal work by Bloom, 2009). These developments are attributable not only to the escalation of uncertainty shocks commencing with the new millennium, exemplified by events such as the 2008 Global Financial Crisis (GFC), the COVID-19 pandemic, and the conflict in Ukraine, but also to the burgeoning accessibility of "big data" and the refinement of text mining methodologies, which facilitate the creation of uncertainty indices. Specifically, during the COVID-19 pandemic, it was discerned that uncertainty exacerbated the initial downturn in economic activity, impeded the pace of recovery, and diminished the efficacy of policy interventions by fostering a climate of heightened caution among investors (Altig et al., 2020).

Addressing this policy question is critical, as remittances represent a vital financial flow for many countries. Understanding how uncertainty affects these transfers can inform policy decisions and support economic stability in recipient nations, making this an important area for investigation. Existing studies that investigate the determinants of remittances implicitly assume that migrants are risk-neutral in their preferences with respect to risk—in a Knightian sense. However, uncertainty can come in various forms, impacting remittances through several channels.

First, economic downturns, unemployment, or recession in countries where migrants work can reduce their income, impacting the amount that can be remitted back home. Uncertainty leading to fluctuations in exchange rates can affect the value of remittances when converted into the recipient country's currency, impacting the real income of remittance-receiving households. Other types of uncertainty emanating from the host country include changes in immigration laws, visa restrictions, or deportation policies, which create uncertainty for migrants, affecting their employment stability and ability to send remittances.

Second, in the recipient country, there is uncertainty arising from political turmoil, conflicts, unsustainable macroeconomic policies, or sanctions that can disrupt remittance channels and flows. Events like earthquakes, floods, or severe climate changes can impact economic activities in migrants' home countries, affecting the need for remittance inflows. Additionally, migrants' propensity to send remittances for investment can be dampened by the bleak and uncertain economic outlook, while recipients may delay the purchase of durable goods.

This study aims to examine the impact of uncertainty on remittance flows, considering both the countries of origin and destination. Using a new dataset on quarterly remittances and incorporating uncertainty measures from Ahir, Bloom, and Furceri (2022), the findings, based on a sample of 77 developing countries during 1999Q1–2019Q4 indicate that uncertainty in the migrants' host country of (termed "foreign uncertainty") negatively affects remittance flows. In contrast, uncertainty in the home country (referred to "domestic uncertainty") appears to have no bearing on remittances. However, further investigations reveal that the net effect of domestic uncertainty on remittances can vary, being either positive or negative. Generally, in the absence of investment considerations, remittances tend to rise with domestic uncertainty, underscoring their countercyclical nature and their role as a stabilizing financial inflow for many low-income nations. Conversely, , when remittances are primarily sent for investment purposes, higher domestic uncertainty leads to a decline in remittances. The fixed-effect estimations and the local projection approach yield consistent results, thus providing ample support to the hypotheses tested.

This research is related to two strands in the literature. The first encompasses studies examining the macroeconomic and microeconomic consequences of remittances, highlighting their positive contributions to development finance, their role as a vital component of international reserves, and their countercyclical nature which serves to mitigate economic volatility (e.g. Chami, Hakura, and Montiel, 2012). Also, Choi and Yang (2007) posit that remittances are reactive to income deficiencies, thereby possessing the capability to stabilize household incomes and diminish familial financial risks. Further, remittances have been associated with enhanced economic resilience and improved health and educational outcomes amidst adversities, augmenting family resistance to uncertainties (Khanna et al., 2022). The second strand explores the consequences of economic uncertainty, examining its effect on various economic indicators, including unemployment rates (Caggiano et al., 2017), exchange rate fluctuations (Bartsch, 2019), bank credit supply and demand (Wu and Suardi, 2021), economic activity levels (Baker and Bloom, 2013), and inbound foreign investments (Jardet, Jude and Chinn, 2023). Despite the growing significance of remittances in the global economy and the escalating levels of uncertainty highlighted by events such as the migrant crises in Europe and America, the resurgence of the Ebola epidemic, Brexit, the US-China trade disputes, and the recent COVID-19 pandemic, there remains a notable gap in empirical research concerning the influence of economic uncertainty on remittance flows.

This paper contributes to the literature along several dimensions. First, the paper fills the gap in the literature by undertaking a systematic and rigorous analysis of the impact of uncertainty on remittance flows. The current literature on uncertainty and remittances is quite limited. Existing studies, such as Yayi (2022), typically examine uncertainty and macroeconomic variables in either the remittance-sending or the remittance-receiving country, but not both, as we do in this study. This broader approach is a key contribution of our paper. Second, we exploit a unique quarterly database on remittances, enabling analysis with high frequency data, including a dynamic approach using local projections (Jorda, 2005). This allows the paper to shed light on the short- and medium-term effects of uncertainty on remittances and assess the persistence of this effect. This paper also challenges the conventional wisdom that remittances act countercyclically, by providing evidence that the net effect is a function of the end use of the remittances. Specifically, in countries with elevated levels of private investment, remittances tend to decrease as domestic economic uncertainty rises, exhibiting a procyclical pattern. Conversely, in countries with deficiencies in public education and health services, remittances increase in response to rising domestic uncertainty, consistent with the countercyclical behavior commonly found in the literature. In a world that is increasingly subject to rising uncertainty, the findings of the paper may help to spell out more granular policy implications.

The paper is structured as follows. Section II reviews the arguments underpinning the link between uncertainty and remittances, distinguishing between uncertainty in the home and host country. Section III outlines the empirical strategy, by delving into the data and measurements, the model specification and the

methodology. Section IV presents the results from the fixed-effect estimations, discusses the local projection approach and elaborates on the findings. Section V concludes and provides some policy implications.

Uncertainty and Remittances: How Close are the Links?

The emerging literature illustrates that uncertainty has a negative impact on the economy and incomes more broadly (see Baker et al., 2016). This influence extends to remittance flow decisions. For individuals, uncertainty about their future employment prospects, income levels, and the value of their savings will impact how much they will send home for instance. Since economic decisions are based on expected outcomes, individuals determine remittance amounts based on their expected future incomes. Rising uncertainty complicates the formation of these forward-looking assessments, generating an 'option value of waiting.' This concept posits that in the face of mounting ambiguity regarding future states, individuals might take a precautionary stance and opt for a strategy of deferral, choosing to postpone remittance decisions until a clearer picture emerges. Consequently, migrants might adopt a precautionary stance, prioritizing savings over remittances due to apprehensions about job stability and income continuity. Conversely, recipient households may exhibit an increased demand for remittances to buffer against uncertainties within their domestic context, thereby facilitating consumption smoothing. Thus, the dynamics of uncertainty, both in the countries of origin and destination, play a pivotal role, underscoring the multifaceted nature by which uncertainty can impact remittance flows. It is therefore important to differentiate the uncertainty faced by the sender of remittances, typically based in advanced economies (AEs), from the receiver of remittances, based in developing economies.

An increase in uncertainty within host countries is expected to adversely affect remittance behaviors among risk-averse individuals, leading to reduced and delayed remittance transactions. Canonical economic frameworks, exemplified by the Black-Scholes model, have traditionally postulated a direct correlation between elevated uncertainty—often represented through volatility—and increased expected returns, implying an augmented risk premium concomitant with a reduced propensity for risk engagement (Arellano, Bai, and Kehoe, 2019; Christiano, Motto, and Rostagno, 2014; Landier and Thesmar, 2020). In addition, the behavioral finance literature provides empirical evidence supporting the assertion that heightened uncertainty engenders pessimistic outlooks among economic agents (Hansen, Sargent, and Tallarini, 1999). In the context of remittance decisions, a risk-averse migrant is likely to adopt a conservative stance, predicated on a worst-case scenario approach to risk management. This inclination towards caution is anticipated to result in an increased allocation towards precautionary savings, curtailing the volume of remittances.

The negative effect of higher uncertainty in the host country on remittances can be particularly strong due to the increasing “opportunity cost” associated with remitting funds. This phenomenon can be attributed to the correlation between economic downturns and increasing unemployment, alongside heightened wage volatility for the employed (Meghir and Pistaferri 2004; Heathcote, Perri, and Violante 2010). When uncertainty rises and the likelihood of job loss increases, it may be more rational for migrants to retain funds to smooth consumption in case of unemployment rather than sending money home. This is especially the case for lower-wage workers, who face significant income volatility in recessions (Guvenen et al., 2021). Additionally, migrants are often employed in sectors that are inherently sensitive to economic cycles, such as construction, manufacturing, and tourism, rendering them more susceptible to protracted periods of unemployment. This vulnerability is further compounded for low-skill laborers, who are typically the first to

be displaced in the advent of an economic downturn, with the reinvigoration of demand for such labor categories only materializing in the later stages of economic recovery.[1]

Nevertheless, higher uncertainty in the host country may paradoxically spur remittances when migrants contemplate a temporary or permanent return to their countries of origin and start repatriating their savings (for instance, remittances to Bhutan increased about threefold during the COVID-19 pandemic, partly driven by Bhutanese migrants returning home with their savings, Royal Monetary Authority of Bhutan, 2020). Delpierre and Verheyden (2014) incorporate uncertainty into a model of endogenous remittances, savings and return migration, showing that migrants with high prospects are likely to remit less, as they are less inclined to return to their country of origin. This finding is also consistent with Amuedo-Dorantes and Pozo (2006), who show that Mexican migrants facing greater income risk in the US tend to remit a larger proportion of their earnings back home for insurance purposes.

Turning to rising uncertainty in the home country, the conventional wisdom is that, all else equal, it should lead to a rising demand for remittances to smooth consumption. This perspective is underpinned by the altruistic motive behind remittance behavior, which suggests that the well-being of the migrant is intrinsically linked to that of their familial unit in the homeland, with the latter's welfare contingent upon per capita consumption levels (Lucas and Stark, 1985; Chami et al., 2008). Consequently, in response to adverse income perturbations within the homeland, migrants are predisposed to augment financial transfers to their kin. The insurance motive may also be at play if the decision to migrate is seen as a risk-sharing strategy. Provided that the uncertainties characteristic of the host and home nations are not strongly positively correlated, such an arrangement holds considerable promise for the migrant's family. This is especially important in developing economies, which are inherently more vulnerable to a range of shocks due to factors such as limited economic diversification, political instability, heightened susceptibility to natural calamities and climate change, and a weak institutional and policy framework.

However, there is a mechanism through which uncertainty in the home country can potentially deter remittances. When remittances are driven by pure self-interest motivations, migrants may send money back home to invest in assets. Elevated uncertainty at home will diminish the expected return on those investments, making them riskier and less profitable. This is attributed to the fact that uncertainty impairs the efficiency of information flows and price discovery mechanisms, potentially delaying investments and resulting in lower remittances.[2] Moreover, when recipient households at the receiving end make decisions on buying durables such as a house or a car, they can postpone the purchase. The inclination to postpone such expenditures escalates in direct proportion to the prevailing uncertainty, thereby amplifying the 'option value of waiting'. Conversely, for non-durables like food, education and health, delaying is harder, and the option value of waiting will be lower.

[1] Since migrants, particularly the undocumented ones, lack access to basic unemployment insurance, they would tend to save more in the face of higher uncertainty, leading to a potential contractionary effect on remittances.

