Risk Sharing through Remittances: Evidence from Developing Countries[1]

Abstract

The sending of remittances is a decentralised decision of migrant workers, nevertheless it has its macroeconomic implication in providing insurance against domestic output shocks in the recipient economies – a phenomenon known in literature as *risk sharing*. Using a large sample of 86 developing countries for the period 1990–2010, we establish that remittance inflows serve as an important channel through which risk sharing takes place in the developing world. Although the extent of risk sharing on average stands at 3.3%, there is substantial cross-country variation found in our sample, ranging from 38% for Tajikistan to -13% for Haiti. Subsequently, we explore why the extent of risk sharing through remittances is so diverse across developing countries. The diversification of migrants turns out to be the leading explanation for the extent of risk sharing via remittances: the more diverse the migration destinations of a country, higher will be the amount of risk shared. In addition, the size of remittance flows appears to have a strong and statistically significant impact on enhancing risk sharing. We also find suggestive evidence that remittances originating from more distant countries facilitate more risk sharing compared to those originating from neighbouring or regional economies. Even after splitting the sample on the basis of country characteristics, our results remain robust.

JEL classification: F15; F22; F24; F41

Keywords: Diversification; International migration; Remittances; Risk sharing

[1] We thank Jeffrey Frankel of Harvard University and Marta Ruiz-Arranz of the International Monetary Fund (IMF) for kindly sharing their data resources with us. All errors in this paper belong to us.

1 Introduction

Remittance flows represent an important source of external financing for many developing countries. In the past two decades, remittance flows to developing economies exhibit a tenfold increase − from US$ 31 billion in 1990 to US$ 332 billion in 2010 (Ratha et al. 2010) − constituting the second largest source of foreign capital after foreign direct investment (FDI). In addition, unlike FDI and private capital flows which decline sharply during the recent global financial crisis, remittances are found to be resilient and relatively less volatile compared to other external flows (Figure 1).[2] Unarguably, the sheer size and stable pattern of remittance flows make them economically vital for many countries in the developing world.

With the growing importance of remittance flows, an increasing number of researchers have simultaneously examined the macroeconomic implications of remittances on recipient economies. Towards this end, recent cross-country evidence has established that remittances impact economic growth (Chami et al. 2003, 2008; World Bank 2005; Jongwanich 2007; Ramirez and Sharma 2008; Barajas et al. 2009; Catrinescu et al. 2009; Giuliano and Ruiz-Arranz 2009), output volatility (Spatafora 2005; Chami et al. 2009; Bugamelli and Paternò 2011; Ebeke and Combes 2013), the severity of poverty (Adams and Page 2005; Jongwanich 2007; Goff 2010), consumption instability (Spatafora 2005; Combes and Ebeke 2011), exchange rate movements (Amuedo-Dorantes and Pozo 2004; Lopez et al. 2007; Barajas et al. 2010), financial sector development (Giuliano and Ruiz-Arranz 2009; Mundaca 2009; Aggarwal et al. 2011), institutional quality (Catrinescu et al. 2009; Abdih et al. 2012b) and other related macroeconomic indicators of the recipient economies.

The underlying role of remittances as investigated in the aforementioned research hinges on the cyclical characteristics of these flows over the business cycle − whether remittances move procyclically or countercyclically with respect to the output of the recipient economy. The conventional wisdom suggests that remittances should move countercyclically with the output, so as to compensate for the lost income of family members owing to economic downturn back home. On the contrary, the procyclical patterns of remittances may

[2] Foreign direct investment (FDI) and private debt and equity flows witness a decline of around 40%, compared to an almost 6% drop in remittance flows to developing countries in 2009 (Ratha and Silwal 2012).

further aggravate macroeconomic fluctuations through transmission of shocks from the host to the recipient country.[3]

On the specific question of cyclicality of remittances, there is a growing evidence that largely point towards countercyclicality (or low procyclicality) of remittance flows.[4] To cite few examples: Spatafora (2005) documents a negative relationship between remittances and domestic output in a panel of 87 countries during the period 1980–2003. Frankel (2011), using a large bilateral dataset on remittances, confirms that remittances are countercyclical with respect to the receiving country and procyclical with respect to the sending country. By contrast, in a sample of 12 low and lower-middle income countries, Sayan (2006) finds procyclical as well as acyclical movements in case of some individual countries; nevertheless, the full sample exhibits a countercyclical pattern. Similarly, Chami et al. (2008) calculate a negative correlation of –0.08 between remittances and real GDP per capita for 88 countries; out of which, 38 countries show positive correlations individually, while the remaining 50 countries show negative correlations. Although recent cross-country research has shown keen interest in exploring the cyclical pattern of remittances, it largely ignores its associated implication in terms of providing insurance against domestic output shocks in the recipient economies ─ a phenomenon commonly referred in literature as *risk sharing*.[5] Specifically, countercyclical remittance flows may contribute to the recipient economy by insulating its aggregate (country-level) income and eventually consumption from domestic output fluctuations.

The risk sharing hypothesis is of importance, since it is argued that excessive consumption fluctuations that are transmitted through output shocks can have adverse implications for the accumulation of human and physical capital (Athanasoulis and van Wincoop 2000; Pallage and Robe 2003). Moreover, countries are found to reap large welfare gains from risk sharing which in some cases may exceed 100% of permanent consumption

[3] For example, the 1990–91 conflict in the Middle East adversely impacts those economies that are dependent on remittances from the region, such as Pakistan and Bangladesh. In a comprehensive study of Middle Eastern, North African and Central Asian economies, Abdih et al. (2012a) conclude that shocks are generally transmitted through remittances to the fiscal balances (i.e. tax receipts) of the recipient economies.

[4] While cross-country studies are few, there is an abundant research from microeconomic perspective (wherein the basic unit of analysis is either the individual or household) that predominantly agree that remittances positively insure individuals against shocks associated with business cycles, natural disasters and civil wars (see for example, Quartey and Blankson 2004; Azam and Gubert 2005; Adams 2006; Gubert 2002).

[5] See, Lewis (1999), Kose et al. (2007) and Islamaj (2012) for extensive surveys of the risk sharing literature. Following the literature, we use the terms *risk sharing* and *smoothing* interchangeably throughout this paper.

(Obstfeld 1994; van Wincoop 1994). Researchers have also documented that improved risk sharing enhances economic efficiency by exploiting the potential gains associated with industrial specialization and economies of scale (Kalemli-Ozcan et al. 2003). Another motivation for exploring the risk sharing potential of remittances is that if they are found to be effective in smoothing output shocks then, in view of the optimum currency area (OCA) theory (Mundell 1973), remittances may be considered as an alternative channel through which prospective member countries of a currency/monetary union can absorb their asymmetric shocks, thereby satisfying the criterion for establishing a union.

It is therefore surprising that empirical studies have often overlooked this crucial aspect of remittance flows, resulting in the scant evidence in research concerning the impact of remittances on risk sharing.[6] For instance, amongst the few studies documenting the role of remittances in facilitation risk sharing, Balli and Ozer-Balli (2011), while examining various other risk sharing channels for Pacific Island countries, show that remittances provide substantial risk sharing (absorbing 19% of domestic output shocks) during the period 2001–2007. In another paper on Middle Eastern and North African (MENA) countries, Balli et al. (2012) find considerable role of remittances in insulating domestic output shocks, particularly in the less developed countries in their sample. Similarly, in a group of 117 developing countries, Hadzi-Vaskov (2006) estimates that countries with above-average remittance flows attain higher levels of consumption risk sharing compared to other sample countries. Apart from the limited time period of analysis (i.e.1990–2000), this study does not endeavour to answer why the extent of risk sharing through remittances is so diverse across groups of developing countries.

Given the limited research in the area and the exceedingly important role remittances play in the overall macroeconomic stabilization of developing economies, it is imperative to explore the risk sharing potential of remittances. This study is a contribution towards this end. In a sample of 86 developing countries over the period 1990–2010, we first measure the extent of risk sharing via remittances for each country in our sample. Following the literature, our risk sharing measure represents the percentage of idiosyncratic output risk buffered

[6] At the household level, remittances are found to provide *ex ante* as well as *ex post* consumption smoothing (Combes and Ebeke 2011). Remittances may offer *ex ante* insurance, as found in the case of some African countries where the remittance-receiving households, instead of auctioning productive assets, utilize their cash holdings during the crisis period. Likewise, an increase in remittances to households when they are unemployed or when the recipient economy is in recession may serve as an *ex post* risk sharing arrangement.

through remittance inflows compared to perfect risk sharing, and ranges from zero (no risk sharing) to 100% (perfect risk sharing).[7] By employing this measure, our results suggest that there is substantial cross-country variation in the estimated degree of risk sharing, ranging from Tajikistan (38%) to Haiti (-13%). As a next logical step, we explore why some developing countries are able to share more risk through remittances compared to others.

First and foremost, we establish that diversification of emigrants is a leading explanation for the extent of risk sharing via remittances: the more diverse the migration destinations of a country, higher will be the amount of risk shared. To the best of our knowledge, we are not aware of any paper that has empirically studied the role of migrant diversification. From a risk sharing perspective, more diverse destinations may ensure that remittances are coming from the regions that have less synchronized business cycles, thereby generating aggregate flows that are more countercyclical vis-à-vis the recipient economy than the ones solely originating from a particular region. Our results also support the factual position for some typical remittance-receiving countries such as Philippines, Turkey and Haiti. Philippines which has a well-diversified migrant population in the United States (US), Gulf Cooperation Council (GCC) and Europe, absorb around 15% of output shocks according to our estimate; whereas, Turkey with nearly two-thirds of migrant workers employed in Germany, and Haiti with around half of migrants in the US, exhibit negative smoothing to the magnitude of –8% and –13% respectively.

Second, we address the issue of whether or not large remittance flows (as a ratio to GDP) tend to facilitate more risk sharing. Here, we document that the size of remittance flows appears to have a strong and statistically significant impact towards enhancing risk sharing. Third, we obtain intuitive findings that remittances originating from farther countries facilitate more risk sharing compared to those originating from neighbouring countries. This is expected since business cycles are typically more synchronized among regional and neighbouring economies, causing remittances to behave procyclicaly vis-à-vis domestic output, thereby resulting in less smoothing or even dis-smoothing of output shocks. In other words, our finding that remittance inflows from less distant or regional countries do not enhance smoothing, is consistent with international business cycle literature, which has shown that countries which share the same border or region exhibit higher business cycle

[7] The risk sharing estimate may take a negative value that reflects dis-smoothing of shocks.

correlations, referred to as the border effect (Clark and van Wincoop 2001; Massmann and Mitchell 2004; Martincus and Molinari 2007; Montoya and de Haan 2008).

Finally, we are not able to observe any prominent role that financial openness, financial sector development and institutional quality, perform to enhance risk sharing capabilities of the recipient economy. Employing both cross-section and panel estimations, splitting the samples and dropping the outliers, reveal that our main findings regarding the effect of diversification of migrants and the size of remittances on risk sharing remain unaffected.

The rest of this paper is organized as follows. In Section 2, we present the underlying theory of risk sharing that is used to specify the empirical model. Section 3 describes the construction of the variables and the data sources, while the estimation findings are discussed in detail in Section 4. Finally, Section 5 concludes this paper.

2 The empirical model

2.1 Theory of risk sharing

The underlying theory of risk sharing suggests that under complete financial markets, consumption of individuals with identical preferences should not respond to idiosyncratic output shocks but should strongly commove with aggregate consumption (Diamond 1967; Wilson 1968; Cochrane 1991; Mace 1991). By the same analogy, the standard open macroeconomic models (Obstfeld and Rogoff 1996; Lewis 1996) show that in the presence of trade in goods and financial assets, a country's consumption should be less correlated with domestic output and highly correlated with world consumption. These models predict that in a perfect risk sharing scenario (the complete markets model), a country should be able to completely detach consumption from domestic output fluctuations.

To validate these theoretical predictions, there is an abundant empirical literature that examines the perfect risk sharing conjecture (e.g., Obstfeld 1994; Stockman and Tesar 1995; Baxter and Crucini 1995; Lewis 1996). The consensus from this vast literature indicates that there is only a weak presence of risk sharing among countries, which is far from perfect and not consistent with the predictions of standard theory (Kose et al. 2007; Islamaj 2012). The leading explanations offered for this low level of risk sharing include the presence of non-traded goods, incomplete financial markets and high transactions costs.