[2] This mechanism can also be at work when migrants face rising uncertainty in the host country. Since an investment cannot easily be reversed, the remittance may be held back, with the emitter waiting.

Empirical Strategy

Remittance and Uncertainty Data and their Measurements

Uncertainty

Quantifying economic uncertainty, like any latent variable, presents numerous methodological hurdles. The first difficulty is its nebulous nature; it reflects the uncertainty perceived by consumers, managers and policymakers about future events that may or may not materialize (Ahir, Bloom and Furceri, 2022). In addition, uncertainty is impacted by local and global factors and is multifaceted, considering national, regional and world growth prospects. It also encompasses a broad spectrum of considerations such as adverse events ranging from health crises, political crises, terrorist attacks, elections, wars to climate change.

The conceptual understanding of uncertainty within the field of economics has been significantly enriched by a series of theoretical contributions. Knight (1921) distinguishes between “risk”, wherein outcomes are associated with known probabilities, and ‘uncertainty’ where such probabilistic assessments are not possible, complicating objective anticipation. According to Keynes (1936), some events occur so infrequently that individuals are unable to establish reliable probability distributions. In contrast, Savage (1954) posits that the mechanism through which economic agents formulate expectations under conditions of both risk and uncertainty is analogous, predicated on the premise that agents construct expectations as though they subscribed to beliefs encapsulated by a probabilistic framework. The theoretical exploration of expectation formation has evolved through several approaches: (i) the adaptive expectations theory (Cagan, 1956), which argue that agents iteratively adjust their expectations based on past forecasting errors; (ii) the rational expectations (RE) framework (Muth, 1961), which asserts that any discrepancy between agents' expectations and perfect predictions is due solely to random shocks; and (iii) the “bounded rationality” paradigm (Simon, 1955), which highlights the cognitive limitations individuals face when processing new information, suggesting that agents' rationality is inherently constrained.

Despite the complex dynamics of firm and household behavior in the face of uncertainty and variety of potential uncertainty shocks, structural models are invariably subject to critique and limitations. The empirical quantification of how economic agents formulate forecasts remains a formidable challenge, compelling the majority of investigations to adopt proxies for uncertainty, such as the volatility of pivotal economic and financial indicators, including capital flows, bond yields, and stock market indices (see Leahy and Whited, 1996; Bloom, 2009; Fernandez-Villaverde, 2011; Jurado, Ludvigson, and Ng, 2015; and Ludvigson, Ma, and Ng, 2021). A major limitation of this methodology is the implicit presumption of market efficiency and fundamental-driven movements, an assumption that may not invariably align with market behaviors, especially during periods of financial turmoil.

Moreover, the scarcity of high-frequency data for many developing countries limits the usefulness of this approach for this group of countries. Alternative methodologies have embraced text mining techniques of newspaper archives, including the Economic and Political Uncertainty Index (Baker, Bloom and Davis, 2016), the Geopolitical Risk Index (Caldara and Iacoviello, 2022), the Twitter (now X) measure (Baker et *al.*, 2021) and the search measure (Bontempi et *al.*, 2021).[3] However, it is important to acknowledge that text

[3] An alternative approach is to use forecaster disagreement measures as a proxy for uncertainty. For instance, high levels of disagreement in forecasting variables like GDP or Inflation are thought to reflect high levels of economic uncertainty.

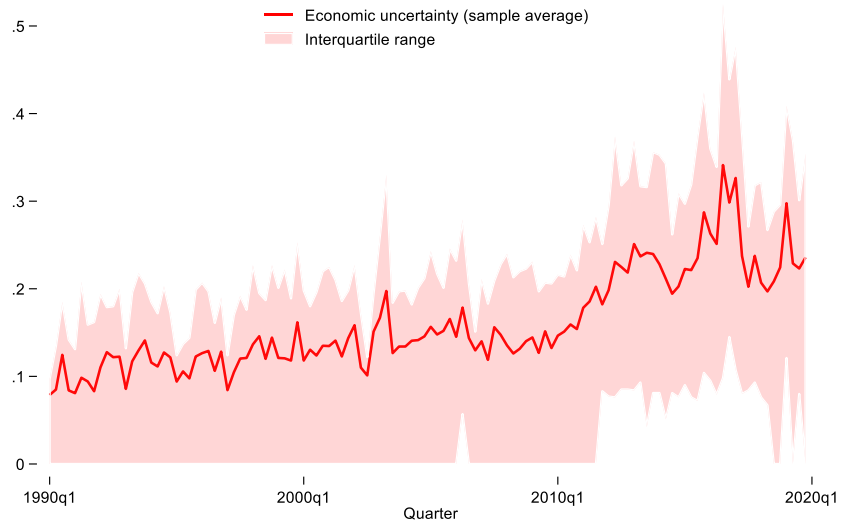
mining methodologies may confront issues related to temporal and geographical comparability, particularly when press coverage of economic phenomena in developing nations is limited.

In this paper, we employ the measure of uncertainty developed from a series of influential works by Bloom and his co-authors over the past decade. The uncertainty index proposed by Ahir, Bloom and Furceri (2022) leverages the text mining approach. Still, it stands out by relying on a single, consistent source available for many developed and developing countries: the quarterly country reports of the Economist Intelligence Unit (EIU). The economic uncertainty index counts the number of times "uncertainty", or an equivalent word, is mentioned in the national EIU reports, normalized by the total word count of each report to account for variations in report length over time and to ensure comparability across countries (Ahir, Bloom and Furceri, 2018). The resulting dataset covers 143 countries, spanning from the first quarter of 1952 to the 2nd quarter of 2021.

Figure 1 presents the trajectory of economic uncertainty for developing countries from 1995Q1 to 2020Q1. This figure highlights significant variability in economic uncertainty, with peaks corresponding to episodes of exceptional increases in economic uncertainty predominantly linked to global events. For instance, the surge in 2003Q1 coincides with the start of the war in Iraq, while the spike in 2007Q3 is linked to the bursting of the real estate bubble heralding the onset of the 2008 global financial crisis (GFC). In the aftermath of the GFC, the rate at which economic uncertainty escalated has been unprecedented, culminating, on the cusp of the COVID-19 pandemic, in a magnitude of uncertainty approximately double that recorded in the 1990s.

Figure 1. Trends in the Economic Uncertainty Index, 1990Q1 to 2019Q4

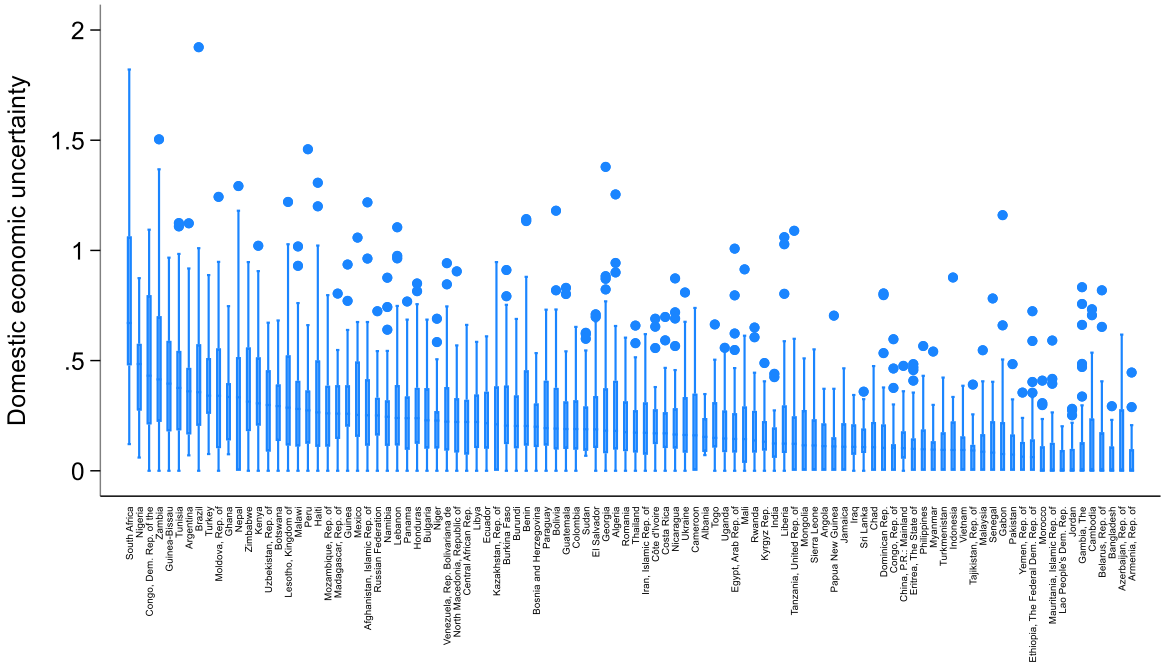
(Developing countries)



Sources: Ahir, Bloom and Furceri (2022) and authors' calculations.

Figure 2 illustrates the pronounced heterogeneity in economic uncertainty at the individual country level in the post-GFC period, with peaks of uncertainty exceeding, on average, four times the global average level of the index. Notably, emerging markets, nations beleaguered by conflict and oil exporters constitute the upper echelons of the ranking countries with the highest economic uncertainty indexes, indicating that country-specific factors may play a role.

Figure 2. Economic Uncertainty Index across Developing Countries, 2010Q1 to 2019Q4



Notes. The thick section of the bars represents the interquartile range, and the dots show extreme values of uncertainty for each country during the period considered.
Sources: Ahir, Bloom and Furceri (2022) and authors' calculations.

Remittances

A significant number of cross-national panel studies rely on the Global Knowledge Partnership on Migration and Development (KNOMAD) database, valued for its comprehensiveness and cross-country comparability. Covering 215 countries and territories with data extending back to the 1980s, this dataset is regularly updated and is freely available to the public. Despite its broad use, a limiting factor in some analytical context is the annual frequency of the data. Specifically, the reliance on annual data to scrutinize the effect of uncertainty on remittances may overlook important intra-year variations. This limits the scope of analysis in a rapidly changing environment where high-frequency data is necessary to capture the dynamics of remittance flows in response to rising uncertainty at both the national and global level. Since remittance flows are expected to adjust to transient variations in uncertainty, annualized remittance figures may fail to capture or "over smooth" the response of remittances, potentially leading to misleading conclusions.

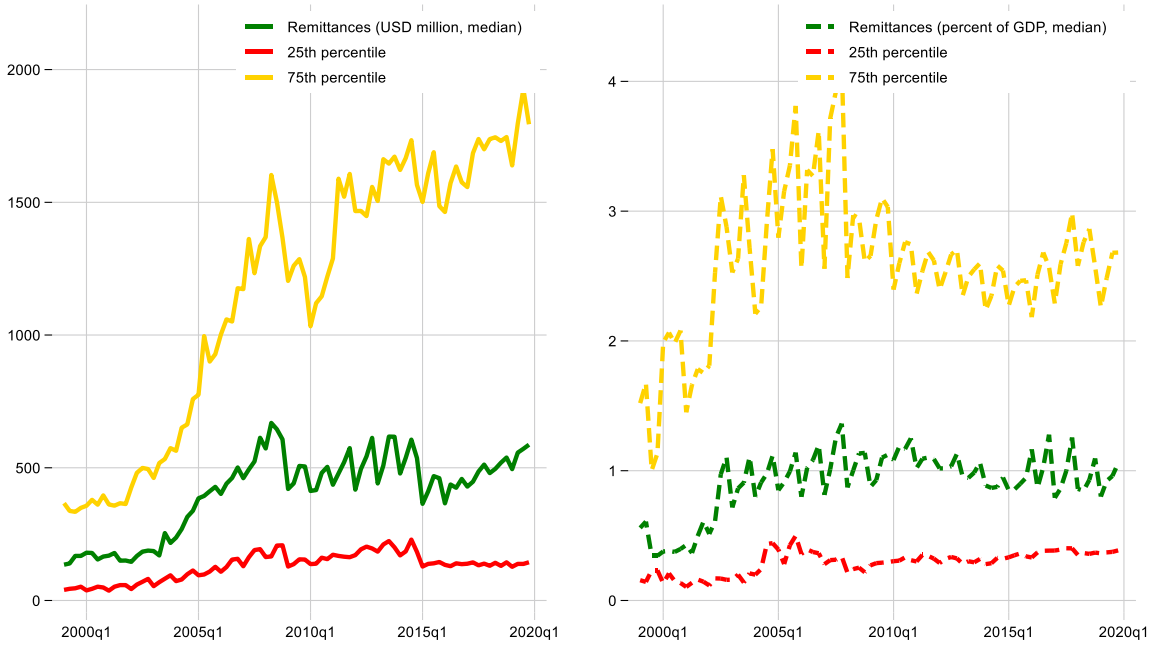
To overcome this constraint and align with the quarterly cadence of the uncertainty data, this study employs a novel and distinct dataset of quarterly remittance flows for a sample of 95 countries, consisting of 18 high-income countries, 62 middle-income countries and 15 low-income countries (building on the monthly dataset by Kpodar et al., 2023). The dataset spans from 1971Q1 for a handful of countries through 2020Q4 for most countries.[4]

[4] Two countries have quarterly data from the 1970s, and this figure rises quickly to 30 countries in the early 2000s. From 2010, the sample reaches 70 countries before stabilizing above 90 countries from 2017 onwards. The remittance data are not bilateral but consolidated at the receiving country level.

The compilation of the quarterly remittance dataset follows the globally recognized definition of remittances that include personal transfers and compensation of employees.[5] In instances where nations do not disclose personal transfer figures within their Balance of Payments (BOP), workers' remittances are used as a proxy measure. If data on the compensation of employers is missing, it is excluded from their calculation; however, the resultant underestimation of remittances is anticipated to be minimal, given the typically marginal proportion of employer compensations relative to the magnitude of personal transfers (for a discussion on remittance measurement intricacies, see Clemens and McKenzie, 2018).[6] We leveraged official online publications of the detailed balance of payments (BOP) and statistical notes by national central banks, ministries of finances and statistical institutes. For countries where data are reported in local currency or a different currency than the US dollar, the quarterly average exchange rate from the IMF's International Financial Statistics (IFS) database or relevant central banks is used to convert the remittance flows into US dollars.

Figure 3 shows the trends in remittance flows for developing countries included in this paper. The median country received about USD 0.5bn per quarter (1 percent of GDP), with some seasonal variations (the peak within the year mostly occurred in Q4). There is also significant cross-country variation, with countries above the 75th percentile receiving more than USD 1.8bn of remittances in a quarter (2.7 percent of GDP), while countries below the 25th percentile got at most USD 0.1bn per quarter (0.4 percent of GDP).

Figure 3. Trends in Quarterly Remittance Flows, 1999Q1–1999Q4



Sources: IMF and authors' calculations
Notes: The sample includes 77 developing countries covered in this study.

[5] 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. Compensation of employees refers to the income of cross-border, seasonal, and other short-term workers employed in an economy where they are nonresident, or residents employed by nonresident entities.

[6] Like the World Bank dataset, the definition used in the study does not consider informal transfers which are difficult to estimate. Thus, remittances made through informal banking arrangements (hawala-type transactions) are also excluded.

The Model, Sample and Econometric Approach

We begin with the premise that the decision and the magnitude of remittance flows are influenced by prevailing economic uncertainty in the country within both the country of origin and the host nation of the migrant, conditional on a set of control variables, as specified by the following linear model:

$$\log(Rem)_{c,t} = \gamma + \alpha Uncert^{l}_{c,t} + \beta Uncert^{f}_{c,t} + \theta \, \mathrm{X}_{c,t} + \mu_c + \vartheta_t + \varepsilon_{c,t} \qquad \text{Eq(1)}$$

where:

- $Rem_{c,t}$ is the remittances in millions of US dollars received by country c at time t
- $Uncert^{l}_{c,t}$ stands for the level of local/domestic economic uncertainty (country of origin)
- $Uncert^{f}_{c,t}$ represents the level of economic uncertainty prevailing in the host country (henceforth foreign uncertainty)
- *X* is a set of control variables which includes the income per capita of the remittance-receiving country and that of the remittance-sending countries to capture the level of development, the number of migrants originating from the remittance-receiving countries, and the US dollar/local currency exchange rate (level and volatility).
- ϑ are the time dummies (year and quarter), u is the country-specific effect, and ε is the error term robust to heteroscedasticity.

By integrating remittance and uncertainty datasets, with a particular focus on developing countries, we compile a dataset of 77 countries covering the period 1999Q1-2019Q4 (Annex 1). Both remittances and uncertainty are measured quarterly, as are the exchange rate's level and volatility (the latter being defined as the quarterly standard deviation of the exchange rate level). Owing to the absence of more granular data, income per capita is measured on an annual basis. As for the stock of migrants, these are derived from survey-based sources and are exclusively available for 2010, 2013 and 2017, with gaps filled by the data point of the nearest previous year.[7]

For a given remittance-receiving country, since remittance data are not available at the bilateral level (remittances inflows are the total received by the country from all remittance sending countries),[8] the level of uncertainty (and correspondingly, the per capita income level) in the host country is proxied by the weighted average of the uncertainty (and per capita income levels, respectively) across all countries hosting migrants from the remittance-receiving country. The weight is based on each host country's share of total migrants originating from the remittance-receiving country. Annexes 2 and 3 present the summary statistics and correlation matrix, respectively, whereas Annex 4 provides the variable definitions and sources.

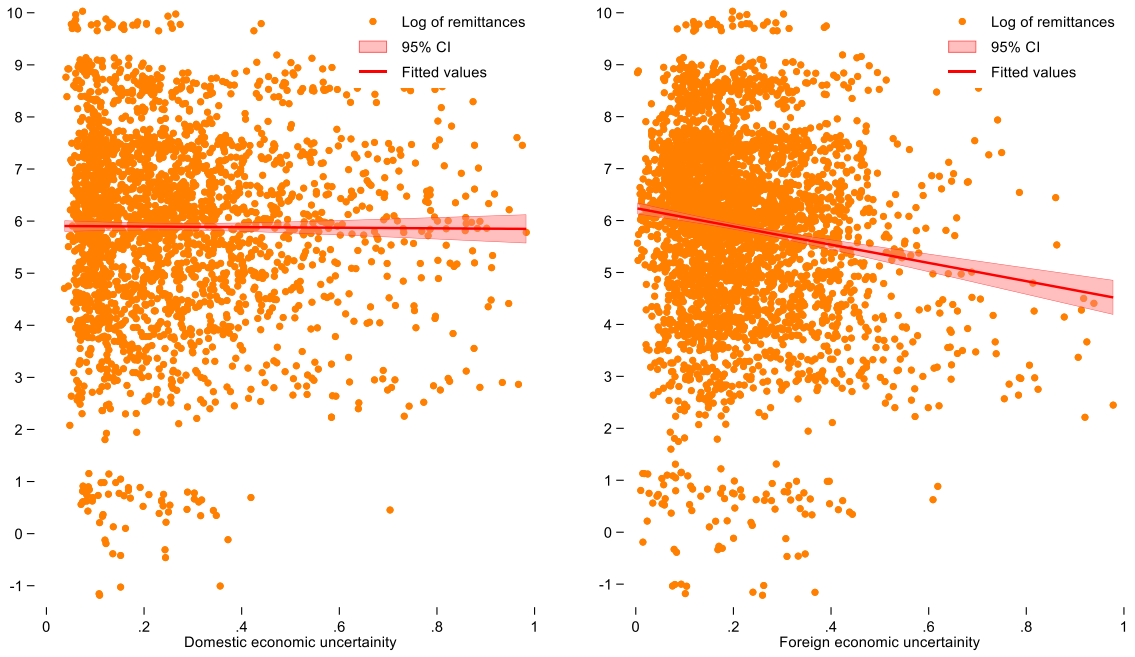
As elaborated in Section III, the coefficient β is expected to be negative indicating the presumption that heightened uncertainty in the host country is likely to reduce remittances, as migrants increase precautionary savings to manage potential future shocks. Conversely, the theoretical expectations regarding the impact of economic uncertainty in the country of origin are less definitive, suggesting that the sign of coefficient α would encapsulate the aggregate outcome emanating from: (i) an increase in remittances intended to assist family members in the home country in mitigating consumption volatility and enhancing resilience against potential adversities induced by escalated uncertainty; and (ii) a reduction in remittances allocated for productive investment purposes. Figure 4 illustrates the correlation between remittance flows and uncertainty both in home and host countries. The empirical evidence aligns with the

[7] Alternatively, the population size is used, and the results are similar.

[8] Large panel data on bilateral remittances are yet to be available.

prediction of a weak association between domestic uncertainty and migrant remittances, whereas the slope of the linear adjustment indicates a negative correlation between foreign uncertainty and remittances.

Figure 4. Correlation Between Economic Uncertainty and Remittances



Sources: Ahir, Bloom and Furceri (2022) and authors' calculations

Turning to the econometric methodology, the model is initially subjected to estimation via the fixed-effect estimator. This approach allows for the control of time-invariant, unobserved country-specific attributes potentially influencing remittance flows. Additionally, the model incorporates temporal dummy variables to account for seasonal fluctuations in remittances, as well as to adjust for exogenous shocks that might simultaneously impact all nations within a specified timeframe. Second, we use the local projection approach by Jorda (2005) to estimate a dynamic relationship between uncertainty and remittances. The underpinning logic and the methodological framework of this approach will be elucidated prior to the exposition and discussion of the ensuing empirical findings.

Empirical Findings

Fixed-Effect Estimations

Baseline results

The empirical results presented in Table 1 show that domestic uncertainty does not significantly influence the magnitude of remittance flows, as evidenced by the non-significant coefficients across various model specifications (columns 1, 3, 4, and 6).[9] This finding, consistent with the descriptive analysis, may reflect

[9] Panel stationarity tests are carried out before running the fixed-effect estimations. The results in Annex 5 show that for most variables, including the dependent variable, the hypothesis of stationarity cannot be rejected in level.

two opposing dynamics. On one hand, uncertainty in the migrant's country of origin could increase remittances due to altruism as migrants endeavor to mitigate the adverse impacts of escalating uncertainty on their families. On the other hand, heightened uncertainty regarding the economic prospects of the home country may deter remittances earmarked for investment purposes.