Although perfect risk sharing is not supported by the data, it remains important to quantify the operative channels through which (partial) risk sharing takes place. In particular, there is a need to first identify the specific channels through which risk is shared and then quantify the extent of risk shared through each channel. This has not been possible until the path-breaking work of Asdrubali et al. (1996) that propose a method to quantify the relative contributions of risk sharing channels in the US. Extending the framework of Asdrubali et al. (1996) in a cross-country context, Sørensen and Yosha (1998) empirically explore the risk sharing patterns among the European Union (EU) and OECD countries. Their method builds on decomposing the cross-sectional variance of Gross Domestic Product (GDP) into various components, representing the incremental amount of smoothing achieved through factor income flows, capital depreciation, international transfers and savings.[8] This decomposition approach is simply based on standard national account identities: Gross National Income (GNI) = Gross Domestic Product (GDP) + net factor income, National Income (NI) = Gross National Income (GNI) ─ capital depreciation, Disposable National Income (DNI) = National Income (NI) + international transfers, and, Consumption (C) = Disposable National Income (DNI) ─ savings.

A strand of research later emerges from the aforementioned influential studies, which aimed at quantifying the channels of international risk sharing among selected groups of countries (e.g., Kim et al. 2006; Kim and Sheen 2007; Demyanyk et al. 2008; Balli and Ozer-Balli 2011; Tapsoba 2010; Yehoue 2011; Jeanneney and Tapsoba 2012). Employing Sørensen and Yosha (1998)'s methodology, these studies measure the fraction of shocks to GDP absorbed through each channel, namely factor income flows[9], international transfers and savings channels. A survey of this literature reveals that the bulk of smoothing is typically achieved through savings and factor income flows, while international transfers remain dormant. International transfers, which mainly constitute remittances (and foreign aid)

[8] For full details on the methodology, see the original papers of Asdrubali et al. (1996), and Sørensen and Yosha (1998).

[9] Among the various channels derived by Sørensen and Yosha (1998), risk sharing via factor income flows primarily occurs through cross-border ownership of assets. An economy would be better placed to sever connections between its income and output fluctuations when it is involved in substantial cross-border financial transactions globally. Since these cross-border financial flows are well recorded in the net factor income account, empirical research attempt to quantify income risk sharing by employing the net factor income channel (some notable contributions include, Lane (2001), Sørensen et al. (2007), Demyanyk et al. (2008) and Volosovych (2013)).

directly affect disposable income and eventually consumption.[10] Since the strand of research exploring the risk sharing channels has predominantly focussed on developed economies, the potential insurance role of remittances that are economically vital for many developing countries remain relatively unknown. It is therefore interesting to assess whether remittances serve as a potential hedge against domestic output shocks in developing countries. In the next section, we outline the empirical specification to measure the extent of income smoothing through remittances.

2.2 Risk sharing via remittances

Remittances are able to provide insurance against domestic output shocks when a country in recession receives higher remittances from migrant workers and vice versa. In other words, countercyclical patterns of remittance inflows facilitate in smoothing of output shocks. We follow the regression model of Balli and Ozer-Balli (2011) and Balli et al. (2012) to quantify the degree of risk sharing through remittances.[11] Their regression examines whether domestic income plus remittance inflows (which can be considered as the "total income" available before other channels of risk sharing take place) varies less than one-to-one with output. To put this simply, we propose a new identity ($gdprem$) which represents the sum of domestic income (gdp) and remittance inflows (wr) i.e. $gdprem = gdp + wr$. Employing this identity to measure income risk sharing via remittances, we run the following regression:

$$\widetilde{gdp_{it}} - \widetilde{gdprem_{it}} = \alpha_{it} + \beta_i \widetilde{gdp_{it}} + \varepsilon_{it}, \quad (1)$$

where $\widetilde{gdp_{it}}$ represents the idiosyncratic part of output calculated as the real gdp per capita growth rate of country *i* in period *t* minus the world real per capita gdp growth.[12] Similarly, based on the $gdprem$ identity, $\widetilde{gdprem_{it}}$ represents the idiosyncratic part of output calculated as the real $gdprem$ per capita growth rate of country *i* in period *t* minus the world real per capita $gdprem$ growth.[13] The coefficient $\widehat{\beta_i}$ directly quantifies the fraction of idiosyncratic risk to country *i*'s gdp insured through remittance inflows compared to full (perfect) risk sharing. Full risk sharing implies that idiosyncratic shocks to gdp and $gdprem$

[10] Jeanneney and Tapsoba (2012) study the stabilizing role of aid inflows in recipient economies and estimate that about 14–19% of output shocks are smoothed out through aid inflows.

[11] Their empirical specification is based on Asdrubali et al. (1996) and Sørensen and Yosha (1998).

[12] Following the empirical literature, the world real per capita gdp aggregate is calculated by the representative sample of 23 high-income OECD countries that reflect more than 80% of global output (Volosovych 2013).

[13] Here $\widetilde{gdprem_{it}}$ is equal to $gdprem_{it}$ minus $gdprem_{wt}$, where $gdprem_{wt}$ is the world-wide aggregate of the $gdprem$ identity.

are uncorrelated, thereby generating a coefficient of zero in the regression; accordingly $\widehat{\beta_i}$ approaches to 1 (or 100%, when multiplied by 100). Similarly, if gdp and $gdprem$ are perfectly correlated, we expect a coefficient of $\widehat{\beta_i}$ approaching to 0, thus indicating non-smoothing of output shocks. In case when idiosyncratic $gdprem$ reacts more than one-to-one to idiosyncratic gdp, $\widehat{\beta_i}$ may turn out to be negative, pointing towards dis-smoothing of shocks.

The Equation 1 represents individual country time series regressions. In other words, we run this model for each country's observations and derive an estimate ($\widehat{\beta_i}$), which is considered to be the extent of income risk sharing through remittances. Each time series regression is estimated via Feasible Generalized Least Squares (Prais–Winsten estimation method) to adjust for the serial correlation among the error terms.[14] Sørensen and Yosha (1998) employ somewhat similar risk sharing equations on cross-section estimations and obtain the idiosyncratic component (i.e. the deviation of a country's growth rate from the aggregate growth rate) by removing the time-fixed effect. In this paper, we remove the aggregate effect by subtracting the world-wide growth rates of each identity. We deduct the aggregate component from the growth rates as the world fluctuations cannot be eliminated by the sharing of risk.

After quantifying the amount of risk insured by individual countries, we further look for the determinants of the estimate of risk sharing via remittances by regressing the estimated extent of risk sharing ($\widehat{\beta_i}$) on several potential determinants. To begin with, cross-sectional specification is employed that enables us to empirically examine those variables that have missing information for some years and those that exhibit little time variation. As this study is at the crossroads of remittance and risk sharing research, we survey both these strands of research and shortlist some important indicators that may possibly determine the magnitude of smoothing via remittances.

To facilitate smoothing, remittances should originate from those countries that have lower business cycle synchronization with respect to the receiving country, since smoothing

[14] The Feasible Generalized Least Squares (FGLS) approach is asymptotically more efficient than the ordinary least squares (OLS) method when the autoregressive order 1 (AR(1)) exists. The FGLS estimation of the AR(1) model has two different names, originating from different methods estimating "ρ". We used the Prais–Winsten estimation, since we have a smaller time series sample and do not afford to lose a single observation.

occurs when remittances and the recipient economy move countercyclically.[15] For this reason, the smoothing property of remittances might hinge on some relevant features of the emigrants, remittance-sending countries and the size of remittances. Geographical dispersion of migrants increases the probability of countercyclical remittance receipts as opposed to remittances originating from only a few destinations. The size of remittance inflows may also effectively determine the magnitude of smoothing via remittances. Furthermore, as neighbouring countries are often found to display higher business cycle synchronization, remittances from distant countries may tend to be more stabilizing. Here we report the model and label the explanatory variables, while the underlying reasoning for employing these variables is discussed in detail in Section 4.2. The following cross-section regression equation is estimated:

$$\widehat{\beta_i} = \gamma_0 + \gamma_1 DIV_i + \gamma_2 REM_i + \gamma_3 DIST_i + \gamma_4 CONT_i + \gamma_5 OECD_i + \gamma_6 X_i + \varepsilon_i, \qquad (2)$$

where γ_0 is the constant and all the explanatory variables are averaged across time for each country i. DIV_i represents the migrant diversification index that captures the extent of diversification of emigrants of each country. REM_i, the proxy for the size of remittances, is measured as remittance inflows to GDP ratio. $DIST_i$ refers to the distantness variable, which is the proxy capturing information frictions and remoteness, and is commonly used in gravity models in the trade and international capital flows literature. $CONT_i$ reflects the share of remittances that originate from countries from the same continent as the recipient country. Similarly, $OECD_i$ is a variable that indicates the share of remittances coming from developed (OECD) economies. Finally, X_i contains control variables that include the logarithmic values of the real GDP representing the size of the economy, and the logarithmic values of the number of migrants indicating the stock of migrants. The construction of the aforementioned variables, along with the data sources, is discussed in detail in the next section.

Finally, in order to take advantage of both the time series and cross-sectional dimensions of the data, we follow Mélitz and Zumer (1999) and Sørensen et al. (2007) to estimate the panel equation:

[15] As mentioned earlier, in a situation where the host and recipient economies are going through recession phase at the same time, smoothing would not occur since it would be hard for migrant workers to support family members facing similar financial conditions back home (Sayan 2006; Frankel 2011).

$$\widetilde{gdp_{it}} - \widetilde{gdprem_{it}} = v_{it} + \beta_0 \widetilde{gdp_{it}} + \beta_1 \widetilde{gdp_{it}} * (DIV_{it} - \overline{DIV_t}) + \beta_2 \widetilde{gdp_{it}} * (REM_{it} - \overline{REM_t}) + \beta_3 \widetilde{gdp_{it}} * (t - \bar{t}) + \varepsilon_{it}, \quad (3)$$

where v_{it} captures the time-fixed effect, while $\widetilde{gdp_{it}}$ and $\widetilde{gdprem_{it}}$ are the same as defined earlier in Equation 1. The coefficient $\widehat{\beta_0}$ represents the average risk sharing via remittances for the sample period 1990–2010. The estimates of β_1 and β_2 measure the impact of the migrant diversification index and the size of remittances on the extent of risk sharing through remittances, respectively. Time trend $t - \bar{t}$ captures the trend changes in risk sharing that are not directly caused by remittances. The explanatory variables (i.e. DIV, REM and time trend) are demeaned in order to clear the cross-section effect. Accordingly the time fixed variables (i.e. $DIST, CONT$ and $OECD$) are removed from the panel analysis.

Following Sørensen and Yosha (1998), we estimate Equation 3 by using a two-step Generalized Least Squares (GLS) procedure. To take into account autocorrelation in the residuals, we assume that the error terms in each equation/country follow an AR (1) process. We restrict the autocorrelation parameter to be identical across countries and equations due to the short sample period. Additionally we allow for country-specific variances of the error terms. The GLS regression involves the following steps: first, the entire panel is estimated using ordinary least squares (which is equivalent to a seemingly unrelated regression type equation, since the model contains identical regressors); second, residuals from the first step are used to estimate variance for each country and corrected for heteroskedasticity (Balli et al. 2011).

3 Data and descriptive statistics

We obtain the data from various sources.[16] The remittance inflows data is obtained from the World Development Indicators (WDI) database.[17] We use the narrow definition of remittances that best reflects remittance behaviour (Chami et al. 2008), which is categorised as *workers' remittances* in the database.[18] The WDI database provides the remittance data in

[16] For construction of the variables and data sources, see Appendix A.

[17] For a few missing observations, we have extracted the data from the Migration and Remittances Unit, the World Bank and Frankel (2011). We do not use net data on remittances because, firstly, it is not available for most of the developing countries and, secondly, the data on remittance outflows is known to be less reliable than that on inflows (Hadzi-Vaskov 2006).

[18] The broad definition considers remittances as the sum of workers' remittances, compensation of employees and migrants' transfers. By definition, *workers' remittances* reflect "current transfers by migrants who are employed in new economies and considered residents there"; *compensation of employees* covers "wages,

US$ for a long period of time. Our sample consists of 86 developing countries, nearly all of which have remittances to GDP ratio of 1% or more, on average.[19] The period of analysis is from 1990 to 2010, since there is a strong likelihood of negligible risk sharing (via remittances) prior to 1990, as remittance inflows to the developing world remain stagnant at low levels during this period (see Figure 1).[20] We obtain the GDP, consumer price index (CPI) and population data for each country from the International Monetary Fund's International Financial Statistics (IFS) database. In order to convert all variables into a uniform currency, we use the annual exchange rates for national currency per US$ from IFS as well.

For the purpose of quantifying the extent of the diversification of emigrants for each sample country, data on bilateral migrant stocks is extracted from the Global Bilateral Migration Database (GBMD) of the World Bank. This data is essentially based on the foreign-born definition of migrants and comprises of five census rounds between 1960 and 2000. Despite the limited time period of analysis, this database contains the most comprehensive and reliable data on bilateral global migration to date.[21] Obtaining the migration data on bilateral basis, we construct a diversification index (DIV_i), similar to the one proposed by Balli et al. (2011), as follows:

$$DIV_i = \frac{1}{\sum_{j=1}^{N} \left| \left(\theta_{ij} - \theta_{ij}^{max} \right) \right|}, \tag{4}$$

where θ_{ij} is the ratio of migrants originating from country *i* working in country *j* over the total number of migrants of country *i*; θ_{ij}^{max} is the highest ratio among all θ_{ij} and *N* is the total number of countries where the emigrants of country *i* are distributed. A higher value of the index implies a higher diversification of migrants across the globe.