In contrast, the analysis reveals a significant negative correlation between remittance volumes and uncertainty within the host country (columns 2, 3, 5 and 6, Table 1), suggesting that migrants hold back from remitting when uncertainty rises in the host nation, possibly as a strategy to augment precautionary savings. Since migrants are often precluded from access to social safety nets in the host country, the impact of foreign uncertainty on remittances could be accentuated.[10] The inclusion of the full set of control variables (columns 4, 5 and 6) does not significantly affect the coefficients of the uncertainty variables, pointing to the stability and robustness of the findings.

Table 1. Uncertainty and Remittances

Dependent variable: remittances (log)	(1)	(2)	(3)	(4)	(5)	(6)
Domestic uncertainty index	-0.009		-0.003	-0.021		-0.015
	[0.052]		[0.053]	[0.050]		[0.051]
Foreign uncertainty index		-0.238	-0.223		-0.225	-0.225
		[0.102]**	[0.084]***		[0.076]***	[0.086]**
GDP per capita (log)	1.271	1.090	1.260	1.258	1.014	1.250
	[0.321]***	[0.301]***	[0.320]***	[0.305]***	[0.288]***	[0.305]***
Foreign GDP per capita (log)				0.390	0.449	0.385
				[0.093]***	[0.083]***	[0.093]***
Domestic Currency per U.S. Dollar (log)				0.237	0.184	0.242
				[0.109]**	[0.111]	[0.110]**
Exchange rate volatility				-0.384	-0.418	-0.387
				[0.209]*	[0.240]*	[0.207]*
Total migrant stock (log)				0.084	0.047	0.093
				[0.083]	[0.030]	[0.082]
Constant	-3.879	-2.745	-3.703	-9.841	-8.048	-9.789
	[2.632]	[2.474]	[2.630]	[2.395]***	[2.295]***	[2.379]***
Observations	3,580	4,188	3,580	3,571	4,179	3,571
Number of countries	65	77	65	65	77	65
R-squared	0.74	0.74	0.74	0.76	0.76	0.76
Country fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes

Notes. Fixed effect estimations. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively.

Regarding control variables, higher income per capita in the host country positively influences remittance flows, mirroring improved economic conditions and job opportunities for migrants. Contrary to expectations, wealthier developing countries also receive larger remittance flows, potentially attributable to the escalated cost of living necessitating increased remittance support from migrants. While it is plausible that there exists a critical juncture at which this relationship may invert—owing to diminished financial dependency of migrants' families—our dataset does not substantiate this hypothesis, as evidenced by the non-significant coefficient pertaining to the squared GDP per capita within the home country.[11]

Furthermore, the analysis corroborates the notion that currency depreciation within the remittance-receiving country acts as a catalyst for increased remittances, aligning with the findings of Mandelman and Vilán

[10] There could be potential spillovers between domestic and foreign uncertainty due to trade and cross-border investment linkages. However, since both variables are included simultaneously in the full baseline specification (column 6, Table 1), the coefficient on domestic uncertainty represents the marginal impact of domestic uncertainty, holding foreign uncertainty constant (and vice versa).

[11] Regression not shown in the paper.

(2020) in the context of Mexico. They attribute this to intertemporal substitution, where migrants expedite remittance transfers to capitalize on the favorable exchange rate.[12] However exchange rate volatility deters remittances as they are possibly postponed, particularly those that are not for emergency assistance. The migrant stock variable exhibits a positive but statistically non-significant coefficient, likely impeded by the gradual temporal dynamics and the predominance of country-specific influences.[13]

To ensure the robustness of these findings, we applied three different approaches: (i) use of alternative indicators of remittances, (ii) inclusion of additional control variables, (iii) and addressing potential concerns of endogeneity. First, the dependent variable, the volume of remittances, is substituted with alternative indicators, including: (a) the ratio of remittances to GDP, to evaluate the economic significance of remittance flows for the recipient country; (b) the level of remittances per migrant to capture the supply dimension of remittances; (c) the aggregate level of remittances divided by the population of the country of origin, serving as a measure of the demand side of remittances; and (d) the level of remittances per migrant as a share of the average income per capita of the host economy to assess the relative financial commitment of remitting for migrants.[14] The empirical results, as depicted in Table 2, confirm the consistency of the initial results across the spectrum of alternative remittance indicators. The lack of a significant relationship between domestic uncertainty and remittance flows and the adverse impact of foreign uncertainty on remittance volumes persist. Furthermore, the directional consistency and statistical significance of the control variables corroborate the initial analytical observations.

Second, to address the possibility that the core findings are contingent upon the omission of pertinent variables, an expanded set of control variables was integrated into the baseline model. These additional controls encompass metrics such as financial accessibility, inflation rates, monetary policy rates, GDP growth rates, and the remittance transaction costs for the country of origin, in addition to the aggregated GDP growth rate of the host nations. The incorporation of these supplementary control variables, as evidenced in Table 3, does not diverge from the initial conclusions but elucidates additional observations. Higher economic growth rates in both the origin country and the host economy foster remittances (column 5 and 6, Table 3). Conversely, a recession in the host economy negatively affects remittances. However, even though recession and higher uncertainty can coincide, the coefficient on the foreign uncertainty remains negative and significant, with a magnitude close to that of the full baseline specification (column 6 of Table 1). This indicates that the first-order shock (a negative growth rate) reduces remittances, and potentially creates higher uncertainty (second-order shock) which would in turn lower remittances further.[15] Additionally, the results in Table 3 suggest a positive correlation between financial accessibility and increased remittance inflows. At the same time, the inverse relationship holds for the inflation rate. As expected, the cost of remittance transfers is inversely related to remittance volumes, underscoring the sensitivity of remittance behaviors to transactional expenses (Kpodar and Imam, 2024).

[12] In some countries, an overvalued official exchange rate can cause remittances to flow informally because of the better rates in the parallel market. Therefore, a depreciation in the official exchange rate that narrows the gap with the parallel market brings remittances back into the formal market. In these cases, the volume of official remittances increases, but only because of a shift from informal to formal channels while from the recipient perspective, there may not be a meaningful change in the amount received.

[13] In a pooling regression (omitting the country-specific effects and the time dummies), the positive coefficient on the stock of migrants becomes closer to one and highly significant (regression not shown in the paper).

[14] This implicitly assumes that migrants' earning is at the average income in the host economy. But in reality, the burden is much higher as migrants are likely to take poorly paid jobs and earn much less than the average income.

[15] The result remains robust with the inclusion of growth volatility in both the host and home countries, measured as the standard deviation of their respective annual real GDP growth rates over the preceding 5 years. These findings reinforce that the observed effects of uncertainty are not simply a reflection of cyclical economic conditions, but rather represent independent influences on remittance flows.

Table 2. Uncertainty and Remittances: Alternative Indicators of Remittances

Dependent variable	Remittances per migrant (log)	Remittances to GDP (log)	Remittances per capita (log)	Remittances per migrant as a share of income per capita of the host economy (log)
	(1)	(2)	(3)	(4)
Domestic uncertainty index	0.000	0.011	-0.002	-0.003
	[0.074]	[0.048]	[0.050]	[0.078]
Foreign uncertainty index	-0.424	-0.177	-0.222	-0.405
	[0.217]*	[0.091]*	[0.083]***	[0.209]*
GDP per capita (log)	1.267	0.062	1.435	1.224
	[0.335]***	[0.395]	[0.335]***	[0.344]***
Foreign GDP per capita (log)	0.849	0.309	0.394	
	[0.393]**	[0.088]***	[0.099]***	
Domestic Currency per U.S. Dollar (log)	0.346	0.395	0.263	0.329
	[0.145]**	[0.124]***	[0.122]**	[0.140]**
Exchange rate volatility	-0.486	-0.161	-0.432	-0.478
	[0.286]*	[0.239]	[0.213]**	[0.286]*
Total migrant stock (log)		0.085	0.097	
		[0.082]	[0.088]	
Constant	-20.858	-6.486	-21.501	-21.978
	[4.518]***	[3.236]**	[2.574]***	[2.850]***
Observations	3,571	3,571	3,571	3,571
Number of countries	65	65	65	65
R-squared	0.61	0.27	0.73	0.44
Country fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes

Notes. Fixed effect estimations. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively.

Third, even after addressing the omitted variable bias, concerns regarding endogeneity may persist, attributed to potential measurement errors and reverse causality. By its very nature, uncertainty presents significant challenges in terms of quantification, rendering it susceptible to measurement errors, particularly in developing countries. These might induce a bias in the coefficient corresponding to domestic uncertainty if a correlation emerges with the error term due to these measurement discrepancies. Moreover, while domestic uncertainty might influence remittance flows, the reverse relationship is also possible, given that migrants' primary objective often involves shielding their families against adverse economic impacts. This dynamic could, in turn, modify the remittance recipients' outlook on the future economic landscape. At a macroeconomic level, an influx of remittances could enhance domestic consumption, bolster foreign exchange reserves, mitigate pressures on currency depreciation, and consequentially diminish economic uncertainty.

Table 3. Uncertainty and Remittances: Additional Control Variables

Dependent variable: remittances (log)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Domestic uncertainty index	-0.010	-0.012	-0.045	-0.033	-0.006	-0.006	-0.010
	[0.050]	[0.052]	[0.048]	[0.045]	[0.051]	[0.051]	[0.036]
Foreign uncertainty index	-0.209	-0.224	-0.172	-0.149	-0.224	-0.227	-0.084
	[0.092]**	[0.086]**	[0.070]**	[0.075]*	[0.084]***	[0.085]***	[0.045]*
GDP per capita (log)	1.135	1.170	1.205	1.055	1.258	1.265	0.085
	[0.302]***	[0.321]***	[0.375]***	[0.351]***	[0.303]***	[0.304]***	[0.323]
Foreign GDP per capita (log)	0.387	0.383	0.438	0.440	0.361	0.359	0.373
	[0.089]***	[0.089]***	[0.092]***	[0.086]***	[0.089]***	[0.088]***	[0.194]*
Domestic Currency per U.S. Dollar (log)	0.241	0.243	0.182	0.196	0.252	0.267	-0.051
	[0.102]**	[0.110]**	[0.099]*	[0.093]**	[0.110]**	[0.115]**	[0.115]
Exchange rate volatility	-0.414	-0.238	-0.055	0.001	-0.372	-0.469	-0.538
	[0.204]**	[0.183]	[0.274]	[0.297]	[0.206]*	[0.321]	[0.436]
Total migrant stock (log)	0.092	0.091	0.059	0.053	0.078	0.082	0.202
	[0.080]	[0.081]	[0.095]	[0.095]	[0.082]	[0.083]	[0.075]***
Financial institutions access index	0.542			0.788			
	[0.485]			[0.434]*			
Inflation		-0.001		-0.002			
		[0.000]***		[0.002]			
Monetary policy rate			-0.003	-0.001			
			[0.003]	[0.003]			
Real GDP growth					0.010	0.010	0.006
					[0.005]**	[0.005]**	[0.006]
Foreign GDP growth						0.000	0.000
						[0.000]*	[0.000]***
Remittance costs ($500)							-0.018
							[0.007]***
Constant	-8.993	-9.080	-9.183	-8.208	-9.487	-9.617	-0.483
	[2.389]***	[2.512]***	[3.023]***	[2.942]***	[2.446]***	[2.457]***	[3.558]
Observations	3,495	3,511	3,214	3,122	3,571	3,567	1,657
Number of countries	64	64	63	62	65	65	60
R-squared	0.76	0.76	0.73	0.74	0.76	0.75	0.37
Country fixed effects	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes

Notes. Fixed effect estimations. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively. The sample in column 6 is smaller because data on remittance costs are only available from 2011.

To address the potential endogeneity concern, this study applies an instrumental variable approach, utilizing the occurrence of legislative and presidential elections as instruments for domestic uncertainty[16] (see also Ahir, Bloom and Furceri, 2022). The first stage results reveal an escalation in domestic uncertainty during electoral periods, with both presidential and legislative election indicators exhibiting positive and statistically significant coefficients (Appendix Table 1). As depicted in Table 4, the exogenously determined component of domestic uncertainty, as explained by election timings, does not significantly alter the trajectory of remittance flows, corroborating earlier observations (columns 1 and 2).[17] Similarly, the results on the foreign uncertainty and control variables are also unchanged. Employing the weighted average of uncertainty levels among trading partners as an instrument for domestic uncertainty (with weights assigned based on each trading partner's share in the exports of the origin country) generates analogous findings (column 3).[18] Consequently, it is reasonable to assert that the integrity of the study's conclusions is upheld, even when accounting for potential endogeneity concerns.

Table 4. Dealing with Endogeneity using an Instrumental Variable Approach

Dependent variable: remittances (log)	(1)	(2)	(3)
Domestic uncertainty index	0.036	0.003	0.751
	[0.332]	[0.318]	[1.181]
Foreign uncertainty index	-0.229	-0.244	-0.286
	[0.092]**	[0.100]**	[0.147]*
GDP per capita (log)	1.256	0.062	1.292
	[0.302]***	[0.073]	[0.321]***
Foreign GDP per capita (log)	0.391	1.108	0.376
	[0.095]***	[0.317]***	[0.107]***
Domestic Currency per U.S. Dollar (log)	0.241	0.327	0.238
	[0.109]**	[0.096]***	[0.111]**
Exchange rate volatility	-0.391	0.250	-0.443
	[0.207]*	[0.110]**	[0.246]*
Total migrant stock (log)	0.094	-1.279	0.099
	[0.083]	[0.472]***	[0.083]
Constant	-9.933	-7.606	-10.253
	[2.346]***	[2.341]***	[2.530]***
Observations	3,567	3,562	3,571
Number of countries	65	65	65
R-squared	0.76	0.75	0.71
Country fixed effects	yes	yes	yes
Year fixed effects	yes	yes	yes
Quarter fixed effects	yes	yes	yes

Notes. Fixed effect IV estimations. In column 1, domestic uncertainty is instrumented by two dummy variables: the first dummy takes 1 when presidential election took place in the quarter and zero otherwise; and the second dummy is defined along the same line for legislative election. In column 2, the instruments for domestic uncertainty are the same, but in addition, all control variables are lagged by one period. In both columns 1 and 2, foreign uncertainty is treated as an exogenous variable. In column 3, domestic uncertainty is instrumented by the export-weighted uncertainty of trading partners. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively.

[16] Data on elections are derived from the DPI2020 Database of Political Institutions.

[17] This also suggests that the lack of significance of domestic uncertainty in the previous regressions is not driven by measurement errors. Challenges may arise with capturing accurately the level of uncertainty if the reports used for the compilation of the uncertainty index have less coverage of developing countries.

[18] It is important to clarify that trade partner uncertainty captures uncertainty in the countries with which the recipient country has significant trade relationships, potentially including a broader set of countries than those covered in the foreign uncertainty index. While the foreign uncertainty index focuses specifically on the host economies from which remittances are sent, trade partner uncertainty encompasses additional countries that are key to the recipient country's trade network, capturing a different dimension of external economic influences. All trading partners are taken into account. The correlation between foreign uncertainty and trade partner uncertainty is 0.7.

Uncovering the heterogenous effect of domestic uncertainty on remittances

The paper explores the puzzling lack of impact of domestic uncertainty on remittances by disentangling the altruism channel from the investment channel. While these two influences might offset each other on an aggregate level, such equilibrium is unlikely to manifest uniformly across all individual nations. Consequently, in some countries, an escalation in uncertainty may precipitate an increase in remittances, whereas in others, a converse dynamic may be observed. Teasing out this heterogeneity across countries is critical for policy making as countries seek to leverage the ever-increasing remittance flows for development and poverty reduction.

To test the investment channel, we assume that the private investment-to-GDP ratio reflects the propensity of households to invest, and thus, more remittances are likely to be channeled to investment projects in countries where private investment is high, or private sector activities are more dynamic. Within this framework, we expect that heightened domestic uncertainty would exert a more pronounced inhibitory effect on remittances as the ratio of a country's private investment to GDP escalates. Table 5 shows the results in columns 1 and 2, whereby the lagged private investment to GDP ratio is introduced in the model as an additive term, but also as an interaction with domestic uncertainty.[19] The coefficient on the lagged private investment ratio is positive and significant in columns 1 and 2, suggesting that countries that put in place an enabling environment from private investment also attract more remittances. As hypothesized, the interaction term between private investment and domestic uncertainty yields a negative and significant coefficient, offering indicative evidence that domestic uncertainty serves to deter remittance allocations earmarked for investment purposes.

A substantial portion of remittance inflows is used by recipient households to cover essential expenses, particularly in healthcare and education. To examine the altruism channel, we hypothesize that remittances may respond positively to rising uncertainty in countries where public provision of health and education services is inadequate. Similar to private investment, uncertainty reduces the expected return on human capital investment, prompting households to cut back on education and health expenditures. This exacerbates the negative impact of uncertainty on economic growth and job creation, further constraining household income and their ability to afford these fundamental expenses.

[19] The lagged value is used to minimize endogeneity issues between private investment and remittances.

Table 5. Domestic Uncertainty and Remittances: The Role of Private Investment and Public Human Capital Spending

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP per capita (log)	1.192	1.209	1.202	1.179	1.068	1.049	1.000	0.974	0.838
	[0.301]***	[0.297]***	[0.338]***	[0.335]***	[0.161]***	[0.154]***	[0.215]***	[0.214]***	[0.188]***
Foreign GDP per capita (log)	0.349	0.353	0.370	0.368	0.338	0.333	0.327	0.321	0.299
	[0.082]***	[0.080]***	[0.106]***	[0.108]***	[0.090]***	[0.093]***	[0.097]***	[0.099]***	[0.080]***
Domestic Currency per U.S. Dollar (log)	0.267	0.267	0.159	0.159	0.109	0.109	0.117	0.116	0.080
	[0.173]	[0.173]	[0.094]*	[0.093]*	[0.067]	[0.066]	[0.078]	[0.077]	[0.106]
Exchange rate volatility	-0.271	-0.263	0.050	0.059	-0.475	-0.445	-0.492	-0.466	-0.534
	[0.222]	[0.226]	[0.337]	[0.338]	[0.556]	[0.557]	[0.543]	[0.544]	[0.590]
Total migrant stock (log)	0.075	0.069	0.145	0.148	0.065	0.065	0.056	0.057	0.052
	[0.078]	[0.078]	[0.065]**	[0.065]**	[0.067]	[0.067]	[0.071]	[0.071]	[0.062]
Domestic uncertainty index	0.020	0.444	0.018	0.115	0.032	0.139	0.050	0.152	0.534
	[0.051]	[0.192]**	[0.045]	[0.074]	[0.058]	[0.076]*	[0.055]	[0.081]*	[0.182]***
Foreign uncertainty index	-0.247	-0.239	-0.258	-0.261	-0.105	-0.106	-0.139	-0.143	-0.151
	[0.083]***	[0.082]***	[0.092]***	[0.090]***	[0.074]	[0.072]	[0.078]*	[0.077]*	[0.079]*
Private investment ratio to GDP (lagged) - Inv	0.012	0.016							0.011
	[0.004]***	[0.004]***							[0.003]***
Inv*Domestic uncertainty		-0.025							-0.021
		[0.010]**							[0.009]**
Public spending on heath per capita - Health			-0.001	-0.000					
			[0.001]	[0.000]					
Health *Domestic uncertainty				-0.000					
				[0.000]**					
Public spending on education per capita - Educ					-0.009	-0.007			
					[0.004]**	[0.004]**			
Educ*Domestic uncertainty						-0.007			
						[0.003]**			
Public spending on health and education per capita - HE							-0.001	-0.001	-0.001
							[0.000]**	[0.000]*	[0.000]**
HE*Domestic uncertainty								-0.000	-0.000
								[0.000]**	[0.000]**
Constant	-8.900	-9.053	-9.501	-9.342	-6.703	-6.516	-5.849	-5.605	-4.172
	[2.328]***	[2.310]***	[2.725]***	[2.723]***	[1.832]***	[1.845]***	[2.270]**	[2.312]**	[2.388]*
Observations	3,190	3,190	3,406	3,406	2,615	2,615	2,541	2,541	2,297
Number of countries	59	59	65	65	62	62	62	62	56
R-squared	0.78	0.78	0.71	0.71	0.79	0.79	0.76	0.76	0.76
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes. Fixed effect estimations. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively.

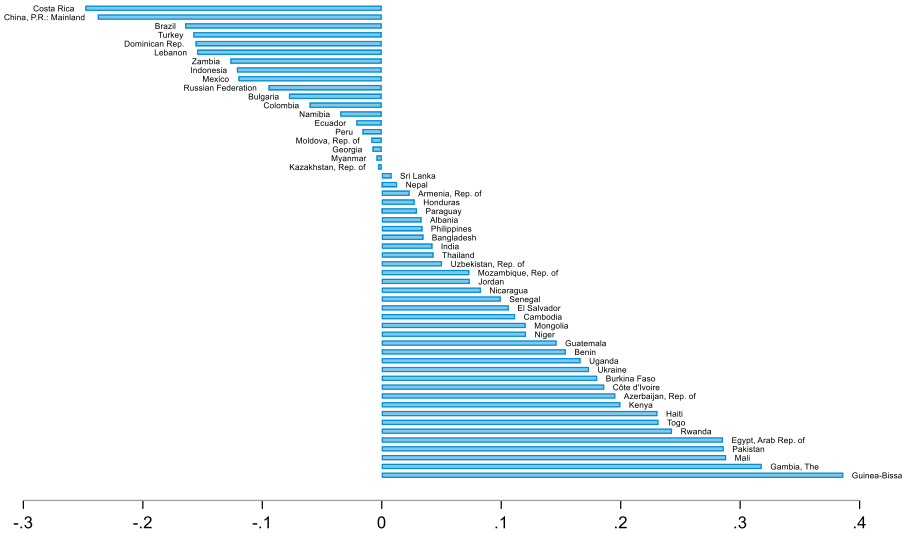
Coibion et al. (2024) show that, using a survey of European households, exogenous variations in the perceived macroeconomic uncertainty reduces the budget share of healthcare spending. Ben-David et al. (2018) find that households with lower income and educational attainment exhibit more volatile expectations regarding their personal and broader economic forecasts, adversely influencing their consumption, credit, and investment activities (see also Nam, Lee, and Jeon, 2021). If these observations pertaining to households in advanced economies extend to developing economies, the decrement in consumption attributable to a specific level of uncertainty is likely to be more pronounced for the families of migrants compared to the average household in the country of origin. It is anticipated that remittances will escalate correspondingly as migrants may be motivated to augment remittances to bolster the educational and healthcare expenditures of their families, considering that this will enhance their resilience in the face of potential shocks, augment their future earning potential, and, by extension, reduce their reliance on remittance inflows. The influence on remittances is posited to be more marked in countries characterized by lower public expenditure on health and education.