---

salaries, and other benefits earned by individuals—in economies other than those in which they are residents—for work performed for and paid for by residents of those economies"; and, *migrants' transfers* refer to "contra-entries to the flow of goods and changes in financial items that arise from the migration of individuals from one economy to another." (Reinke 2007, p. 2). More specifically, transfers by workers who stay less than one year are categorised under compensation of employees, while transfers by those workers who stay for a year or longer are considered residents and are categorised as workers' remittances. For a discussion of the definitions and issues related to compilation of data on remittances, see Reinke (2007) and Chami et al. (2008).

[19] However, there are few exceptions such as China, which is included as it is among the top remittance receiving countries in *nominal* terms: China has been the second highest recipient of remittances (in dollar terms) after India in recent years (Ratha and Silwal 2012). For a complete list of sample countries, see Appendix A.

[20] In addition, the time period is chosen owing to the unavailability of remittance data prior to 1990 for some countries in our sample.

[21] For a detailed discussion on the Global Bilateral Migration Database (GBMD), see Özden et al. (2011).

Following Kalemli-Ozcan *et al.* (2003), Alfaro *et al.* (2008) and Volosovych (2013), we construct a distantness variable, which is the weighted average of the distance in thousands of kilometres from the capital city of a particular country to the capital cities of other countries using the total GDP shares of the other countries as weights.[22] We obtain the bilateral distance between the capital cities from the French Research Center in International Economics (CEPII). The distantness variable ($DIST_i$) is expressed as:

$$DIST_i = \frac{1}{T}\sum_{t=1}^{T}\sum_j \frac{d_{ij}gdp_j^t}{gdp^t}, \quad (5)$$

where d_{ij} is the distance from the capital city of country i to the capital city of country j, $gdp^t$is the group-wide GDP and T is the total sample length.

Bilateral remittance data is required to compute the shares of remittance inflows originating from OECD countries[23] ($OECD_i$) and from countries belonging to the same continent ($CONT_i$). There is a scarcity of bilateral data which is only available for a few years for our sample countries.[24] We combine various data sources that include Ratha and Shaw (2007), Jiménez-Martín et al. (2007), Lueth and Ruiz-Arranz (2008) and Frankel (2011), to obtain the maximum number of observations. In addition to these sources, we have obtained bilateral remittance data from the Migration and Remittances Unit of the World Bank and the web pages of some central banks.[25]

The descriptive statistics for the variables of main interest are presented in Table 1. There is a considerable variation in the estimate of risk sharing ($\widehat{\beta}_i$) which has a standard deviation of 8%, with a maximum value of 38% for Tajikistan and a minimum value of –13% for Haiti. The average score of the migrant diversification index is 2.96 with the range from 7.44 for Syria and 1.09 for Nepal. While the sample countries bear an average remittance to GDP ratio of 5%, for some countries such as Lesotho this ratio is as high as 29%, and for few

[22] As indicated in Alfaro et al. (2008) and Volosovych (2013), this variable is not a direct measure for distance because of using the GDP shares as weights: out of two equally distant countries, the one which has a comparatively smaller economy would display a higher value.
[23] For a complete list of OECD countries, see Appendix A.
[24] Owing to data limitations, we are able to compute approximate values for these indicators. These proxies are used in cross-section estimations since they are anticipated to remain invariant over time and are averaged for the purpose of estimation.
[25] The various data sources are cross-examined to ensure that a consistent definition of remittances is followed in calculating these shares.

others such as China it is close to 0%. Based on our distantness measure, countries belonging to East Asia and Pacific region are found to be more distant then the rest of the sample, while countries belonging to Europe and Central Asia are generally least remote: Tonga is the farthest in our sample with a value of 9.45, whereas Poland is least distant with a value of 8.16.

As expected a large share (55%) of remittance inflows to sample countries originate from OECD group (fifth row of Table 1). Guinea-Bissau is most heavily dependent with 94% of remittances coming from developed economies. Furthermore, on average 58% of remittances are received from those countries that belong to the same continent as the recipient country. Latin American countries typically have a high share of remittances originating from the same continent. Nicaragua is at the top of the list with 98% of remittances originating from same continent, while Philippines and Cambodia witness negligible share of remittances in this regard (sixth row of Table 1).

Prior to running regressions, we draw scatter plots (Figures 2–5) to examine the possible relationship between the dependent variable (i.e. risk sharing estimate) and other explanatory variables. Figure 2 suggests that there is a positive association between risk sharing estimate and migrant diversification index, indicating that countries with more diverse migrants tend to share more risk via remittances. Similar positive correlation is found in case of risk sharing estimate vis-à-vis remittance to GDP ratio (Figure 3), while the other variables also display the expected behavior which we discuss in detail in the next section.

4 Empirical results

4.1 Individual countries estimates of risk sharing via remittances

Table 2 reports the individual regression estimations ($\widehat{\beta_i}$) for Equation 1. Out of 86 developing countries, 58 countries exhibit a positive degree of risk sharing through remittances, while 28 countries report a negative estimate as we do not impose any restriction on the sign of the β-coeffecients. As reported earlier, the extent of risk sharing via remittances stands at 3.3% on average , with a range from 38% for Tajikistan to –13% for Haiti.

At first glance, Table 2 displays mixed patterns of the estimate ($\widehat{\beta_i}$) for countries belonging to a particular region; nonetheless, deeper examination reveals some common trends that warrant discussion. Almost all countries in the East Asia and Pacific region show positive risk sharing. This finding supports Balli and Ozer-Balli (2011), who found a significant amount of risk sharing via remittances for Pacific Island countries during recent years (2001–2007).

Among Latin America and Caribbean countries, we mostly observe dis-smoothing.[26] Since remittance inflows to the region largely originate from North America, possible explanations for negative risk sharing are the less diversification of migrant destinations and a highly correlated business cycle with the US (as documented by Ratha et al. 2010); resulting in procyclical movement of remittances with regards to recipient economies.[27] To clarify this with an example, as remittances are known to move in a procyclical fashion with the output of the host country (Sayan 2006; Frankel 2011; Chami et al. 2008), at times of economic crisis in the US, it may become challenging for a Bolivian worker employed in the US to support his/her family members facing the same economic conditions back home. This is also apparent in Figure 6, which shows that countries which receive relatively lesser share of remittances from North America witness higher risk sharing (e.g., Ecuador and Colombia), compared to others (e.g., El Salvador, Guatemala, Haiti and Honduras). Among other regions, Middle East and North African (MENA) countries smooth on average 4.5% of domestic output shocks through remittances, comparable to what has been estimated by Balli et al. (2012) for a similar group of MENA countries.[28]

The Europe and Central Asia group mostly comprises of transition economies, some of which particularly those that belong to Commonwealth of Independent States (CIS) realize a substantially large estimate for smoothing. For instance, Tajikistan stands at the top of the list in our sample with 38% of the domestic output shocks being absorbed through remittances. Apart from other factors, we conjecture that this is possibly an outcome of large

[26] Ten out of seventeen countries belonging to Latin America and Caribbean region show negative risk sharing, resulting in the average smoothing of around –1% for the whole region. This extent of risk sharing is considerably lower compared to the average smoothing of 3.3% for the whole sample.

[27] Among other factors, the procyclical behaviour of remittances is generally an outcome of the investment motive being dominant over the smoothing motive.

[28] For the period 1992–2009, Balli et al. (2012) estimate that about 6% of output shocks are buffered through remittances for a sample of non-oil MENA countries that include Egypt, Jordan, Syria, Algeria, Morocco and Tunisia.

size of remittance inflows to Tajikistan, which has the highest remittance to GDP ratio (around 50%) in the world during the recent years (Slay and Bravi 2011).[29] In comparison to other developing countries, Hadzi-Vaskov (2006) also finds that the extent of smoothing through remittances is strongest in transition economies. Most countries belonging to Sub-Saharan Africa witness positive smoothing, while for others with a negative estimate, the extent of dis-smoothing is small. This positive smoothing observed by several regional economies seems to be the outcome of countercyclical characteristics of remittances, as comprehensively documented by Singh et al. (2009).

Except Bangladesh, all other countries in South Asia witness positive smoothing. Remittance flows to Bangladesh are heavily concentrated to the Gulf Cooperation Council (GCC) countries: 65% of all remittances come from the GCC in 2009. This heavy dependence to a particular region may have resulted in dis-smoothing of output shocks via remittances. Pakistan also has a higher share of remittance inflows (56%) from GCC economies; consequently, the extent of positive smoothing is nominal.

4.2 Determinants of risk sharing via remittances

The aforementioned discussion is primarily based on the findings of other studies that at best, may partly explain the cross-country patterns of smoothing. There is a need, therefore, to systematically investigate the underlying factors that explain the large cross-country differences in the estimated degree of income smoothing via remittances. We examine these indicators under two specific categories: first, we think about whether the diversification of migrants, the size of remittances and the locational characteristics of remittance-sending countries matter for risk sharing; second, we look for other potential determinants, such as the degree of financial openness, financial development and the institutional quality of the recipient economy, that may affect risk sharing to varying degrees.

4.2.1 Diversification, size and sources of remittances

Table 3 presents our main findings based on the cross-section estimations of Equation 2, wherein the dependent variable is the estimate of risk sharing via remittance flows ($\widehat{\beta_i}$).

[29] Tajikistan has maintained a considerably high average remittance to GDP ratio of 25% in the last two decades (based on our own calculations).

First and foremost, our variable of interest is the measure capturing the extent of migrant diversification for each country. From a risk sharing perspective, having more diverse migrant destinations may ensure that remittances are coming from regions that have less synchronized business cycles, thereby generating aggregate flows that are more countercyclical vis-à-vis the domestic economy than the ones solely originating from a particular region. Few researchers such as Ratha et al. (2010) also have argued in favour of well-diversified migrant destinations but for different reasons, such as bringing stability in remittance flows, particularly in times of economic downturn.[30]

In Table 3, we hold the diversification measure fixed, and introduce all the other explanatory variables including the control variables one by one, in order to check the stability of the coefficient of the diversification measure. The migrant diversification measure comes out to be positively significant in all models (Columns 1–8), implying that the more diverse the migration destinations, higher will be the amount of risk shared in the recipient economy. A factual case in point here is the Philippines, whose emigrants are well-diversified globally with presence in US, the GCC and Europe, and consequently has a substantially high risk sharing estimate (15%). On the contrary, Turkish and Haitian emigrants are concentrated in a few destinations (mostly Germany and the US, respectively)[31], and may therefore generate remittances that are unable to smooth output fluctuations (–8% and –13%, respectively). This is further supported by evidence of procyclical behaviour of remittances send by Turkish workers in Germany with the output in their home country (Sayan 2004 & 2006; Sayan and Tekin-Koru 2007a & 2007b).[32] In other words, remittances that Turkey receives from Germany tend to decrease when there is a slowdown in economic activity in Turkey, leading to dis-smoothing of output fluctuations. Similarly, Ratha et al. (2010) document that business cycles are highly synchronized between Haiti and US, which have resulted in procyclical remittance inflows.

Second, we address the important issue of whether or not relatively large remittance-receiving countries tend to share more risk than others. The size of remittance flows as

[30] To prove their point, Ratha et al. (2010) documents that remittance inflows to India witness a modest decline during the recent global financial crisis mainly because of well-diversified Indian immigrants to the GCC (40%), North America (20%) and other regions (40%).

[31] It has been documented that almost two-thirds of Turkish migrant workers are employed in Germany (Sayan 2006) and half of Haitian migrant workers are employed in the US (Ratha et al. 2010).

[32] Sayan and Tekin-Koru (2007a & 2007b) further argue that remittances from Germany are less likely to have noticeable poverty-reducing effects in Turkey.

measured by remittances to GDP ratio is statistically significant at 1% level (Columns 2 and 8), suggesting that higher remittance flows lead to higher risk sharing. As another countercheck, top recipient economies in terms of the size of remittances are found to share a substantial amount of risk through remittances. For instance, Lesotho has the highest remittance to GDP ratio (29%) in the sample and shares 26% of output shocks. Tajikistan, with a 26% remittance to GDP ratio, has absorbed 38% of output shocks through remittances. Likewise, about 11% of output shocks are being absorbed in Bosnia and Herzegovina, having remittance to GDP ratio of 25%, and 26% of risk is shared in Tonga with a 22% remittance to GDP ratio.

Both our proxies for migrant diversification and the size of remittances appear to be the leading determinants of risk sharing via remittances, as together they capture almost 28% of the variation in the risk sharing estimate, as indicated by a relatively high R-squared (Column 2), given the cross-section nature of our estimations.