The empirical findings delineated in columns 3 to 7 (Table 5) reveal that the coefficients pertaining to the interaction between per capita public health expenditure (and similarly, per capita public education expenditure) and domestic uncertainty are negative and statistically significant (as observed in columns 4 and 5, Table 5). This indicates that in countries characterized by limited public service provisioning in education and healthcare, remittance inflows exhibit a more pronounced positive response—or a mitigated negative reaction—to escalations in domestic uncertainty, as compared to other contexts. Such results underscore the pivotal function of remittances as quasi-social safety nets during periods of adverse economic perturbations.

This pattern persists when per capita public expenditures on health and education are amalgamated (column 8) and remains consistent upon adjusting for variations in the private investment ratio (column 9). Notably, in several model specifications (4 out of 9), the coefficient associated with domestic uncertainty assumes a positive and significant value, unveiling the anticipated remedial response of remittances in the wake of deteriorating economic conditions within the country of origin.

Utilizing the model specification from column 9, Figure 5 elucidates the marginal impact of domestic uncertainty on remittance flows, factoring in the private investment ratio and public investments in health and education for each respective country. The analysis indicates that for most countries within the sample, the overarching influence of uncertainty on remittances is positive. However, in a subset of cases, remittance flows decline in response to escalating uncertainties, mainly due to the investment channel.

Figure 5. Marginal Impact of Domestic Uncertainty on Remittances Conditional to the Country's Private Investment Ratio to GDP and Government Spending on Health and Education per Capita.



Source: Authors' calculations

The Local Projection Estimations

Rationale and model specification

While the static model delineated in Equation 1, estimated via the fixed-effect methodology, provides valuable insights into the immediate repercussions of shifts in economic uncertainty on remittances, it may not fully capture the temporal interactions between economic uncertainty and remittance flows. The reaction of remittances to changes in economic uncertainty could be immediate or subject to delays, wherein not merely the contemporaneous response is of significance, but also the responses manifesting in subsequent temporal intervals. Within this framework, a prospective surge in economic uncertainty at time t could influence remittance flows not only at time *t* but also extend its impact into future periods (*t+1*, etc.), until such effects attenuate. The use of quarterly remittance data is particularly suited for conducting such an analysis, thereby mitigating potential biases in the estimated coefficients attributable to economic uncertainty, which might emerge should the dynamic interplay still need to be addressed.

Moreover, given the potential for remittance flows to exhibit temporal persistence, the static model may not fully account for this enduring nature, as it does not incorporate the baseline conditions (represented by the lagged dependent variable). In contrast, a dynamic model is equipped to integrate multiple lagged instances of the dependent variable (remittances), alongside feedback mechanisms from historical occurrences of the explanatory variable of interest (economic uncertainty). This approach facilitates a comprehensive exploration of both the immediate and extended-term responses of remittances to fluctuations in economic uncertainty.

A common method to estimate a dynamic model is to rely on conventional Vector Autoregressive models (VARs) to derive the impulse response functions (IRFs). Nevertheless, a VAR can give rise to a bias if the specification is not representative of the data-generating process, especially when misspecification errors are compounded with the forecast horizon (Jordà, 2005). A more flexible and widely used approach is the local projection method (LP) developed by Jordà (2005).

The LP involves an intuitive approach to assess the impact of a shock at time *t* on the dependent variable by generating multi-step forecasts using direct forecasting models that are re-estimated for each forecast horizon. Olea and Plagborg-Møller (2021) demonstrate that the LP robustly handles highly persistent data and the estimation of impulse response functions (IRFs) at long horizons, whereas Auerbach and Gorodnichenko (2013) and Ramey et al. (2018) point out that it easily accommodates non-linearities. According to Jordà (2005), the LP method defines impulse responses independently of the unknown data-generating process, making it robust to lag structure misspecification and avoiding the need for the identifying restrictions required in VARs to derive IRFs. Nevertheless, some studies offer a more nuanced view on the LP. For instance, Barnichon and Brownlees (2019) point out that the flexibility of the LP relative to VARs comes at the cost of efficiency, and according to Plagborg-Møller and Wolf (2021), the LP is equivalent to VARs from an identification and estimation standpoint (see Jordà (2023) for more discussion). On balance, the ease of the implementation of the LP and the intuitive design makes it a preferred approach compared to VARs in this paper. More importantly, the ability to handle nonlinearities will be useful as we investigate sample heterogeneity.

The LP, however, requires tweaking Eq (1), which becomes:

$$\log(Rem)_{c,t+h} = \gamma + \sum_{i=1}^{n} \alpha_i \log(Rem)_{c,t-i} + \sum_{i=1}^{n} \beta_i Uncert^{l}_{c,t-i} + \sum_{j=0}^{h} \delta_j Uncert^{l}_{c,t+j} + \sum_{i=1}^{n} \varphi_i Uncert^{f}_{c,t-i} + \sum_{j=0}^{h} \omega_j Uncert^{f}_{c,t+j} + \theta_h \mathrm{X}_{c,t} + u_c + \vartheta_t + \varepsilon_{c,t+h}$$

for h=0, …, H Eq(2)

where:

- $Rem_{c,t+h}$ is the remittances in millions of dollars received by country c at time t
- $Uncert^{l}_{c,t}$ stands for the level of local economic uncertainty.
- $Uncert^{f}_{c,t}$ represents foreign economic uncertainty.
- $X_{c,t}$is a set of control variables which includes the income per capita of the remittance-receiving country and that of the remittance-sending countries to capture the level of development, the number of migrants originating from the remittance-receiving. countries, and the level and volatility of the US dollar/local currency exchange rate
- ϑ are the time dummies (year and quarter), u is the country-specific effect, and ε is the error term robust to heteroscedasticity.
- the number of lags, *n*, is set at 4 considering the quarterly frequency of the remittance data, and the forecast horizon, *h*, is set at 5 quarters.

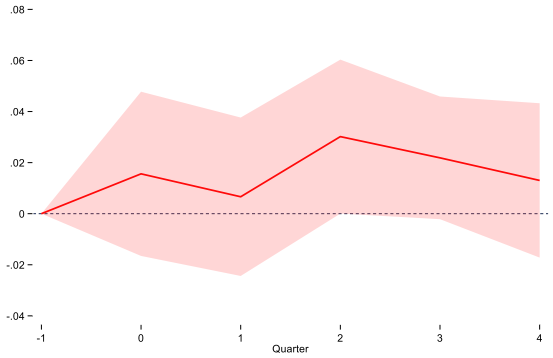
The dependent and independent variables as well as the underlying data, are consistent for both the fixed-effect (Eq.1) and LP (Eq.2). However, there are notable differences between the two specifications:

- In the LP model, the dependent variable includes not only the contemporaneous value of remittances (like the fixed-effect model), but also its future realizations when the model is estimated at different horizons *h*.
- Unlike the fixed-effect model, the LP includes multiple lags of the dependent variable.
- The LP requires a correction factor (Teulings and Zubanov, 2014) to capture changes in economic uncertainty costs observed within the forecast horizon. Indeed, when there are subsequent uncertainty shocks, the IRF also captures the treatment effect given the usual path of these shocks and the usual behavior of the other variables. Teulings and Zubanov (2014) underline that the LP may be subject to a bias if its specification estimated at horizon *h* is not expanded to control for shocks occurring between *t+1* and *t+h* (embedded in the third and fifth terms of Eq. 2, respectively for local and foreign uncertainty). Controlling for potential subsequent shocks is critical for properly isolating the impact of an uncertainty shock at time *t* on remittance flows a time *t* and beyond.

The results

Figures 6 and 7 present the Impulse Response Functions (IRF) of remittance flows both immediately and, in the quarters succeeding an unforeseen escalation in uncertainty within both the home and host nations. Echoing the findings derived from fixed-effect estimations, the Local Projections (LP) methodology initially does not manifest a discernible correlation between domestic uncertainty and remittances. Conversely, an increment in foreign uncertainty precipitates a reduction in remittances during the initial quarter, thereafter, the marginal effect attenuates to statistical insignificance, suggesting that remittances do not revert to their levels prior to the perturbation. Notably, the immediate response of remittances to foreign uncertainty is substantially more pronounced in the fixed-effect estimations as compared to the LP outcomes, indicating a potential overestimation when the dynamic interplay remains unconsidered.[20]

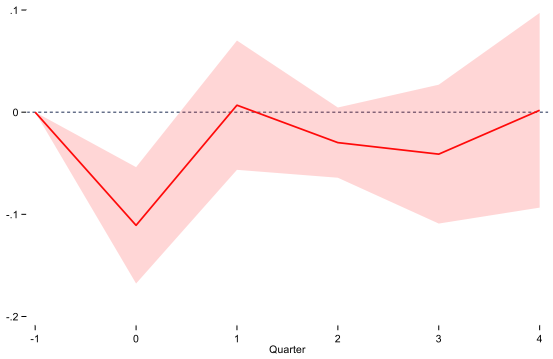
Figure 6. IRF of Remittances with Respect to Domestic Uncertainty



Notes: Shaded area represents the 90 percent confidence interval.
Source: Authors' calculations.

[20] Employing the occurrence of presidential and legislative elections, in conjunction with trade-weighted foreign uncertainty as instrumental variables for domestic uncertainty within the instrumental variable Local Projection framework, does not alter the aforementioned findings. The IRFs, not shown in the paper, are available on request.

Figure 7. IRF of Remittances with Respect to Foreign Uncertainty



Notes: Shaded area represents the 90 percent confidence interval.
Source: Authors' calculations.

Turning to the heterogeneity of the marginal impact of domestic uncertainty on remittances concerning the private investment ratio and per capita public spending on health and education, we run the corresponding IRFs that include these variables in additive term and as an interaction with domestic uncertainty. Despite the Local Projections (LP) methodology being adept at accommodating non-linear relationships, depicting the conditional marginal impact of one variable (x) on another (y) across time, subject to a third variable (z), in a two-dimensional graphical representation poses challenges.

Previous studies have adopted a methodology that differentiates a structural shift between a low and high regime of the conditional variable using a dummy that take 1 above a certain threshold (e.g. sample average or median) and zero otherwise. The main limitations of this approach are the arbitrary nature of the threshold and the assumed step change in the marginal impact at that point. Other studies have used a smooth transition function between the two regimes (e.g. Auerbach and Gorodnichenko, 2013; Furceri, Loungani, and Zdzienicka, 2018), but this leaves the arbitrary threshold unaddressed. Moreover, the appropriate transition function remains an open question.

Our approach differs from these conventions by eschewing the necessity for any transformation or presuppositions regarding the smoothness of the transition function. This is achieved by integrating an interaction term between the variable of interest (x) and the conditional variable (z), and subsequently delineating the IRFs at the 10th and 90th percentiles of the distribution of z. Since the marginal impact of x on y linearly correlates with z, it is posited that the IRF corresponding to any intermediate value of z within its 10^{th} to 90^{th} percentile range should inherently fall within the bounds established by the IRFs of these lower and upper percentiles.

Figure 8 shows that at a low level of private investment ratio (10^{th} percentile of the distribution), an increase in domestic uncertainty is associated with higher remittances in the first quarter before the effect dies out from the second quarter. This confirms supporting evidence that the dampening effect of uncertainty on remittances is less pronounced in countries where households have a low propensity to invest, and therefore are less likely to channel remittances to investment projects. As the private investment ratio rises to reach the 90^{th} percentile of the distribution, the relationship between domestic uncertainty and remittances turns negative and significant for the first quarter. The marginal impact crosses the zero line at a private investment ratio of 18 percent of GDP, well above the sample median (15.14 percent) and the sample average (16 percent of GDP).

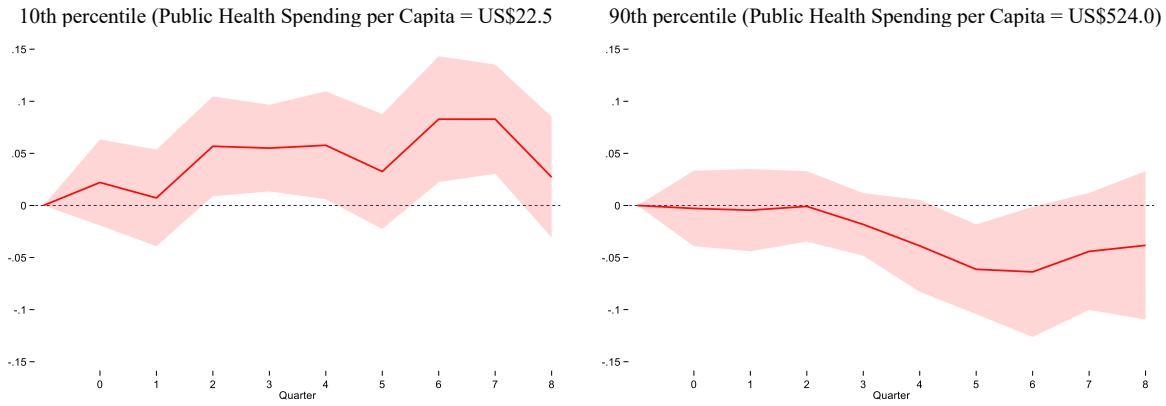
Figure 8. IRF of Remittances with Respect to Domestic Uncertainty and Conditional to the Private Investment Ratio to GDP

Notes: Shaded area represents the 90 percent confidence interval.
Source: Authors' calculations.

For the public spending on health per capita, a low level is associated with a positive response of remittances to a rise in uncertainty, while this relationship reverses for countries with higher public health spending in relation to their population. This may be because the out-of-pocket expenses incurred by households are lower and migrants' families may not need to cut back their health spending amid adverse economic shocks (Figure 9).

It is noteworthy that the response of remittances, conditional on public health spending, is slower and more prolonged compared to the response linked to private investment. The IRFs for private investment show a quick and contained reaction within the first quarter, whereas for public health spending, the marginal impact becomes significant only beyond the first quarter. This suggests that remittances intended for investment purposes are more responsive to market forces than those allocated for essential spending. There is also a distinct difference between the low and high regimes of public health spending: in countries with high public health spending, remittances decline only after the fourth quarter, whereas in countries with low public health spending, the positive response occurs from the second quarter after the uncertainty shock.

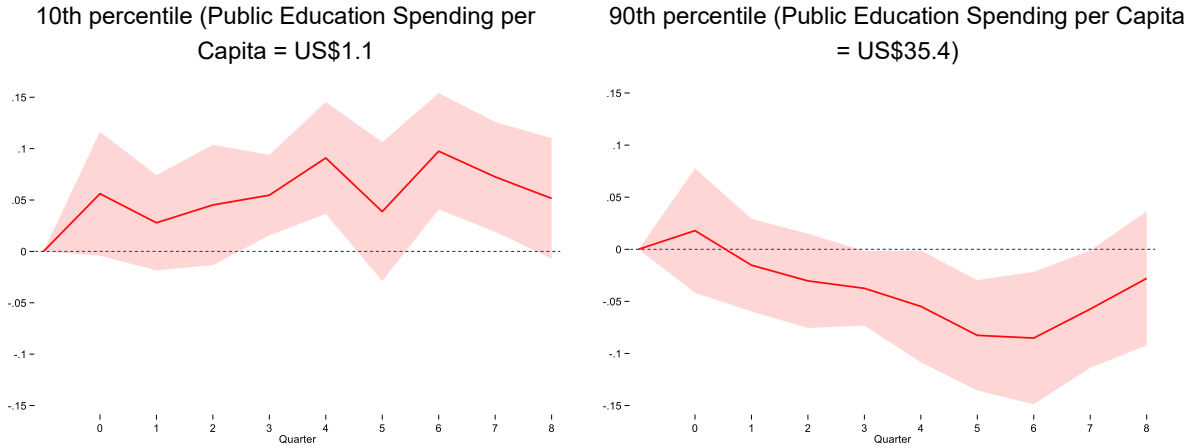
Figure 9. IRF of Remittances with Respect to Domestic Uncertainty and Conditional to Public Health Spending per Capita



Notes: Shaded area represents the 90 percent confidence interval.
Source: Authors' calculations.

The IRFs conditional to public education spending per capita exhibit similar patterns as for public health spending per capita (Figure 10). Remittances increase with uncertainty in countries with inadequate public investment in education, whereas they decline with uncertainty (albeit with a lag) where public investment in education is high.

Figure 10. IRF of Remittances with Respect to Domestic Uncertainty and Conditional to Public Education Spending per Capita



Notes: Shaded area represents the 90 percent confidence interval.
Source: Authors' calculations.

Conclusion

This paper shows that uncertainty is a key driver of remittances, with significant implications for policymaking. Using a sample of 77 countries from 1999Q1 2019Q4, the econometric estimations reveals that uncertainty in the remittance-sending country discourages remittances, consistent with the idea that migrants build up precautionary savings to manage the risks associated with uncertainty in their host country.. However, the effect of uncertainty in the remittance receiving-country is more nuanced. In countries with high private investment ratios, remittances decline with rising domestic uncertainty, while remittances react positively in countries with low public spending on education and health, acting as a social safety net mechanism. Accounting for these non-linearities shows a highly heterogeneous effect of domestic uncertainty on remittances. The results remain robust to alternative indicators of remittances, inclusion of additional control variables, treatment of potential endogeneity concerns, and different econometric methodologies (fixed effect estimates and local projections).

The resulting policy implications can be spelled out as follows. First, the negative relationship between remittance flows and uncertainty in sending countries highlights the importance of maintaining a stable economic and political environment in these countries for both the citizens and migrants. Policies that provide migrants with stable employment opportunities and access to social safety nets can help mitigate the adverse effects of uncertainty on remittances. Further, policies aimed at reducing volatility and enhancing predictability in financial markets could significantly bolster the confidence of migrants in sustaining or increasing remittance flows. Second, the ambiguous effect of receiving-country uncertainty on remittances--driven by the conflicting forces of investment disincentives and the altruistic need for familial support--underscores the importance of nuanced, but targeted, policy interventions. While remittances serve as a crucial social safety net, increasing public investment in healthcare and education could enable households to direct a greater share of remittances towards investment. Moreover, the findings suggest that fostering a conducive investment climate in remittance-receiving countries could further harness the developmental potential of remittances. By implementing policies that ensure political stability, regulatory clarity, and ease of doing business, governments can attract remittance flows into productive investments, thereby catalyzing economic growth and job creation.

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Appendix Table 1. First-Stage Regressions of the Instrumental Variable Approach

Dependent variable: domestic uncertainty	(1)	(2)
Legislative elections	0.045	
	[0.012]***	
Presidential elections	0.042	
	[0.016]**	
Export weighted uncertainty of trading partners		0.128
		[0.067]*
Observations	3,567	3,571
Number of countries	65	65
R-squared	0.07	0.05
Country fixed effects	yes	yes
Year fixed effects	yes	yes
Quarter fixed effects	yes	yes

Notes. Fixed effect estimations. Regressions include as additional variables: foreign uncertainty and all control variables specified in Table 4 shown in the text. Robust standard errors in brackets. *,**,*** denote significance at 10 percent, 5 percent and 1 percent, respectively.

Annex 1. Country Sample Composition

Low income	Lower middle income	Upper middle income
Benin	Armenia	Azerbaijan
Burkina Faso	Bangladesh	Bulgaria
Comoros	Bolivia	Bosnia and Herzegovina
Gambia	Côte d'Ivoire	Belarus
Guinea-Bissau	Cabo Verde	Brazil
Haiti	Egypt	China, P.R.: Mainland
Liberia	Guatemala	Colombia
Mali	Honduras	Costa Rica
Mozambique	Indonesia	Dominican Rep.
Niger	India	Ecuador
Nepal	Kenya	Fiji, Rep. of
Rwanda	Kyrgyz Rep.	Georgia
Senegal	Cambodia	Jamaica
Togo	Sri Lanka	Jordan
Uganda	Morocco	Kazakhstan
	Moldova	Lebanon
	Myanmar	Mexico
	Mongolia	North Macedonia
	Nigeria	Mauritius
	Nicaragua	Namibia
	Pakistan	Panama
	Philippines	Peru
	Papua New Guinea	Paraguay
	El Salvador	Russian Federation
	São Tomé and Príncipe	Serbia
	Tonga	Thailand
	Ukraine	Turkey
	Uzbekistan	Albania
	Samoa	Bhutan
	Zambia	Montenegro
		Suriname
		Kosovo

Annex 2. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Remittances (millions of US dollars, log)	4,188	5.408	2.042	-1.738	10.030
Remittances per migrant (thousands of US dollars, log)	4,188	-1.256	1.548	-7.412	8.226
Remittances to GDP (log)	4,188	-0.299	1.634	-6.695	2.428
Remittances per capita (thousands of US dollars, log)	4,188	-3.943	1.623	-10.273	-0.645
Remittances per migrant as a share of income per capita of the host economy (log)	4,188	-11.254	1.404	-17.109	-2.725
Domestic uncertainty index	3,580	0.200	0.215	0.000	2.038
Foreign uncertainty index	4,188	0.219	0.147	0.001	1.668
GDP per capita (log)	4,188	7.968	0.834	6.044	9.628
Foreign GDP per capita (log)	4,188	9.998	0.701	7.598	10.951
Exchange rate volatility	4,179	0.012	0.028	0.000	1.223
Total migrant stock (log)	4,188	13.572	1.532	3.596	20.906
Financial institutions access index	4,048	0.280	0.209	0.008	1.000
Inflation	4,084	18.604	255.905	0.017	7481.66
Monetary policy rate	3,742	13.581	29.066	0.000	239.267
Real GDP growth	4,188	4.634	3.026	0.000	34.466
Foreign GDP growth	4,176	11.355	225.936	-75.742	7260.74
Remittance costs (for 500 $ sent)	1,849	4.763	2.557	0.790	26.155
Private investment ratio to GDP	3,538	17.838	6.880	-7.019	54.799
Public spending on heath per capita (US dollars)	3,926	223.272	202.781	8.362	1192.82
Public spending on education per capita (US dollars)	2,942	16.084	15.230	0.479	86.432
Public spending on health and education per capita (US dollars)	2,856	241.890	223.231	9.264	1242.15