In Columns 3–5, we use proxies representing the relevant features of the remittance-sending countries that are similar to the variables commonly used in gravity models from the trade literature. In the risk sharing context, remittances that come from distant countries may have opposite implications than the ones that originate from less remote or regional countries, owing to the degree of business cycle synchronization. Because of higher business cycle correlations among regional and neighbouring countries (known as the border effect in international business cycle literature)[33], it is anticipated that remittances originating from the same continent or region will be procyclical and thus fail to serve as a buffer against domestic output shocks.

The estimated coefficients, for the Distantness, the proxy capturing "remoteness" and information frictions, and Continent share (representing the share of remittances coming from countries belonging to the same continent) point towards similar outcomes. For either of these measures, we obtain intuitive findings indicating that a higher proportion of remittances coming from countries that share the same continent as recipient country and remittances coming from less distant countries negatively affect the extent of risk shared via remittances.

[33] See for example, Clark and van Wincoop (2001), Martincus and Molinari (2007), and Montoya and de Haan (2008).

OECD share is employed to check whether remittance inflows from developed economies are stabilizing although the linkage is ambiguous. The coefficient is negative and significant at 10%, indicating that a higher proportion of remittance inflows from the OECD group is unfavourable for smoothing out output fluctuations.[34] The interpretation for the negative coefficient for the OECD share is not straightforward. There are some strong channels through which shocks are known to be transmitted from the OECD to developing economies, depending on the varying degree of their financial exposure. This has possibly resulted in producing business cycles that move in tandem in both developed and recipient countries, thus generating remittances from the OECD group that are procyclical to the recipient economy.

4.2.2 Financial openness, financial development and institutional quality indicators

Apart from the aforementioned indicators, we search for other potential determinants of smoothing based on the survey of remittance and risk sharing literatures. In this regard, we are further interested in exploring whether the degree of financial openness, financial development and institutional quality, influence a recipient country's capacity to absorb output shocks through remittances. In Table 4, we present the estimations by adding the relevant measures one by one, along with controls relating to the size of the economy and the stock of emigrants.

Our first indicator is the measure for financial openness that appears to have an expected positive (albeit insignificant) impact on smoothing via remittances. We then examine whether financial sector development plays any role in absorbing output shocks through remittances. On the one hand, a well-developed financial sector is expected to direct remittances to projects with higher returns; on the other hand, remittances are found to provide an alternative financing channel to address liquidity constraints in countries with a less developed financial sector (see for example, Giuliano and Ruiz-Arranz (2009) and Combes and Ebeke (2011)).

[34] In other words, this implies that remittances originating from developing countries should enhance smoothing. Our preliminary investigation supports this conjecture (positive and significant coefficient) when developing countries' share (i.e. 1-OECD share) is included as an explanatory variable.

Here we use three different measures to proxy for financial sector development, that include (1) liquid liabilities as a share of GDP (M2 to GDP ratio); (2) bank deposits, comprising demand, time and saving deposits as a share of GDP; and (3) private credit by deposit money banks as share of GDP.[35] In all of the models (Columns 2–4), financial development measures remain mostly insignificant with a positive sign. This positive sign may also be for the reason that countries with a more developed financial sector fetch a high volume of remittances (Giuliano and Ruiz-Arranz 2009), and thus enhance risk sharing. To tackle this, we also control for the size of remittance inflows, but obtain similar findings.

Finally, we investigate whether or not institutional quality matters for risk sharing via remittances. Logically, remittances can contribute more towards smoothing when there are sound institutions and policies in place that provide incentives to utilize these flows prudently. Volosovych (2013) estimates that an improvement in investor protection enhances risk sharing from cross-border factor income by fivefold. Fratzscher and Imbs (2009) also obtain comparable findings. Similarly in remittance literature, Catrinescu et al. (2009) conclude that remittances enhance growth in countries having better quality institutions. By contrast, Abdih et al. (2012b) document that remittance inflows adversely impact the institutional quality of the recipient economy, primarily for the reason that the government diverts these resources to cater to its own objectives.

As in the previous case, we introduce three measures that reflect different dimensions of the institutional quality of the recipient economies, namely regulatory quality, government effectiveness and the Corruption Perception index. We find that all the measures for institutional quality exert a positive but statistically insignificant impact on risk sharing via remittances (Columns 5–7). Overall, we are not able to observe any prominent role that financial openness, financial sector development and institutional quality, perform to enhance the risk sharing capabilities of the recipient economy.

4.2.3 Sub-sample analysis and removing outliers

To investigate whether our earlier results are sample-specific, we group our sample countries on the basis of relevant country characteristics namely, high/low remittance to GDP countries, high/low emigrant to population countries, high/low financially open countries,

[35] For an extensive literature survey on financial development indicators, see Levine (1997).

high/low financially developed countries, and non-African/African countries. Although the distinction between high and low categories is subjective and is essentially driven by the aggregate sample size[36]; nevertheless, these groupings are fairly representative of the underlying characteristics on which they are based. For instance, *high* remittance to GDP countries, have remittances exceeding 9% of GDP on average, while *low* remittance to GDP countries have only 1% remittance to GDP ratio (on average).[37]

As can be seen from Table 5, the estimate for migrant diversification is strongly significant in all sub-samples, implying that higher diversification of emigrants facilitates higher smoothing through remittances. Similarly, Table 6 echoes our previous results that a high remittance to GDP ratio enhances risk sharing. However, it is worth noting that the estimated coefficient is insignificant in case of high financially open countries. One possible explanation could be that more open economies have other dominant mechanisms through which remittances augment smoothing. Overall, both the measures capturing migrant diversification and the size of remittances are found to be robust to splitting the samples.

Among all subsamples, we are particularly interested to see whether our main variables behave differently with the inclusion of other explanatory variables in the case of high/low categories of financially open countries and financially developed countries. This is primarily for the reason that these country characteristics appear to be vital for an effective role of remittances in providing insurance against output shocks. Also our previous results indicate that the level of significance of the migrant diversification and the size of remittance measures differ among these subsamples.

[36] Considering the aggregate sample of 86 countries and retaining sufficient number of observations (in each group) for estimation purposes, the groupings turn out to be of approximately equal size.

[37] Similar is the case with all other groups. For high/low remittance (to GDP) countries: all countries with remittances more than 3% of GDP are included in the high remittance to GDP group (group mean: 10%), while those with less than 3% of GDP are included in the low remittance to GDP group (group mean: 1%). For high/low emigrant (to population) countries: all countries with emigrants above 5% of the population are included in the high category (group mean: 18%), while countries with below 5% value are included in low category (group mean: 2%). For high/low financially open countries: all countries that have Chinn–Ito index values between –0.3 to 2.5 are considered high financially open countries (group mean: 0.8), while countries with index values between –0.3 and –2.5 are included in the less open category (group mean: –1.1). For high/low financially developed countries: all countries that have M2 to GDP ratio above 30% belong to high financially developed countries (group mean: 53%), while those with below 30% value are categorized under low financially developed countries (group mean: 22%). For non-African and African countries: countries belonging to Sub-Saharan Africa are indicated as African countries, while all other countries mentioned in Table 2 are categorized as non-African countries.

Table 7 reports the results in the presence of other explanatory variables. As established earlier, the size of remittance flows does not affect the extent of smoothing in more open economies (Column 1). By contrast, in high/low financially developed countries, both our proxies for migrant diversification and the size of remittances are significant. Our findings here do not conform to those of Combes and Ebeke (2011) which suggest that remittances work better towards stabilizing consumption in less financially developed economies. The coefficients of the other explanatory variables related to the locational characteristics of the remittance-sending countries (i.e. Distantness, OECD share, and Continent share) have the expected signs but are mostly insignificant. To sum up, even after splitting the samples, our main results, by and large, remain unaffected.

As another robustness check to consider whether or not the findings are driven by outliers, Equation 2 is estimated by dropping the extreme values of the risk sharing estimate ($\widehat{\beta_i}$). The top and bottom 3.5% of the countries in terms of high and low values of $\widehat{\beta_i}$ are removed;[38] nevertheless, the estimates of the migrant diversification index and the remittance to GDP ratio remain significant. In addition, we employ Least Absolute Deviation (LAD) estimation that gives less weight to outliers as compared to OLS estimation (Volosovych 2013). The migrant diversification index is highly significant at 1% level, while the other explanatory variables are insignificant with a pseudo R-squared of 18%. In general, the findings remain robust to controlling for outliers.[39]

4.2.4 Panel regression results

Finally, to take advantage of both dimensions of the data, we estimate the panel specification in Equation 3 using a two-step Generalized Least Squares (GLS) regression. As can be seen in Table 8, the estimation results for the panel model are similar to the results obtained with the cross-section regressions. The coefficient $\widehat{\beta_0}$ reflects the average risk sharing via remittances, which is comparable to the average of the estimated extent of risk sharing obtained by individual countries as reported in Table 2. Further confirming the results of the cross-section estimations, both our measures for migrant diversification and the size of

[38] The bottom three countries in terms of the risk sharing estimate ($\widehat{\beta_i}$) include Haiti (–13%), Bangladesh (–9%) and Belize (–9%), while the top three countries include Tajikistan (38%), Lesotho (26%) and Tonga (26%).
[39] Following Volosovych (2013), we also experiment by including other controls such as the financial openness, financial development and institutional quality indicators one by one into our main regression (Equation 2); nevertheless, the results remain somewhat similar.

remittances are positive and highly significant. The coefficient of the time trend is positive (but not significant), which roughly indicates that risk sharing through remittances has improved over time.

6 Concluding remarks

Remittances are considered as a valuable source of foreign exchange in many developing countries, particularly in times of economic downturn. Unlike FDI and private capital flows which often rise during booms and depress during economic downturns, remittances are found to be countercyclical and relatively less volatile compared to other external flows. With the growing importance of remittance flows, an increasing number of researchers have simultaneously examined the macroeconomic implications on recipient economies. Contributing to this strand of literature, our paper examines the potentially important role of migrants' remittances in providing insurance against domestic output shocks. Using a large sample of 86 developing countries over the period 1990–2010, our results suggest that remittance inflows provide an important channel through which risk sharing might take place in the developing world. Although the extent of risk sharing via remittances stands at 3.3% on average, there is substantial cross-country variation found in our sample, ranging from 38% for Tajikistan to –13% for Haiti. We therefore thought it necessary to explore why the impact of remittances is so heterogeneous across developing countries.

Against this background, our study documents some leading determinants of risk sharing via remittances. Most importantly, we estimate that countries with well-diversified migrants globally, share more risk than others. This is further supported by evidence that those countries which are well-known for broad geographical dispersion of their migrants (such as Philippines) are found to attain a higher degree of risk sharing, while countries whose migrants are concentrated in a few destinations (such as Turkey and Haiti) are unable to insure through remittances. In addition, a larger amount of remittance flows is likely to have a greater stabilizing impact on recipient economies. It is also observed that remittances originating from less distant countries and from countries belonging to the same continent adversely affect the extent of smoothing via remittances. In essence, this result (although not robust) reflects the same underlying behaviour: the actual degree of business cycle correlation between remittance-receiving and -sending countries can help explain why the extent of smoothing through remittances varies so much. Both the cross-section and panel estimations

confirm that the main findings with regard to the positive impact of the diversification of migrants and the size of remittance flows on risk sharing are robust.

From the currency/monetary union perspective, our results point out that for several developing economies that aim to be part of a prospective union, remittances can provide an effective channel to absorb asymmetric output shocks and should therefore be considered in the discussion on the optimum currency area (OCA). In this regard, our results further support Frankel (2011, p.14), who concludes that "remittances should join trade, labor mobility, and transfers, on the list of optimum currency area criteria". Needless to mention here that the insurance role of remittances may actually turn out to be more pronounced, as a large chunk of remittance flows that are transmitted through informal channels remain unrecorded in official estimates.

References

Abdih, Y., Barajas, A., Chami, R., Ebeke, C., 2012a. Remittances channel and fiscal impact in the Middle East, North Africa, and Central Asia. International Monetary Fund Working Paper 12/104.

Abdih, Y., Chami, R., Dagher, J., Montiel, P., 2012b. Remittances and institutions: Are remittances a curse. World Development 40, 657–666.

Adams Jr., R.H., Page, J., 2005. Do international migration and remittances reduce poverty in developing countries? World Development 33, 1645–1669.

Adams Jr., R.H., 2006. Remittances and poverty in Ghana. World Bank Policy Research Paper 3838.

Aggarwal, R., Demirgüç-Kunt, A., Martínez Pería, M.S., 2011. Do remittances promote financial development? Journal of Development Economics 96, 255–264.

Alfaro, L., Kalemli-Ozcan, S., Volosovych, V., 2008. Why doesn't capital flow from rich to poor countries? An empirical investigation. Review of Economics and Statistics 90, 347–368.

Amuedo-Dorantes, C., Pozo, S., 2004. Workers' remittances and the real exchange rate: A paradox of gifts. World Development 32, 1407–1417.

Asdrubali, P., Sørensen, B.E., Yosha, O., 1996. Channels of interstate risk sharing: United States 1963–90. Quarterly Journal of Economics 111, 1081–1110.

Athanasoulis, S.G., van Wincoop, E., 2000. Growth uncertainty and risk sharing. Journal of Monetary Economics 45, 477–505.

Azam, J-P., Gubert, F., 2005. Migrant remittances and economic development in Africa: A review of evidence. Institut d'Économie Industrielle (IDEI) Working Papers 354. Available at http://idei.fr/doc/wp/2005/remit.pdf

Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., Montiel, P., 2009. Do workers' remittances promote economic growth? International Monetary Fund Working Paper 09/153.

Barajas, A., Chami, R., Hakura, D.S., Montiel, P., 2010. Workers' remittances and the equilibrium real exchange rate: Theory and evidence. International Monetary Fund Working Paper 10/287.

Balli, F., Basher, S.A., Ozer-Balli, H., 2011. Income insurance and the determinants of income insurance via foreign asset revenues and foreign liability payments. Economic Modelling 28, 2296–2306.

Balli, F., Basher, S.A., Louis, R.J., 2012. Risk sharing in the Middle East and North Africa: The role of remittances and factor incomes. Economics of Transition 21, 135–155.

Balli, F., Ozer-Balli, H., 2011. Income and consumption smoothing and welfare gains across Pacific Island countries: The role of remittances and foreign aid. Economic Modelling 28, 1642–1649.

Baxter, M., Crucini, M.J., 1995. Business cycles and the asset structure of foreign trade. International Economic Review 36, 821–854.

Beck, T., Demirgüç-Kunt, A., 2009. Financial institutions and markets across countries and over time: Data and analysis. World Bank Policy Research Working Paper 4943.

Bugamelli, M., Paternò, F., 2011. Output growth volatility and remittances. Economica 78, 480–500.

Catrinescu, N., Leon-Ledesma, M., Piracha, M., Quillin, B., 2009. Remittances, institutions, and economic growth. World Development 37, 81–92.

Cochrane, J.H., 1991. A simple test of consumption insurance. Journal of Political Economy 99, 957–976.

Combes J-L., Ebeke, C., 2011. Remittances and household consumption instability in developing countries. World Development 39, 1076–1089.

Chami, R., Fullenkamp, C., Jahjah, S., 2003. Are immigrant remittance flows a source of capital for development? International Monetary Fund Working Paper 03/189.

Chami, R., Gapen, M., Barajas, A., Montiel, P., Cosimano, T., Fullenkamp, C., 2008. Macroeconomic consequences of remittances. International Monetary Fund Occasional Paper No. 259.

Chami, R., Hakura, D., Montiel, P. 2009. Remittances: An automatic output stabilizer? International Monetary Fund Working Paper 09/91.

Chinn M.D., Ito, H., 2008. A new measure of financial openness. Journal of Comparative Policy Analysis: Research and Practice 10, 309–322.

Chinn M.D., Ito, H., 2012. Notes on the Chinn-Ito financial openness index. Available at http://web.pdx.edu/~ito/Chinn-Ito_website.htm

Clark, T., van Wincoop, E., 2001. Borders and business cycles. Journal of International Economics 55, 59–85.

Demyanyk, Y., Ostergaard, C., Sørensen, B. E., 2008. Risk sharing and portfolio allocation in EMU. European Economy, Economic Papers 334. Directorate General Economic and Monetary Affairs, European Commission.

Diamond, P., 1967. Cardinal welfare, individualistic ethics, and interpersonal comparison of utility: Comment. The Journal of Political Economy 75, 765–766.

Ebeke, C., Combes J-L., 2013. Do remittances dampen the effect of natural disasters on output growth volatility in developing countries? Applied Economics 45, 2241–2254.

Frankel, J., 2011. Are bilateral remittances countercyclical? Open Economies Review 22, 1–16.

Fratzscher, M., Imbs, J., 2009. Risk sharing, finance and institutions in international portfolios. Journal of Financial Economics 94, 428–447.

Giuliano, P., Ruiz-Arranz, M., 2009. Remittances, financial development, and growth. Journal of Development Economics 90, 144–152.

Goff, M.L., 2010. How remittances contribute to poverty reduction: A stabilizing effect. Centre d'Etudes et de Recherches sur le Développement International, University of Auvergne. Available at http://www.cerdi.org/uploads/ed/2010/2010.08.pdf

Gubert, F., 2002. Do migrants insure those who stay behind? Evidence from the Kayes Area (Western Mali). Oxford Development Studies 30, 267–287.

Hadzi-Vaskov, M., 2006. Workers' remittances and international risk-sharing. Utrecht School of Economics, Discussion Paper Series 06–19.

Islamaj, E., 2012. Financial liberalization and consumption smoothing: What have we learned so far? Working Paper, Vassar College. Available at http://irving.vassar.edu/faculty/ei/survey.pdf

Jeanneney, S.G., Tapsoba, S.J-A., 2012. Aid and income stabilization. Review of Development Economics 16, 216–229.

Jiménez-Martin, S., Jorgensen, N., Labeaga, J.N., 2007. The volume and geography of remittances from the EU. Directorate General for Economic and Financial Affairs, European Commission.

Jongwanich, J., 2007. Workers' remittances, economic growth and poverty in developing Asia and the Pacific countries. UNESCAP Working Paper 07/01.

Kalemli-Ozcan, S., Sorensen, B.E., Yosha, O., 2003. Risk sharing and industrial specialization: Regional and international evidence. American Economic Review 93, 903–918.

Kim, S., Kim, S. H., Wang, Y., 2006. Financial integration and consumption risk sharing in East Asia. Japan and the World Economy 18, 143–157.

Kim, D., Sheen, J., 2007. Consumption risk-sharing within Australia and with New Zealand. The Economic Record 83, 46–59.

Kose, M. A., Prasad, E.S., Terrones M. E., 2007. How does financial globalization affect risk sharing? Patterns and channels. International Monetary Fund Working Paper WP/07/238.

Lane, P., 2001. Do international investment income flows smooth income? Weltwirtschaftliches Archiv 137, 714–736.

Levine, R., 1997. Financial development and economic growth: Views and agenda. Journal of Economic Literature 35, 688–726.

Lewis, K., 1996. What can explain the apparent lack of international consumption risk sharing?. Journal of Political Economy 104, 267–297.

Lewis, K., 1999. Trying to explain home bias in equities and consumption. Journal of Economic Literature 37, 571–608.

Lopez, H., Molina, L., Bussolo, M., 2007. Remittances and the real exchange rate. World Bank Policy Research Working Paper 4213.

Lueth, E., Ruiz-Arranz, M., 2008. Determinants of bilateral remittance flows. The B.E. Journal of Macroeconomics 8, 1–21.

Mace, B.J., 1991. Full insurance in the presence of aggregate uncertainty. Journal of Political Economy 99, 928–956.

Massmann, M., Mitchell, J., 2004. Reconsidering the evidence: Are Eurozone business cycles converging? Journal of Business Cycle Measurement and Analysis 1, 275–307.

Martincus, C.V., Molinari, A., 2007. Regional business cycles and national economic borders: What are the effects of trade in developing countries? Review of World Economics 143, 140–178.

Mélitz, J., Zumer, F., 1999. Interregional and international risk sharing and lessons for EMU, Carnegie-Rochester Conference Series on Public Policy, 51, 149–88.

Montoya, L.A., de Haan, J., 2008. Regional business cycle synchronization in Europe? International Economics and Economic Policy 5, 123–137.

Mundaca, B.G., 2009. Remittances, financial market development, and economic growth: The case of Latin America and the Caribbean. Review of Development Economics 13, 288–303.

Mundell, R., 1973. Uncommon arguments for common currencies. In: Johnson, H.G., Swoboda, A.K. (Eds.), The Economics of Common Currencies: Proceedings of the Madrid Conference on Optimum Currency Areas. Allen and Unwin, London, UK, pp. 114–132.

Obstfeld, M., 1994. Are industrial-country consumption risks globally diversified? In: Leiderman, L., Razin, A. (Eds.), Capital Mobility: The Impact on Consumption, Investment, and Growth. Cambridge University Press, New York.

Obstfeld, M., Rogoff, K., 1996. Foundations of International Macroeconomics. MIT Press, Cambridge.

Özden, Ç., Parsons, C.R., Schiff, M., Walmsley, T.L., 2011. Where on earth is everybody? The evolution of global bilateral migration 1960–2000. World Bank Policy Research Working Paper 5709.

Pallage, S., Robe, M.A., 2003. On the welfare cost of economic fluctuations in developing countries. International Economic Review 44, 677–698.

Quartey, P., Blankson, T., 2004. Do migrant remittances minimize the impact of macro-volatility on the poor in Ghana? Global Development Network (GDN) report. Available at http://www.imf.org/external/np/res/seminars/2005/macro/pdf/quarte.pdf

Ratha, D., Mohapatra, S., Silwal, A., 2010. Outlook for remittance flows 2010–11: Remittance flows to developing countries remained resilient in 2009, expected to recover during 2010–11. Migration and Development Brief 12. Migration and Remittances Unit, World Bank.

Ratha, D., Shaw, W., 2007. South–South migration and remittances. Working Paper 102, World Bank.

Ratha, D., Silwal, A., 2012. Remittance flows in 2011 – an update. Migration and Development Brief 18. Migration and Remittances Unit, World Bank.

Ramirez, M.D., Sharma, H., 2008. Remittances and growth in Latin America: A panel unit root and panel cointegration analysis. Yale Economics Department Working Paper 51. Available at SSRN: http://ssrn.com/abstract=1148225

Reinke, J., 2007. Remittances in the balance of payments framework: Current problems and forthcoming improvements. Statistics Department, International Monetary Fund. Available at http://www.imf.org/external/np/sta/bop/pdf/rem.pdf

Sayan, S., 2004. Guest workers' remittances and output fluctuations in host and home countries: The case of remittances from Turkish workers in Germany. Emerging Markets Finance and Trade 40, 68–81.

Sayan, S., 2006. Business cycles and workers' remittances: How do migrant workers respond to cyclical movements of GDP at home? International Monetary Fund Working Paper 06/52.

Sayan, S., Tekin-Koru, A., 2007a. Business cycles and remittances: A comparison of the cases of Turkish workers in Germany and Mexican workers in the US. MPRA Paper 6030, University Library of Munich, Germany.

Sayan, S., Tekin-Koru, A., 2007b. Remittances, business cycles and poverty: The recent Turkish experience. MPRA Paper 6029, University Library of Munich, Germany.

Singh, R.J., Haacker, M., Lee, K., 2009. Determinants and macroeconomic impact of remittances in Sub-Saharan Africa. International Monetary Fund Working Paper 09/216.

Slay, B., Bravi, A., 2011. Recent trends in remittances and migration flows in Europe and Central Asia: The best protection against economic crisis? UNDP-RBEC Senior Economist's Office. Available at http://europeandcis.undp.org/news/show/065515FB-F203-1EE9-B5511CA5A95279B7

Sørensen, B.E., Yosha, O., 1998. International risk sharing and European monetary unification. Journal of International Economics 45, 211–238.

Sørensen, B. E., Wu, Y.T., Yosha, O., Zhu,Y., 2007. Home bias and international risk sharing: Twin puzzles separated at birth. Journal of International Money and Finance 26, 587–605.

Spatafora, N.L., 2005. Workers' remittances and economic development. Chapter II in World Economic Outlook: Globalization and External Imbalances, International Monetary Fund, 69–84.

Stockman, A.C., Tesar, L.L., 1995. Tastes and technology in a two-country model of the business cycle: Explaining international comovements. American Economic Review 85, 168–185.

Tapsoba, S.J-L., 2010. West African monetary integration and interstates risk-sharing. Centre d'Etudes et de Recherches sur le Développement International, University of Auvergne. Available at http://halshs.archives-ouvertes.fr/docs/00/55/32/44/PDF/2010.02.pdf

van Wincoop, E., 1994. Welfare gains from international risk sharing. Journal of Monetary Economics 34, 175–200.

Volosovych, V., 2013. Risk sharing from international factor income: Explaining cross-country differences. Applied Economics 45, 1435–1459.

Wilson, R., 1968. The theory of syndicates. Econometrica 36, 119–132.

World Bank, 2005. Global economic prospects 2006: Economic implications of remittances and migration. Washington, DC.

Yehoue, E.B., 2011. International risk-sharing and currency unions: the CFA zones. Journal of International Development 23, 936–958.