Source: authors

Annex 3. Correlation matrix

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Remittances (log)	1	1.0000																				
Remittances per migrant (log)	2	0.6670*	1.0000																			
		0.0000																				
Remittances to GDP (log)	3	0.3608*	0.5872*	1.0000																		
		0.0000	0.0000																			
Remittances per capita (log)	4	0.4545*	0.6695*	0.8530*	1.0000																	
		0.0000	0.0000	0.0000																		
Average remittances/income per capita of the host economy (log)	5	0.6110*	0.8917*	0.5992*	0.5436*	1.0000																
		0.0000	0.0000	0.0000	0.0000																	
Domestic uncertainty index	6	0.0201	0.0778*	0.0046	0.0313*	0.0603*	1.0000															
		0.2294	0.0000	0.7843	0.0613	0.0003																
Foreign uncertainty index	7	-0.0676*	-0.0429*	-0.0821*	-0.0447*	-0.0090	0.1691*	1.0000														
		0.0000	0.0055	0.0000	0.0038	0.5614	0.0000															
GDP per capita (log)	8	0.1069*	0.0326*	-0.3541*	0.1553*	-0.2023*	0.0255	0.0217	1.0000													
		0.0000	0.0347	0.0000	0.0000	0.0000	0.1270	0.1604														
Foreign GDP per capita (log)	9	0.2491*	0.4223*	0.0967*	0.3897*	-0.0337*	0.0524*	-0.0767*	0.4773*	1.0000												
		0.0000	0.0000	0.0000	0.0000	0.0291	0.0017	0.0000	0.0000													
Exchange rate volatility	10	-0.0684*	-0.0714*	-0.1120*	-0.1117*	-0.0535*	0.0270	0.0224	0.0361*	-0.0497*	1.0000											
		0.0000	0.0000	0.0000	0.0000	0.0005	0.1071	0.1469	0.0196	0.0013												
Total migrant stock (log)	11	0.6587*	-0.1213*	-0.1123*	-0.0706*	-0.0866*	-0.0593*	-0.0468*	0.1094*	-0.0946*	-0.0196	1.0000										
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0025	0.0000	0.0000	0.2048											
Financial institutions access index	12	0.1522*	0.1558*	-0.1231*	0.2622*	0.0059	0.0988*	0.0912*	0.6696*	0.3179*	0.0383*	0.0575*	1.0000									
		0.0000	0.0000	0.0000	0.0000	0.7085	0.0000	0.0000	0.0000	0.0000	0.0149	0.0003										
Inflation	13	-0.0697*	-0.0754*	-0.0563*	-0.0967*	-0.0674*	-0.0200	-0.0418*	-0.0208	-0.0310*	0.5315*	-0.0160	-0.0514*	1.0000								
		0.0000	0.0000	0.0003	0.0000	0.0000	0.2359	0.0076	0.1844	0.0473	0.0000	0.3071	0.0012									
Monetary policy rate	14	0.0230	-0.0314*	0.0758*	0.0441*	-0.0551*	-0.0074	-0.0230	-0.0075	0.0411*	-0.0330*	0.0619*	-0.0781*	0.2312*	1.0000							
		0.1599	0.0550	0.0000	0.0070	0.0008	0.6740	0.1595	0.6480	0.0119	0.0441	0.0001	0.0000	0.0000								
Real GDP growth	15	0.0114	-0.1090*	-0.0716*	-0.1829*	-0.0056	-0.1601*	-0.0953*	-0.1481*	-0.2294*	-0.0446*	0.1252*	-0.2019*	0.0368*	-0.0481*	1.0000						
		0.4621	0.0000	0.0000	0.0000	0.7171	0.0000	0.0000	0.0000	0.0000	0.0040	0.0000	0.0000	0.0187	0.0032							
Foreign real GDP growth	16	0.0611*	0.0325*	0.0055	-0.0063	0.0288*	-0.0132	-0.0106	-0.0236	0.0138	0.0162	0.0501*	-0.0140	-0.0010	-0.0069	0.0189	1.0000					
		0.0001	0.0358	0.7226	0.6840	0.0626	0.4311	0.4929	0.1276	0.3714	0.2962	0.0012	0.3739	0.9471	0.6740	0.2210						
Remittance costs (500 $)	17	-0.4150*	-0.2286*	-0.2009*	-0.3342*	-0.1737*	0.1096*	0.3551*	-0.1764*	-0.1501*	0.0855*	-0.3871*	-0.1092*	-0.0267	-0.1019*	-0.0350	0.0032	1.0000				
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.2590	0.0000	0.1325	0.8898					
Private investment ratio to GDP	18	-0.0138	-0.0038	-0.0035	0.0587*	0.0111	-0.0438*	0.0551*	0.1042*	-0.0294*	-0.0183	-0.0136	0.1031*	-0.0551*	-0.1390*	0.1993*	0.0366*	0.0438*	1.0000			
		0.4118	0.8191	0.8341	0.0005	0.5098	0.0132	0.0010	0.0000	0.0800	0.2774	0.4190	0.0000	0.0012	0.0000	0.0000	0.0296	0.0784				
Public spending on heath per capita	19	0.0020	-0.0014	-0.0475*	0.0087	-0.0189	-0.0155	-0.0562*	0.0946*	0.0350*	-0.1158*	0.0041	0.0561*	-0.0163	-0.0117	0.0582*	0.0023	0.0022	0.0173	1.0000		
		0.8992	0.9323	0.0030	0.5854	0.2372	0.3673	0.0004	0.0000	0.0287	0.0000	0.7966	0.0005	0.3153	0.4843	0.0003	0.8882	0.9250	0.3191			
Public spending on education per capita	20	0.0810*	0.0955*	-0.4030*	0.0782*	-0.1093*	0.0540*	0.1181*	0.7490*	0.3511*	0.0842*	0.0176	0.6102*	-0.0484*	-0.0831*	-0.2202*	-0.0278	-0.0132	0.0296	0.1019*	1.0000	
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0057	0.0000	0.0000	0.0000	0.0000	0.3394	0.0000	0.0095	0.0000	0.0000	0.1319	0.6158	0.1341	0.0000		
Public health and education spending per capita	21	0.1367*	0.1472*	-0.3493*	0.1367*	-0.0738*	0.0646*	0.0787*	0.7675*	0.3907*	0.0367*	0.0439*	0.6483*	-0.0830*	-0.0206	-0.2370*	-0.0341*	-0.0850*	-0.0116	0.1245*	0.8862*	1.0000
		0.0000	0.0000	0.0000	0.0000	0.0001	0.0011	0.0000	0.0000	0.0000	0.0499	0.0189	0.0000	0.0000	0.2912	0.0000	0.0682	0.0013	0.5615	0.0000	0.0000	

Source: authors

Annex 4. Variable Definitions and Sources

Variable	Definition	Source
Remittances	Sum of personal transfers and compensation of employees in millions USD/Local Currency.	Central Banks and National institutes of Statistics (Kpodar et al., 2023)
Domestic uncertainty index	Index calculated as the number of occurrences of the word uncertainty and its equivalents over the total number of words in the Economist Intelligence Unit (EIU) report	Ahir and Furceri (2022)
Foreign uncertainty index	Weighted average of the uncertainty index of all host countries with the weight being the host country's share of total migrants	Authors' calculations using Ahir and Fuceri (2022) database, World Development Indicators (WDI) and World Bank bilateral migrant stock data.
Foreign GDP per capita (log)	Weighted average of GDP per capita of all host countries (in log) with the weight being the host country's share of total migrants	
Foreign GDP growth	Weighted average of annual GDP growth rate of all host countries with the weight being the host country's share of total migrants	
Exchange rate volatility	Standard deviation of domestic currency per U.S. Dollar (log)	Authors' calculations using the International Financial Statistics (IFS)
Total migrant stock (log)	Total migrant stock of the receiving country in millions (in log)	World Bank
Remittances costs (500 $)	Transaction cost (in percent of a $500 remittance, log) for the home country	
Financial institutions access index	Financial Access Index calculated using the number of bank branches and ATMs per 100,000 adults. The index ranges from 0 to 1.	International Monetary Fund (IMF)
Monetary policy rate	Quarterly average of the main monetary policy rate of the Central Bank of the receiving country	International Financial Statistics (IFS)
Private investment ratio to GDP	Private gross fixed capital formation, current prices (% GDP)	World Economic Outlook (WEO) database
GDP per capita (log)	GDP per capita (constant 2010 US$) in log	World Development Indicators (WDI)
Real GDP growth	Annual GDP growth rate	
Inflation	Annual percentage change in the consumer price index.	
Public spending on heath per capita	Current government health expenditure per capita (current US$) in the receiving country	
Public spending on education per capita	Government expenditure on education per capita in receiving country	
Legislative elections	Dummy variable equal to 1 for the period of legislative elections and zero otherwise.	Database of Political Institutions (DPI2020)
Presidential elections	Dummy variable equal to 1 for the period of presidential elections and zero otherwise.	
Bilateral export	Bilateral export of goods (in thousands current US$)	Direction of Trade and Statistics (DOTS), IMF

Source: authors

Annex 5. Stationarity tests: Maddala and Wu (1999)

Variable	Level		First difference		Conclusion
	Chi2 Stat.	Prob. > Chi2	Chi2 Stat.	Prob. > Chi2	
Remittances (log)	348.627	0.000			I(0)
Remittances per migrant (log)	352.677	0.000			I(0)
Remittances to GDP (log)	550.842	0.000			I(0)
Remittances per capita (log)	420.283	0.000			I(0)
Remittances per migrant as a share of income per capita of the host economy (log)	444.437	0.000			I(0)
Domestic uncertainty index	2,951.879	0.000			I(0)
Foreign uncertainty index	2,175.163	0.000			I(0)
GDP per capita (log)	277.864	0.999	11,639.629	0.000	I(1)
Foreign GDP per capita (log)	231.969	1.000	11,098.391	0.000	I(1)
Exchange rate volatility	5,587.854	0.000			I(0)
Total migrant stock (log)	166.863	1.000	10,260.483	0.000	I(1)
Financial institutions access index	225.1843	1.000	9,427.435	0.000	I(1)
Inflation	1846.77	0.000			I(0)
Monetary policy rate	1,176.934	0.000			I(0)
Real GDP growth	2,184.565	0.000			I(0)
Foreign GDP growth	3,070.572	0.000			I(0)
Remittances costs (500 $)	542.497	0.000			I(0)
Private investment ratio to GDP	524.845	0.000			I(0)
Public spending on heath per capita	224.890	1.000	7,225.490	0.000	I(1)
Public spending on education per capita	115.250	1.000	4,962.610	0.000	I(1)

Source: authors

PUBLICATIONS