Appendix A: Data description and sources

Variables used to obtain the estimate of risk sharing via remittance flows $(\widehat{\beta_i})$

Remittance inflows	In US$ from the World Development Indicators (WDI) database and other sources.
GDP	Source: IMF's International Financial Statistics (IFS)
CPI	Source: IMF's International Financial Statistics (IFS)
Population	Source: IMF's International Financial Statistics (IFS)
Exchange rate	Units of local currency per US$ available from the IMF's International Financial Statistics (IFS).

Explanatory variables

Migrant diversification index	It measures the extent of diversification of migrant workers of a country across the world. The index is constructed as: $DIV_i = 1/\sum_{j=1}^{N}\left\|\left(\theta_{ij} - \theta_{ij}^{max}\right)\right\|$, where θ_{ij} is the ratio of migrants originating from country *i* working in country *j* over the total number of migrants from country *i*; θ_{ij}^{max} is the highest ratio among all θ_{ij} and *N* is the total number of countries where the emigrants of country *i* are distributed. The data on bilateral migrant stocks is extracted from the Global Bilateral Migration Database (GBMD) of the World Bank.
Distantness	It is the weighted average of the distances in thousands of kilometres from the capital city of a particular country to the capital cities of other countries using the total GDP shares of the other countries as weights. It is calculated as: $DIST_i = \frac{1}{T}\sum_{t=1}^{T}\sum_j \frac{d_{ij}gdp_j^t}{gdp^t}$, where d_{ij} is the distance from the capital city of country *i* to the capital city of country *j*, $gdp^t$is the group-wide GDP and T is the total sample length. The bilateral distance between the capital cities is obtained from the French Research Center in International Economics─(CEPII).
OECD share	It measures the share of total remittance inflows originating from OECD countries. The bilateral remittance data is obtained from Ratha and Shaw (2007), Jiménez-Martin et al. (2007), Lueth and Ruiz-Arranz (2008), Frankel (2011), the Migration and Remittances Unit (World Bank) and the web pages of several central banks.
Continent share	It measures the share of total remittance inflows coming from countries belonging to the same continent as the recipient country.
Financial openness (index)	It is based on Chinn–Ito index, which measures a country's degree of capital account openness. The index is based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) (Source: Chinn and Ito 2008, 2012).
M2 to GDP ratio	Money and quasi-money (M2) comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings and foreign currency deposits of resident sectors other than the central government (Source: World Development Indicators (WDI)).
Bank deposit to GDP ratio	It represents demand, time and saving deposits in deposit money banks as a share of GDP (Secondary source: Beck and Demirgüç-Kunt (2009); Primary source: IMF's International Financial Statistics (IFS)). Updated data from other sources.
Private sector credit by banks to GDP ratio	It simply represents the private credit by deposit money banks as ratio to GDP (secondary source: Beck and Demirgüç-Kunt (2009); primary source: IMF's International Financial Statistics (IFS)). Updated data from other sources.

Appendix A (continued)

Regulatory quality index	It reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The index ranges from –2.5 (weak) to 2.5 (strong) governance performance (Source: The Worldwide Governance Indicators, World Bank).
Government effectiveness index	It reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The index ranges from –2.5 (weak) to 2.5 (strong) governance performance (Source: The Worldwide Governance Indicators, World Bank).
Corruption perception index	This index is based on perceived levels of corruption in the public sector, as determined by expert assessments and opinion surveys for individual countries. It is available from Transparency International and ranges from 10 (highly clean) to 0 (highly corrupt).

List of countries

Sample countries (86)	Albania (ALB), Algeria (DZA), Azerbaijan (AZE), Bangladesh (BGD), Belize (BLZ), Benin (BEN), Bolivia (BOL), Bosnia and Herzegovina (BIH), Botswana (BWA), Bulgaria (BGR), Burkina Faso (BFA), Cambodia (KHM), Cameroon (CMR), Cape Verde (CPV), China (CHN), Colombia (COL), Costa Rica (CRI), Côte d'Ivoire (CIV), Croatia (HRV), Dominica (DMA), Dominican Republic (DOM), Ecuador (ECU), Egypt (EGY), El Salvador (SLV), Ethiopia (ETH), Fiji (FJI), Gabon (GAB), Gambia (GMB), Georgia (GEO), Ghana (GHA), Guatemala (GTM), Guinea (GIN), Guinea-Bissau (GNB), Guyana (GUY), Haiti (HTI), Honduras (HND), India (IND), Indonesia (IDN), Jamaica (JAM), Jordan (JOR), Kenya (KEN), Kyrgyz Republic (KGZ), Latvia (LVA), Lesotho (LSO), Lithuania (LTU), Malaysia (MYS), Mali (MLI), Mauritania (MRT), Mauritius (MUS), Moldova (MDA), Morocco (MAR), Mozambique (MOZ), Myanmar (MMR), Nepal (NPL), Nicaragua (NIC), Niger (NER), Nigeria (NGA), Pakistan (PAK), Panama (PAN), Papua New Guinea (PNG), Paraguay (PRY), Peru (PER), Philippines (PHL), Poland (POL), Rwanda (RWA), Samoa (WSM), São Tomé and Principe (STP), Senegal (SEN), Sierra Leone (SLE), Slovak Republic (SVK), Solomon Islands (SLB), Sri Lanka (LKA), Sudan (SDN), Swaziland (SWZ), Syrian Arab Republic (SYR), Tajikistan (TJK), Thailand (THA), Togo (TGO), Tonga (TON), Tunisia (TUN), Turkey (TUR), Uganda (UGA), Ukraine (UKR), Vietnam (VNM), Yemen (YEM), Zambia (ZMB).
OECD countries (23)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

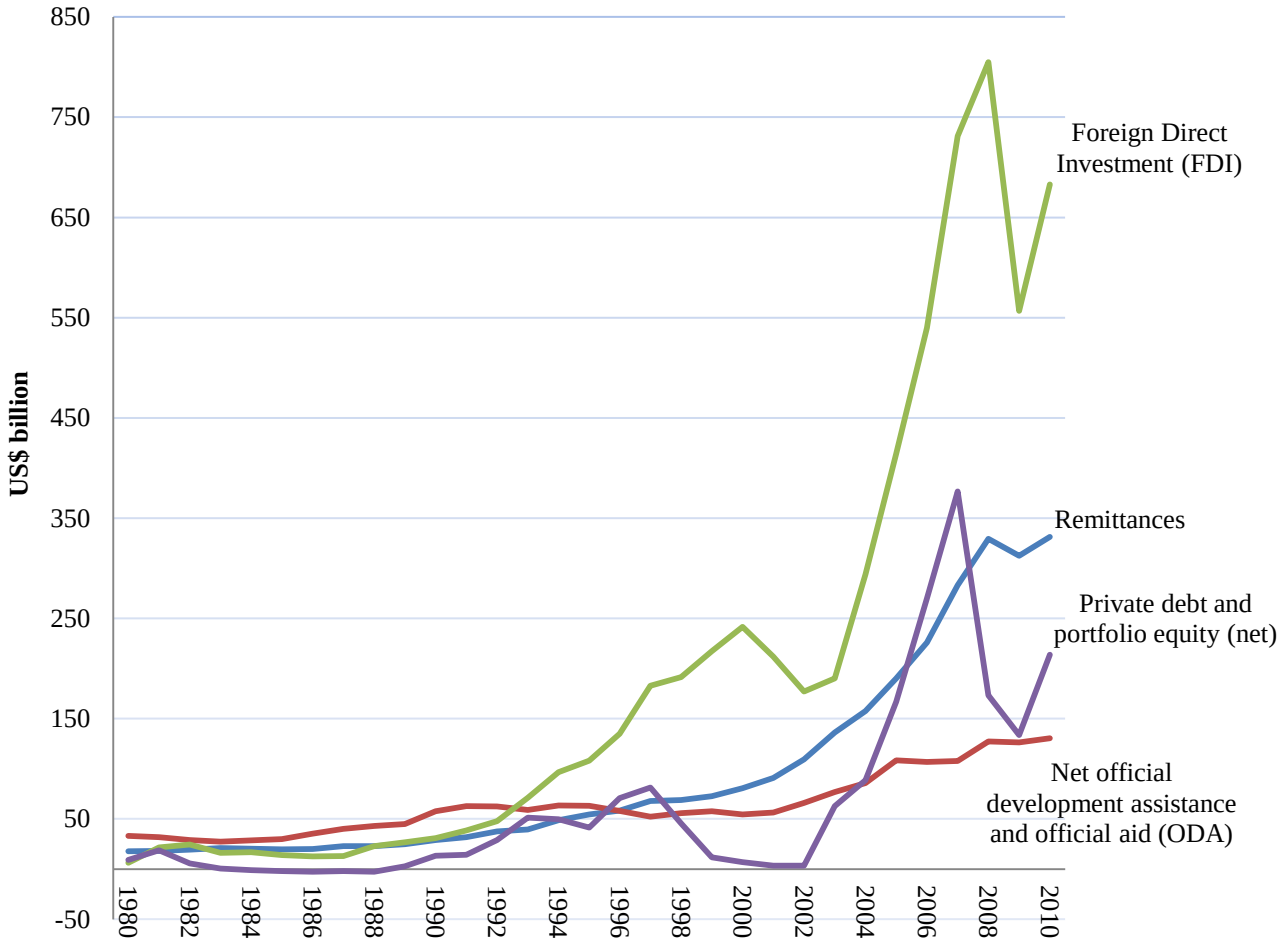

Figure 1: Remittances and other external flows to developing countries (Source: data on remittances, FDI, private debt and equity (net flows), and ODA are obtained from the World Development Indicators).

Table 1: Descriptive statistics for the main variables

	Observations	Mean	Standard Deviation	Maximum	Minimum
Risk sharing via remittance flows ($\widehat{\beta_i}$)	86	0.03	0.08	0.38	–0.13
Migrant diversification index	86	2.96	1.38	7.44	1.09
Remittance to GDP ratio	86	0.05	0.08	0.29	0.01
Distantness (log)	86	9.01	0.25	9.45	8.16
OECD share	86	0.55	0.31	0.94	0.00
Continent share	86	0.58	0.32	0.98	0.00
Migrant number (log)	86	12.18	1.76	15.31	7.30
GDP (log)	86	23.28	1.92	28.74	18.52
Financial openness (index)	86	–0.14	1.13	2.46	–1.86
M2 to GDP ratio	86	0.39	0.23	1.19	0.09
Bank deposit to GDP ratio	78	0.32	0.20	1.02	0.07
Private sector credit by banks to GDP ratio	78	0.26	0.20	1.10	0.03
Regulatory quality index	86	–0.32	0.57	1.02	–2.12
Government effectiveness index	86	–0.41	0.54	1.04	–1.43
Corruption perception index	86	3.01	0.93	5.86	1.44

Notes: For a detailed description of the variables, see Appendix A. All variables are averaged across time for each country.

Table 2: Samples and the estimates of risk sharing via remittance inflows, $\widehat{\beta_i}(\%)$

East Asia & Pacific	$\widehat{\beta_i}(\%)$	**Latin America & Caribbean**	$\widehat{\beta_i}(\%)$	**Sub-Saharan Africa**	$\widehat{\beta_i}(\%)$
Cambodia	5	Belize	–9	Benin	2
China	3	Bolivia	–1	Botswana	3
Fiji	4	Colombia	2	Burkina Faso	–1
Indonesia	1	Costa Rica	–1	Cameroon	–1
Malaysia	3	Dominica	10	Cape Verde	4
Myanmar	2	Dominican Republic	–7	Côte d'Ivoire	–2
Papua New Guinea	–1	Ecuador	14	Ethiopia	–3
Philippines	15	El Salvador	–3	Gabon	0
Samoa	4	Guatemala	–6	Gambia	18
Solomon Islands	–1	Guyana	11	Ghana	4
Thailand	2	Haiti	–13	Guinea	3
Tonga	26	Honduras	–7	Guinea-Bissau	5
Vietnam	9	Jamaica	–8	Kenya	–4
Europe & Central Asia	$\widehat{\beta_i}(\%)$	Nicaragua	2	Lesotho	26
Albania	–6	Panama	0	Mali	6
Azerbaijan	21	Paraguay	–1	Mauritania	1
Bosnia and Herzegovina	11	Peru	2	Mauritius	6
Bulgaria	–4	**Middle East & North Africa**	$\widehat{\beta_i}(\%)$	Mozambique	4
Croatia	–2	Algeria	–4	Niger	5
Georgia	2	Egypt, Arab Rep.	9	Nigeria	2
Kyrgyz Republic	15	Jordan	0	Rwanda	–1
Latvia	3	Morocco	9	São Tomé and Principe	0
Lithuania	17	Syrian Arab Republic	12	Senegal	2
Moldova	3	Tunisia	3	Sierra Leone	–2
Poland	1	Yemen, Rep.	3	Sudan	–2
Slovak Republic	12	**South Asia**	$\widehat{\beta_i}(\%)$	Swaziland	12
Tajikistan	38	Bangladesh	–9	Togo	2
Turkey	–8	India	4	Uganda	–3
Ukraine	–3	Nepal	2	Zambia	1
		Pakistan	1		
		Sri Lanka	13		

Notes: $\widehat{\beta_i}$ quantifies the extent of idiosyncratic output risk smoothed through remittances by each sample country and is obtained from the regression Equation 1 as explained in Section 2.2. The estimated value of $\widehat{\beta_i}$ is reported in percentage terms in this table. The time series estimations are conducted for 86 developing countries for the period 1990–2010.

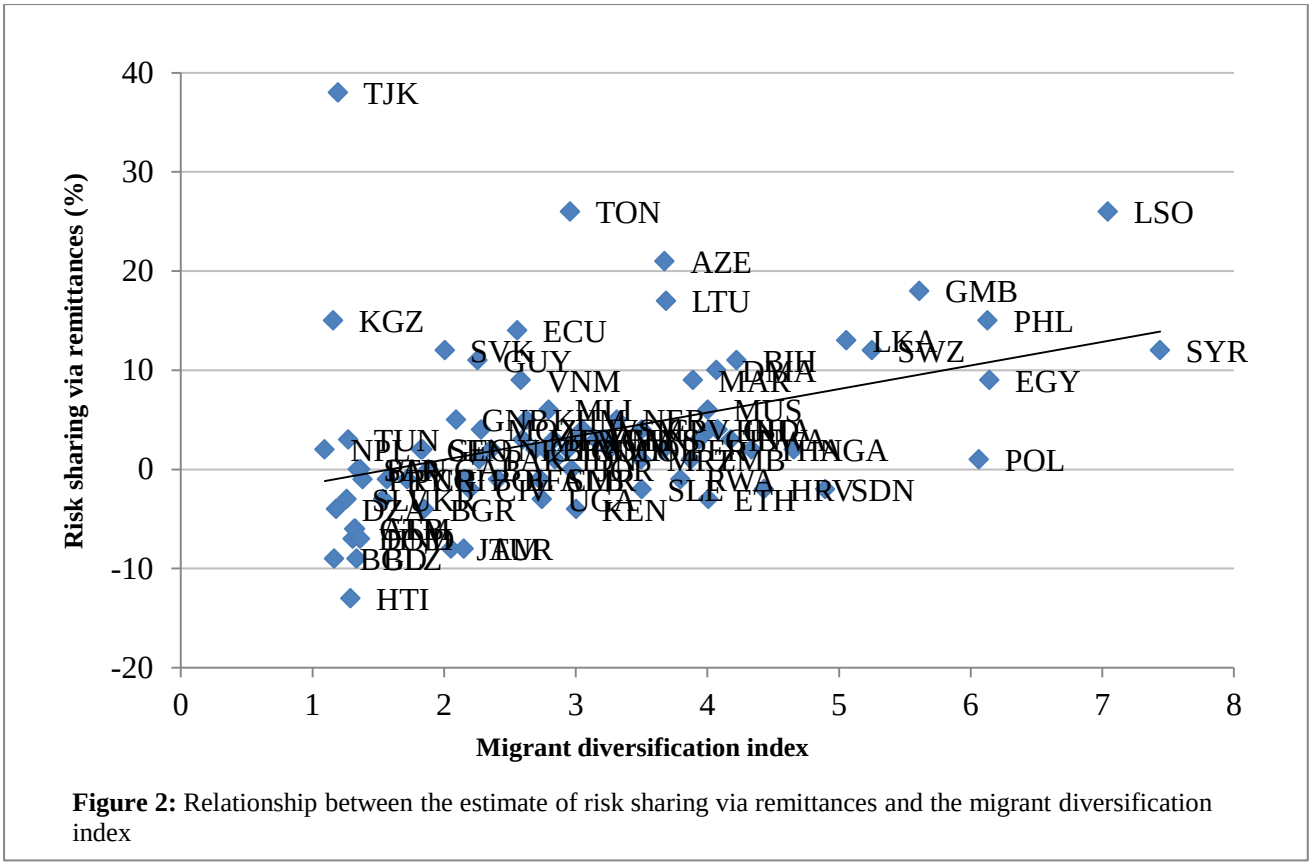

Figure 2: Relationship between the estimate of risk sharing via remittances and the migrant diversification index

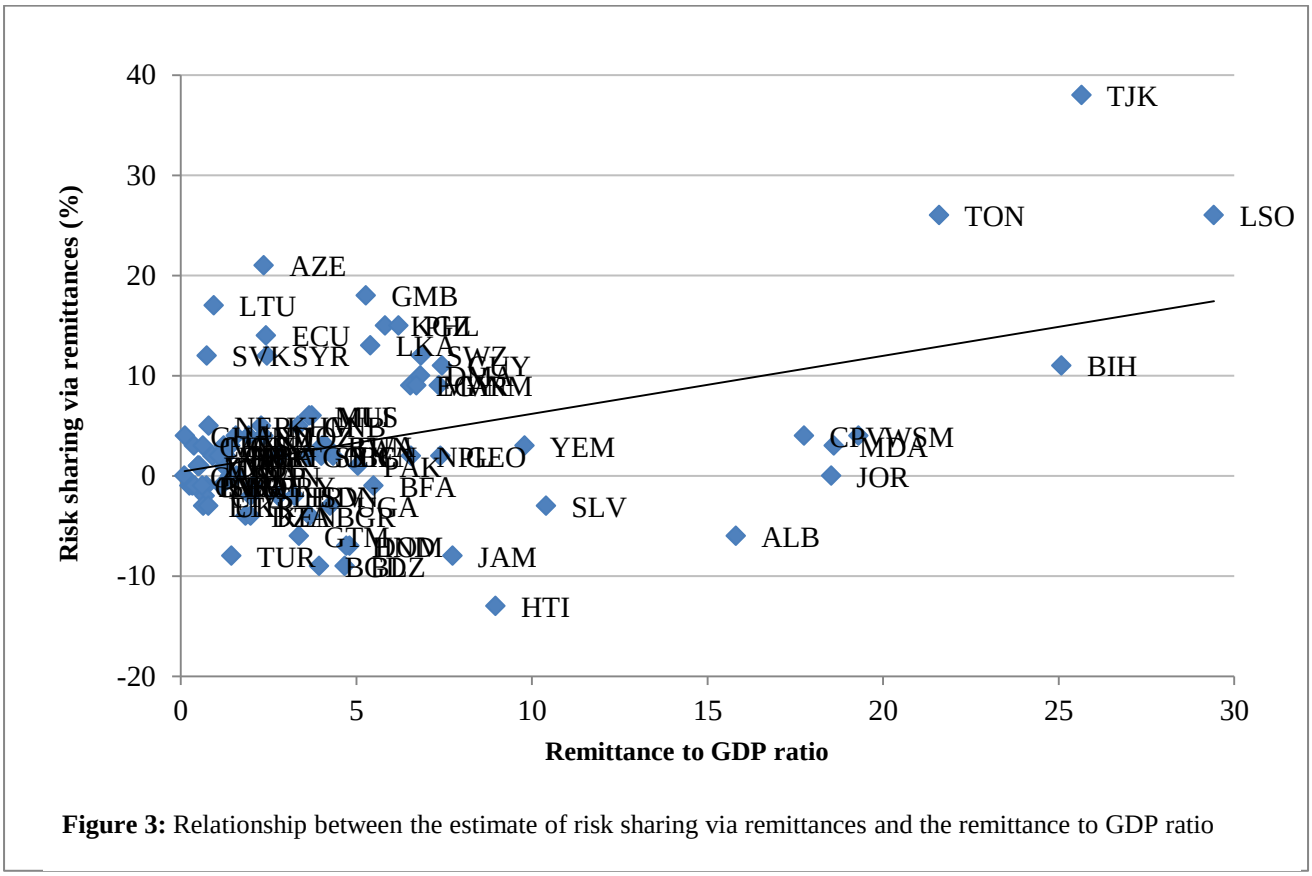

Figure 3: Relationship between the estimate of risk sharing via remittances and the remittance to GDP ratio

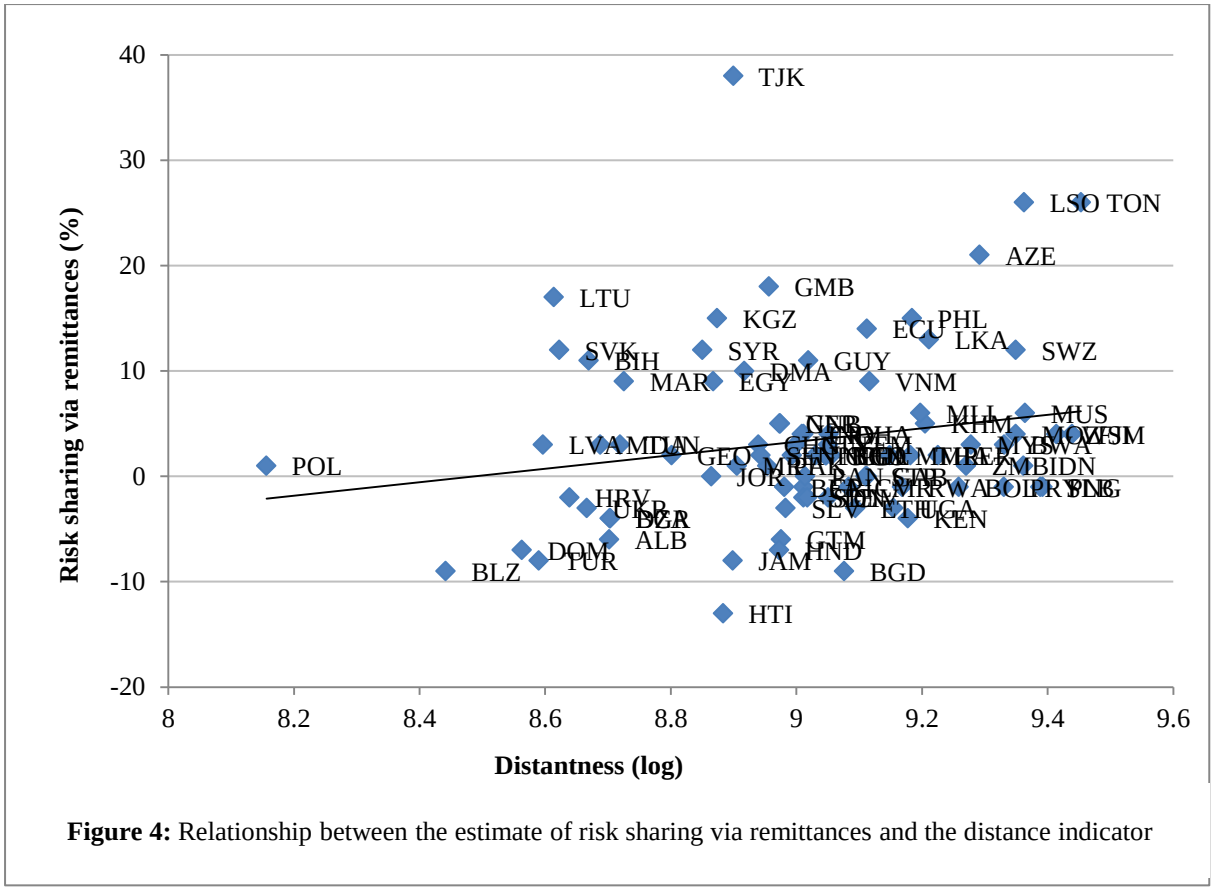

Figure 4: Relationship between the estimate of risk sharing via remittances and the distance indicator

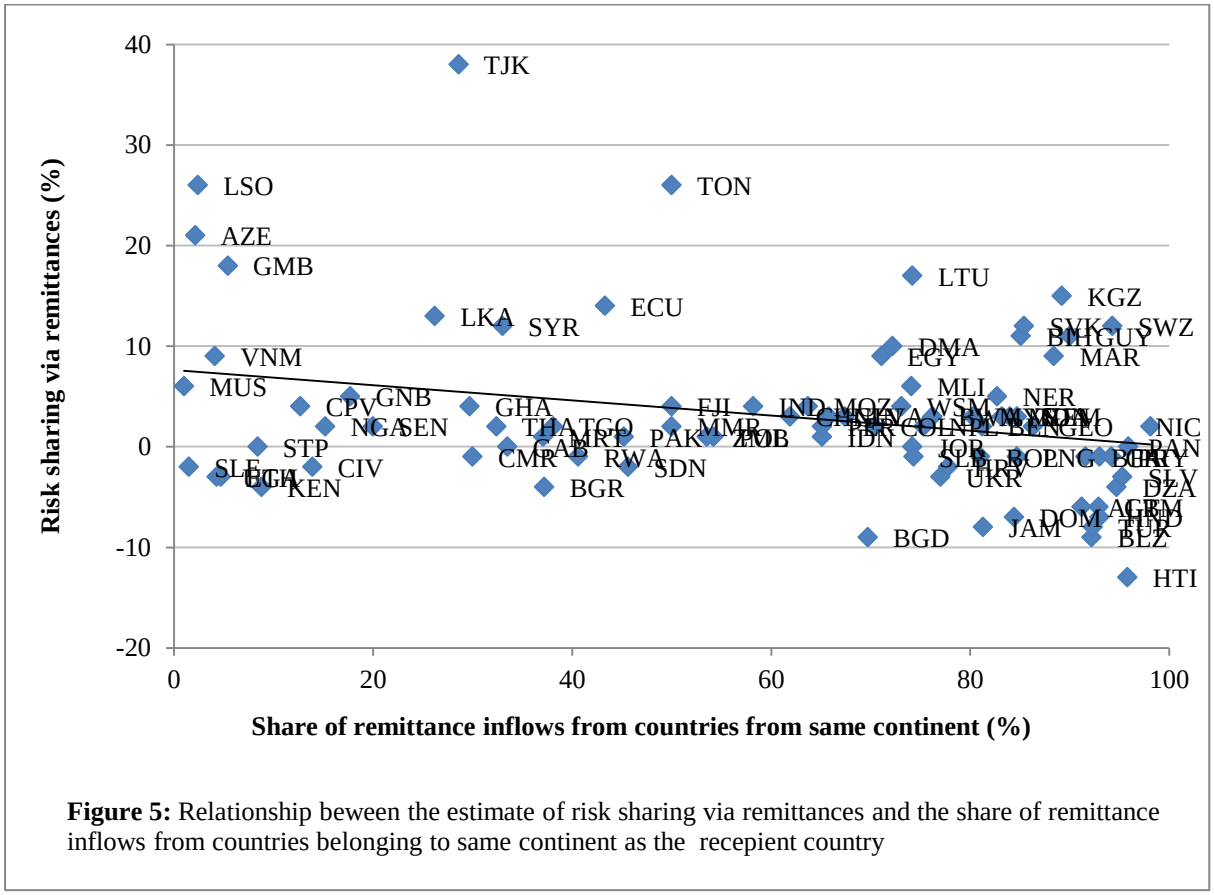

Figure 5: Relationship beween the estimate of risk sharing via remittances and the share of remittance inflows from countries belonging to same continent as the recepient country

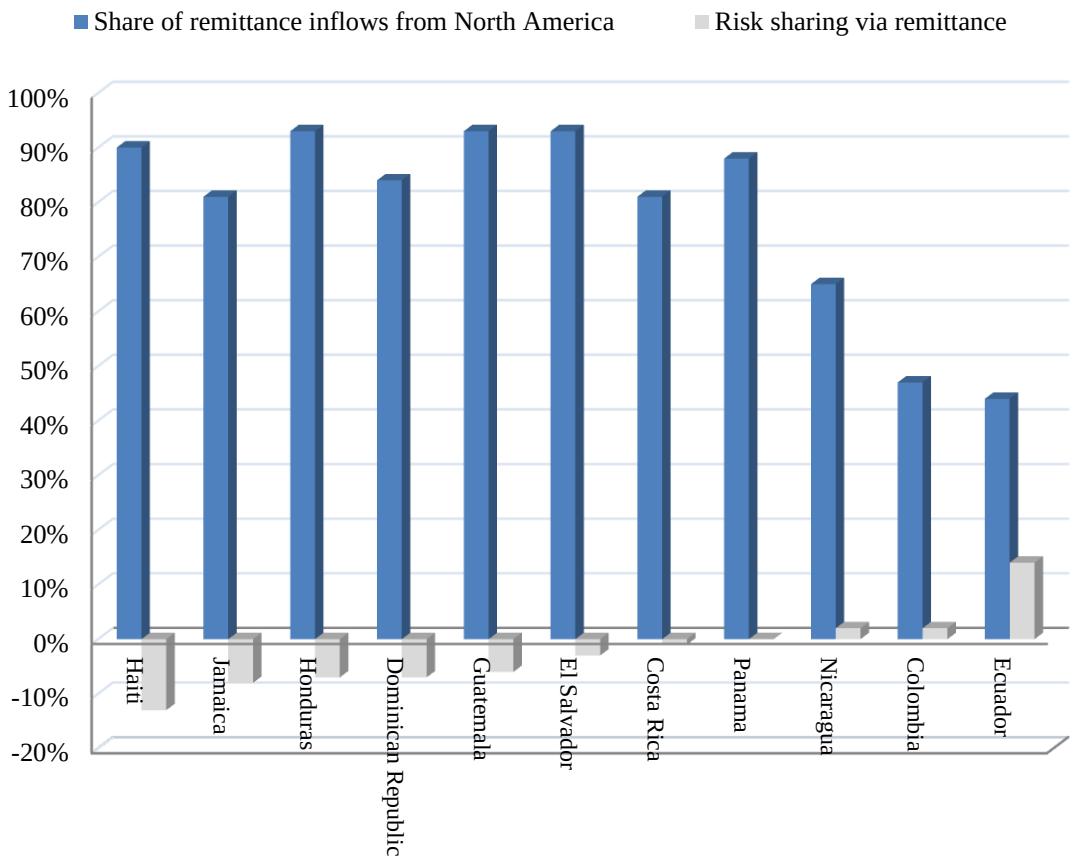

Figure 6: Risk sharing via remittances and origin of remittances for Latin America and Caribbean countries

Table 3: OLS estimations: exploring the determinants of risk sharing via remittance inflows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta}_i$)								
Migrant diversification index	0.021	0.017	0.020	0.020	0.017	0.021	0.022	0.017
	(3.02)***	(2.60)**	(3.10)***	(2.96)***	(2.24)**	(3.10)***	(3.41)***	(2.59)**
Remittance to GDP ratio		0.408						0.349
		(2.74)***						(2.71)***
Distantness (log)			0.054					0.038
			(1.69)*					(1.23)
OECD share				–0.049				–0.059
				(–1.38)				(–1.86)*
Continent share					–0.053			–0.047
					(–1.68)*			(–1.63)*
Migrant number (log)						–0.002		0.013
						(–0.54)		(1.81)*
GDP (log)							–0.008	–0.011
							(–1.93)*	(–1.74)*
R-squared	0.13	0.28	0.15	0.16	0.16	0.13	0.16	0.39
Observations	86	86	86	86	86	86	86	86

Notes: The dependent variable $\widehat{\beta}_i$ quantifies the extent of risk sharing through remittance inflows, and is obtained from regression Equation 1 as explained in Section 2.2. This table reports cross-section estimations including a constant term and employing the OLS technique. All variables are averaged across time for each country. White heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a detailed description of the explanatory variables, see Appendix A.

Table 4: Other potential determinants of risk sharing via remittance inflows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta}_i$)							
Financial openness (index)	0.001						
	(0.13)						
M2 to GDP ratio		0.000					
		(0.14)					
Bank deposit to GDP ratio			0.057				
			(1.76)*				
Private sector credit by banks to GDP ratio				0.055			
				(1.54)			
Regulatory quality index					0.000		
					(0.03)		
Government effectiveness index						0.015	
						(0.93)	
Corruption perception index							0.001
							(0.10)
Migrant number (log)	0.001	0.001	0.012	0.011	0.002	0.002	0.002
	(0.19)	(0.18)	(1.33)	(1.29)	(0.18)	(0.15)	(0.17)
GDP (log)	–0.005	–0.006	–0.000	–0.001	–0.005	–0.007	–0.006
	(–0.65)	(–0.70)	(–0.01)	(–0.08)	(–0.71)	(–0.89)	(–0.71)
R-squared	0.02	0.02	0.08	0.08	0.02	0.03	0.02
Observations	86	86	78	78	86	86	86

Notes: For an explanation of the estimation procedure, see the notes of Table 3. White heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a detailed description of the explanatory variables, see Appendix A.

Table 5: Sub-sample analysis: impact of the diversification of emigrants on risk sharing via remittance flows

	High remittance (to GDP) countries	Low remittance (to GDP) countries	High emigrant (to population) countries	Low emigrant (to population) countries	High financially open countries	Low financially open countries	High financially developed countries	Low financially developed countries	Non-African countries	African countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta}_i$)										
Migrant diversification index	0.037	0.014	0.032	0.024	0.035	0.021	0.027	0.024	0.029	0.029
	(4.53)***	(2.38)**	(2.99)***	(3.59)***	(5.66)***	(2.54)**	(4.96)***	(2.18)**	(2.83)***	(5.02)***
Migrant number (log)	0.016	0.011	0.013	0.004	0.013	0.012	-0.007	0.031	0.018	0.002
	(2.11)**	(0.94)	(0.69)	(0.48)	(1.35)	(1.06)	(-0.68)	(2.49)**	(1.49)	(0.37)
GDP (log)	–0.024	–0.009	–0.018	–0.000	–0.018	–0.017	–0.005	–0.031	–0.022	–0.009
	(–2.18)**	(–0.94)	(–1.24)	(–0.01)	(–1.78)*	(–1.52)	(–0.66)	(–2.27)**	(–2.07)**	(–1.62)
R-squared	0.26	0.11	0.17	0.39	0.26	0.14	0.34	0.16	0.13	0.53
Observations	43	43	46	40	42	44	46	40	50	36

Notes: For explanation on the estimation procedure, see the notes of Table 3. White heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a detailed description of the explanatory variables, see Appendix A.

Table 6: Sub-sample analysis: impact of the size of remittances on risk sharing via remittance flows

	High remittance (to GDP) countries	Low remittance (to GDP) countries	High emigrant (to population) countries	Low emigrant (to population) countries	High financially open countries	Low financially open countries	High financially developed countries	Low financially developed countries	Non-African countries	African countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta}_i$)										
Remittance to GDP ratio	0.470	1.771	0.553	0.454	0.332	0.516	0.376	0.911	0.730	0.361
	(3.25)***	(2.46)**	(1.69)*	(5.62)***	(1.29)	(3.83)***	(4.12)***	(2.19)**	(2.04)**	(6.94)***
Migrant number (log)	0.005	0.000	0.023	0.000	–0.013	0.001	0.017	0.006	0.018	–0.006
	(0.55)	(0.03)	(1.05)	(0.00)	(–1.03)	(0.13)	(1.69)*	(0.62)	(1.07)	(–0.90)
GDP (log)	–0.005	–0.002	–0.009	–0.004	–0.002	–0.000	0.011	–0.007	–0.012	–0.001
	(–0.42)	(–0.23)	(–0.57)	(–0.67)	(–0.24)	(–0.02)	(1.44)	(–0.77)	(–0.99)	(–0.15)
R-squared	0.27	0.16	0.15	0.56	0.07	0.37	0.29	0.31	0.17	0.43
Observations	43	43	46	40	42	44	46	40	50	36

Notes: The estimation procedure is the same as mentioned in the notes of Table 3. White heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 7: Sub-sample analysis: determinants of risk sharing via remittance inflows

	High financially open countries	Low financially open countries	High financially developed countries	Low financially developed countries
	(1)	(2)	(3)	(4)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta_i}$)				
Migrant diversification index	0.029	0.090	0.020	0.015
	(3.74)***	(2.04)**	(3.44)***	(2.19)**
Remittance to GDP ratio	0.208	0.385	0.295	0.890
	(0.85)	(3.09)***	(3.35)***	(3.36)***
Distantness (log)	0.026	0.028	0.066	0.026
	(1.87)*	(1.71)*	(1.99)*	(0.40)
OECD share	–0.023	–0.086	0.040	–0.113
	(–0.64)	(–1.98)*	(1.09)	(–3.70)***
Continent share	–0.034	–0.063	–0.024	–0.077
	(–0.89)	(–1.63)	(–0.72)	(–2.41)**
Migrant number (log)	0.011	0.014	0.000	0.017
	(1.00)	(1.43)	(0.04)	(1.95)*
GDP (log)	–0.013	–0.011	0.002	–0.015
	(–1.45)	(–1.26)	(0.38)	(–1.59)
R-squared	0.29	0.54	0.49	0.60
Observations	42	44	46	40

Notes: The estimation procedure is the same as mentioned in the notes of Table 3. White heteroscedasticity-consistent t-statistics are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8: Panel estimations: leading determinants of risk sharing via remittance flows

	(1)	(2)	(3)
Dependent variable: estimate of risk sharing via remittance flows ($\widehat{\beta_i}$)			
β_0	0.021	0.021	0.020
	(1.65)	(1.35)	(1.22)
Trend	0.450	0.391	0.410
	(0.21)	(0.44)	(1.03)
Migrant diversification index	1.143		2.032
	(2.94)***		(3.07)***
Remittance to GDP ratio		2.270	2.301
		(3.67)***	(3.83)***
R-squared	0.16	0.21	0.33
Observations	1624	1624	1624

Notes: This table reports the panel estimations results obtained from regression Equation 3 as explained in Section 2.2. ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a detailed description of the explanatory variables, see Appendix A.